# BENTHIC FORAMINIFERAL ASSEMBLAGES ON THE CONTINENTAL MARGIN OFF NOVA SCOTIA: A MULTIVARIATE APPROACH.

By

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# ABSTRACT

Two hundred and fifty grab samples from the continental margin off Nova Scotia were examined for total (live+dead) foraminiferal content. One hundred and twenty species were recognised, seventy five of which occur with an abundance greater than 3% in any one sample. Q-Mode factor analysis of the raw abundance data (total population) determined 8 shelf and 4 slope factor assemblages, accounting for 87.5% and 77% of the original raw data respectively. Comparison of the live data with the factor assemblages enabled the detection of anomalous assemblages which are un-representative in respect to present day environments.

In the north east of the study area (around Misaine, Canso and Banquereau) an exclusively agglutinated assemblage dominated by *Adercotryma glomerata* occupies both banks and basins. In the LaHave and Emerald Basins of the central shelf, a predominantly calcareous assemblage occurs with maximum amounts of *Globobulimina auriculata* and *Nonionellina labradorica*. Transitional between these two shelf assemblages is an agglutinating assemblage dominated by *Saccammina atlantica*. Consistently present along the shelf edge is a *Trifarina angulosa* assemblage. Present in Chedabucto and Gaberous bays and in a few samples near Sable Island is an agglutinating *Eggerella advena* assemblage. A relict and in some areas a transport affected assemblage is recognised in the south western approaches to Emerald Basin on the Scotian Gulf; this is dominated by *Elphidium excavatum*. Occupying the hard, rough bedrock, and sandy/gravelly areas of the inner shelf and outer bank regions is a *Cibicides lobatulus* assemblage.

Four assemblages lie seaward of the shelf break. An upper slope assemblage is dominated by *Bulimina exilis*, with a local variation dominated by *Trifarina occidentalis*. A lower slope assemblage is dominated by *Uvigerina peregrina*. Also present in slope regions is another *Elphidium excavatum* assemblage which is thought to be the down slope equivalent of the shelf assemblage.

The statistical relationship of these defined assemblages to various aspects of the marine environment (depth, temperature, salinity, percent gravel, sand and mud) were investigated through multiple regression techniques. This indicates that the present foraminiferal distribution patterns off Nova Scotia are mainly a response to the prevailing hydrography. The *Adercotryma glomerata* assemblage is influenced by the presence of cold, less than normal salinity waters of arctic, Labrador current origin. The central basin assemblage (*G. auriculata*) is related to warmer more saline waters of slope origin. The transition between these two bottom waters is marked by the *Saccammina atlantica* assemblage. The primary influence of the hydrography on assemblage distribution patterns on the shelf off Nova Scotia is probably related to calcium carbonate availability which is a function of temperature, salinity, and carbon dioxide content within each water type. Preferred substrate character is found to determine the occurrence of the *Cibicides lobatulus* assemblage.

Diversity trends within the study area were examined (S,H(s),$\alpha$,E). Each index used produced similar patterns which indicate relationships to hydrography and environmental stability.

Implications of the present study for further work on Pleistocene to Recent climatic changes are discussed with reference to a piston core from Canso Basin. On the basis of this study the down core changes in foraminiferal populations indicate several distinct variations in temperature and salinity since the last glaciation; these variations are probably a result of the varying degree of influence that Labrador derived waters have had in this area and is in turn a function of changing ice volumes to the north.

# ACKNOWLEDGEMENTS

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Finally, gratitude is due for an Izaak Walton Killam Memorial Scholarship, and to Dalhousie Graduate Studies for financial support that has made my sojourn at Dalhousie very pleasant indeed.

In dedication to Marie-Claude.

...the face of places,
and their forms decay;
and that is solid earth,
that once was sea;
Seas, in their turn,
retreating from the shore
make solid land,
where ocean was before.

Ovid metamorphoses, XV

# CHAPTER 1: INTRODUCTION

## 1.1 General Introduction

The usefulness of foraminifera to stratigraphic and palaeoenvironmental investigations of earth's history is well documented in the geological literature. Early taxonomic studies of the 19th century gave way in the first half of the 20th century to a recognition of their worth in helping to overcome problems of correlation, palaeoecology and age determinations posed by hydrocarbon exploration. Their uselfulness in this respect is a result of their small size, being easily retrieved (if diagenetic conditions allow) from borehole chips in statistically sufficient numbers to provide vital numerical control. This capability of foraminifera to provide representative populations from small samples coupled with their sensitivity to environmental conditions has provided investigators with a valuable tool in the determination of palaeoenvironments and, more recently, with a quantitative control of these investigations.

One of the basic tenets of geological philosophy is that the present is a key to the past. To this end, there is an increasingly vast body of literature that documents the occurrence of foraminiferal species and their influencing environments. The very richness of foraminiferal species and their individual response to environments lead often to confusing and misleading conclusions. One thing remains clear: the limits of accuracy of each palaeoenvironmental study are set by the knowledge, direct or homeomorphic, of present day regimes governing a species distribution. This is providing that the "present is a key to the past" assumption is valid.

## 1.2 Objectives

The aims of this study are:

a/ to determine, using quantitative methods, the present day assemblages of benthic foraminifera on the continental margin off Nova Scotia, their distribution and faunal trends;

b/ to determine, utilizing live distribution data, the degree and extent that these foraminiferal assemblages are in equilibrium with the presently occurring environmental regimes (i.e. in situ, transported or relict).

c/ to establish a quantitative correlation between the defined assemblages and various geological and oceanographic parameters related to presently-occurring environmental regimes.

d/ to comment on the implications of the above study.

The purpose behind these aims becomes apparent in the light of other research projects underway on the Eastern Canadian coast. These other investigations are concerned with the interpretation of Pleistocene to Recent sediments in terms of the climatic and oceanographic history of Eastern Canadian watermasses since the last glaciation. The overall project is necessarily multidisciplinary in approach, involving the study of pollen ( Mudie, 1982), diatoms, sedimentology ( King 1972; Piper 1975, 1976; Hill 1981), geochemistry (Oxygen isotopes; Alam and Piper, 1980; Aksu 1980), as well as the use of foraminifera ( Vilks, 1980, Scott et al 1979)). The results of this study will expand the present data base and provide a vital quantitative control applicable to palaeoceanographic investigations of the Pleistocene to Recent sediments off Eastern Canada, using benthic foraminifera. A following section will describe the prevailing hydrography of this study area and will show the presence of a major hydrographic boundary extending across the shelf. Waters to the north east of this boundary are essentially of Arctic origin whilst those to the south west are warm, slope, Gulf stream derived. The studies mentioned above endeavour to document the changing nature of these influences since the Pleistocene; the present study provides an ideal oppertunity to study the foraminiferal population dynamics across this oceanographic boundary at the present day,and to consider the implications of the results for understanding past and future oceanographic changes.

## 1.3. General Aspects

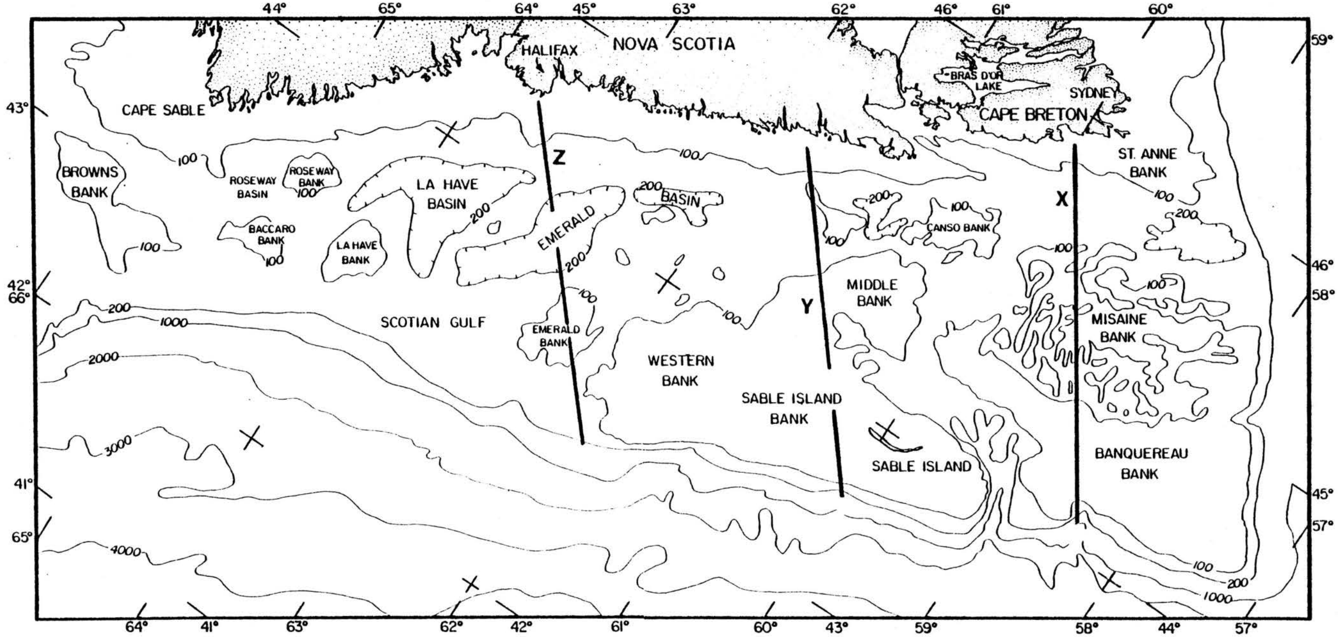
### 1.3.1. Location.

The continental margin off Nova Scotia is considered here as that submerged area adjacent to its mainland Atlantic coast which lies between 41°N 65° 30'W and 46°N 57°W and extends to depths of approximately 3000 m. It is bounded to the east by the Laurentian channel and to the west by Browns Bank ( Fig. 1.1).

### 1.3.2. Bathymetry.

Figure 1.1 Bathymetry of the continental margin off Nova Scotia.

Sections X,Y,Z, refer to figure 1.4.


NOVA SCOTIA
HALIFAX
CAPE SABLE
BRAS D'OR LAKE
SYDNEY
CAPE BRETON
ST. ANNE BANK
BROWNS BANK
ROSEWAY BASIN
ROSEWAY BANK
LA HAVE BASIN
BACCARO BANK
LA HAVE BANK
EMERALD
BASIN
CANSO BANK
MIDDLE BANK
MISAINE BANK
SCOTIAN GULF
EMERALD BANK
WESTERN BANK
SABLE ISLAND BANK
SABLE ISLAND
BANQUEREAU BANK
X
Y
Z
100
200
1000
2000
3000
4000
44°
65°
64°
45°
63°
62°
46°
61°
60°
59°
58°
57°
43°
42°
41°

The shelf break occurs at about the 200 m contour off Nova Scotia and effectively divides the study area into two physiographic regions: the continental shelf and the continental slope. The shelf is quite variable in width, ranging from 125 km in the west to 230 km in the east. Compared to other shelf areas of the eastern United States, northern Newfoundland and, to some extent, Labrador, the Nova Scotian shelf is topographically complex ( Emery, 1972).

King and Maclean (1976) recognized three physiographic zones: an inner zone of rough topography lying between Cape Sable and St-Annes Bank, a central zone of isolated banks and basins and an outer zone of shallow, wide, flat banks. Within this framework, five physiographic and bathymetric subzones are observed:(fig. 1.1)

1/ The Banks: These are commonly as shallow as 50 m and include Baccaro, Roseway, LaHave. Emerald, Western, Sable Island, Middle, Canso, St-Annes, Misaine and Banquereau Banks.

2/ The Basins: These are as deep as 350 m and commonly 250 m , and include Roseway, LaHave, Emerald, Canso and Misaine Basins.

3/ "Between-Bank" depressions: These include the deeper areas between Banks such as the Scotian Gulf and that part of the Gully between the north arms of Banquereau and Sable Island Banks.

4/ Transitional areas between Banks and Basins: These include the area between Baccaro Bank and Roseway Basin, the Emerald Bank and Basin, the Nearshore zone and Central Basin complex. Only the Misaine Basin complex shows sharp transitions from banks to basins with deep localized basins and intervening isolated banks.

5/ Inner Shelf Nearshore area: often of rough bedrock, sands and gravel.

The continental slope lies seaward of the shelf break and in this study, extends to depths of 3000 m. Transitional between the shelf and the abyssal plains, this area appears smooth topographically. However, several canyons dissect the slope in these regions. Hill (1982) has shown that, although smooth and featureless when compared to the shelf, even undissected areas of the slope are often morphologically complex, albeit on a smaller scale.

### 1.3.3. Surficial Geology

Much literature pertains to the surficial distribution of sediments on the Scotian shelf. In a series of papers on the subject, King and his co-workers have described this distribution ( Drapeau, 1969; Cok, 1970; King, 1970; Maclean and King, 1971; Drapeau and King, 1972; Maclean, Fader and King, 1977), and recognized, on the basis of their acoustical data and samples, five surficial sedimentary units (Table 1.1). All of these essentially flat lying units unconformably rest upon pre-Pleistocene strata.

The central and outer shelf areas (Fig 1.1) are covered with well sorted sands and gravels and localised boulder fields (Table 1.1: Sable Island Sand and Gravel unit). Peripheral to these banks and predominating in the Scotian Gulf region is a somewhat finer sand unit ( Sambro Sand unit) that is thought by King (1970) to be relict. The central basins of LaHave and Emerald, as well as the complex of basins

## TABLE 1.1

## SURFICIAL SEDIMENTS OF THE SCOTIAN MARGIN

(After King 1970)

| MAP-UNIT | LITHOLOGY | THICKNESS (m) |
|---|---|---|
| Sable Island sand and gravel | medium to coarse grained, very well sorted sand.<br>grades laterally to coarse, sub-rounded, glacial lag gravel.<br>basal transgressive unit. | 0-15 |
| LaHave clay | very dark, loosely compacted silty clay, grades locally to clayey silt. | 0-20 |
| Sambro sand | medium to fine grained, moderately to well sorted, sub-littoral sand, grades to sandy gravel. | 0-80 |
| Emerald silt | poorly sorted clayey and sandy silt.<br>some gravel. | 0-200 |
| Scotian Shelf drift | dark, cohesive sandy till.<br>ground and end morraines. | 0-90 |

south of Misaine Bank, are carpeted by the LaHave Clay unit (Table 1.1). This clay includes contemporary sediment and fines winnowed from glacial deposits that subsequently filled topographic depressions. The Glacial Till ( Scotian Shelf Drift, Table 1), mainly thought to be of Wisconsinan age, occurs in varying amounts on the central and inner zones of the shelf. Deposits of Emerald silt can be found at the periphery of topographic basins and are generally thought to be older than the LaHave Clay units. Similar to the Drift, this unit varies texturally by its absence of gravel. The inner shelf area consists mainly of coarse sands and gravels (Sable Island Sand and Gravel), and locally, of rough exposed bedrock.

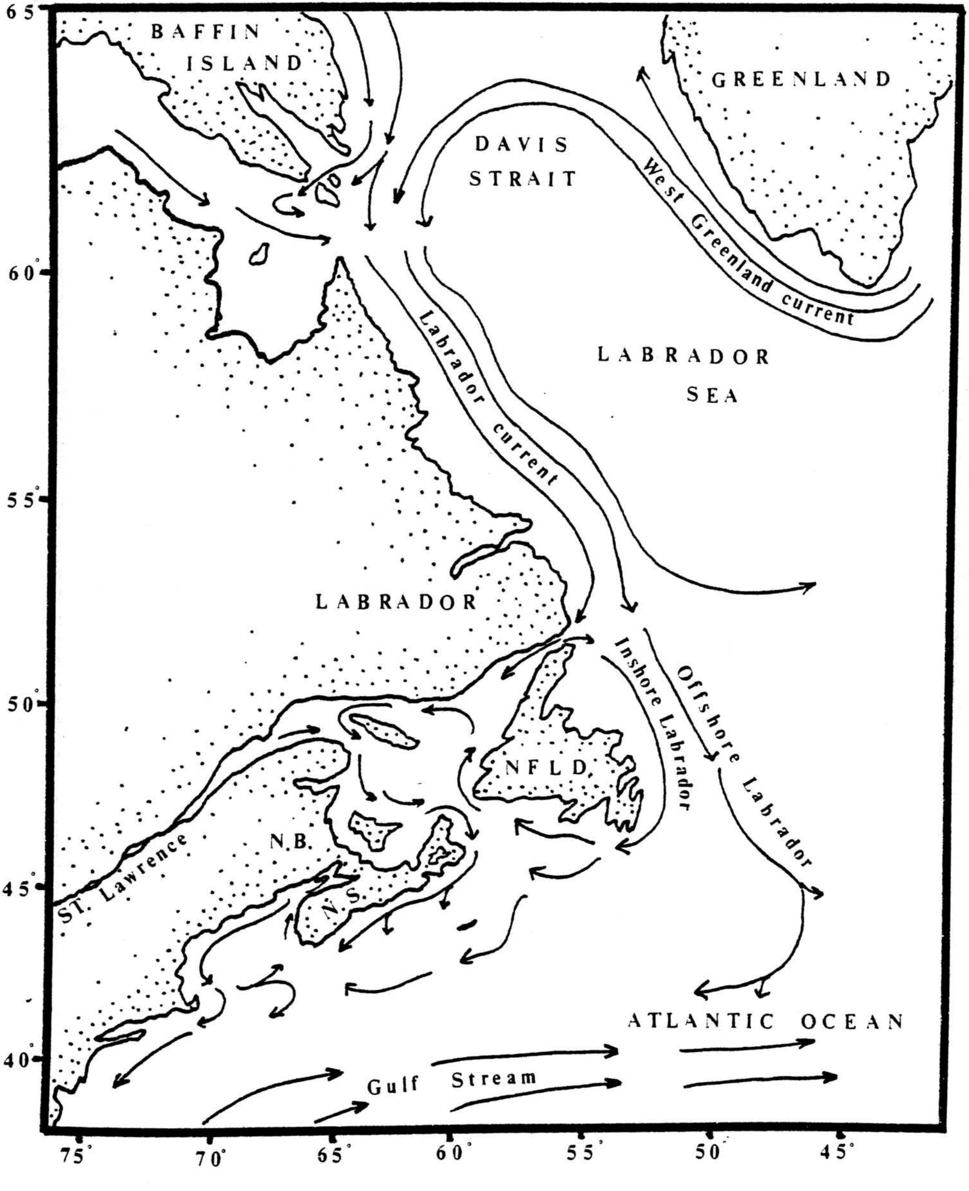
### 1.3.4. Oceanography

The waters off Nova Scotia possess some of the richest fishing grounds in the world. A consequence of this is a large body of oceanographic data and publications. Of direct interest to this study is the nature and distribution of bottom water masses and their influences on benthic foraminiferal distributions. This section briefly reviews the salient oceanographic features of the study area.

Surface circulation off Nova Scotia is dominated by three main elements (Dunbar 1951). The Labrador Current skirts the continental margin off Labrador and flows southward around Newfoundland and into the study area. Some Labrador water flows into the Gulf of St. Lawrence and enters the study area through the Cabot Strait (Fig. 1.2). This cold, relatively fresh water originates in the Arctic and includes some Baffin Bay and Beaufort Sea water (Dunbar, 1951). It continues off Nova Scotia as the Nova Scotian current of cool water flowing southwest. The Gulf

Figure 1.2 Surface currents off eastern Canada.

( after Robe, 1971 )


BAFFIN ISLAND
GREENLAND
DAVIS STRAIT
West Greenland current
LABRADOR SEA
Labrador current
LABRADOR
Inshore Labrador
Offshore Labrador
NFLD.
N.B.
N.S.
ST. Lawrence
ATLANTIC OCEAN
Gulf Stream
65°
60°
55°
50°
45°
40°
75°
70°
65°
60°
55°
50°
45°

Stream flows northeast. Branches of this warm, saline water mix with the Labrador Current to form the third element: the Slope water (McLellen, 1957).

The slope water has been shown to be of two parts. Gatien (1975) distinguished, through detailed temperature and salinity data, between warm slope water and cold Labrador slope water. Mixing of Labrador Current water and Gulf Stream water produces the warm slope waters to depths of 300-400 metres. Mixing of Labrador Current water and North Atlantic Central water produces the Labrador slope water directly overlying the continental slope down to 1200 m. At greater depths lies the North Atlantic Central water.

Bottom waters on the shelf are ultimately a product of mixture and advection of these watermasses. Using methods devised by Miller (1950) and first applied to the Scotian shelf by Mclellen (1954), Houghton _et al_. (1978) described the distribution of Nova Scotian shelf waters. This work, together with Mclellen's mapping of the bottom waters (1954) and data obtained from the Marine Environmental Data Service tapes, enable the distribution of shelf bottom waters to be shown (Fig. 1.3., Table 1.2.). Cold, relatively fresh bottom water predominates in the northeast of the study area. It overlies the Misaine Bank and Basin complex, St. Annes Bank, Canso Bank and Basin as well as Banquereau Bank. To the southwest, this water is pushed shorewards both by bathymetry ( Middle Bank) and by an increased presence of warm, more saline water of slope origin. The cold water is present to the north and northeast margins of Emerald and LaHave Basins and in the Scotian Gulf. Although the presence of this slope derived water is in part due to tropical storm-generated water movements and eddies, Warner (1970) has shown its persistence throughout the year (although its boundary with

## TABLE 1.2

## WATERMASS CHARACTERS OFF NOVA SCOTIA

(SUMMARIZED FROM HOUGHTON *et al.* (1978))

| WATERMASS NO. | SALINITY/TEMPERATURE | | CHARACTER AND ORIGIN |
|---|---|---|---|
| 1 | 32.3% | 0-4°C | Subsurface water from Cabot strait and St. Lawrence. Labrador current origin. |
| 2 | 31.8% | 3-6°C | Surface water from Cabot strait and St. Lawrence. |
| 3 | 33-34% | 4-8°C | Similar to 1, although warmer, a product of 1 and 4 (slope waters). |
| 4 | 35% | 8-12°C | Water dominated by slope characters of maximum temperature and salinity. Some mixing with 1 and 2. |
| 5 | 34.5-35% | 4-6°C | Deep Atlantic water. |

Figure 1.3 Bottom hydrography on the continental margin off Nova Scotia

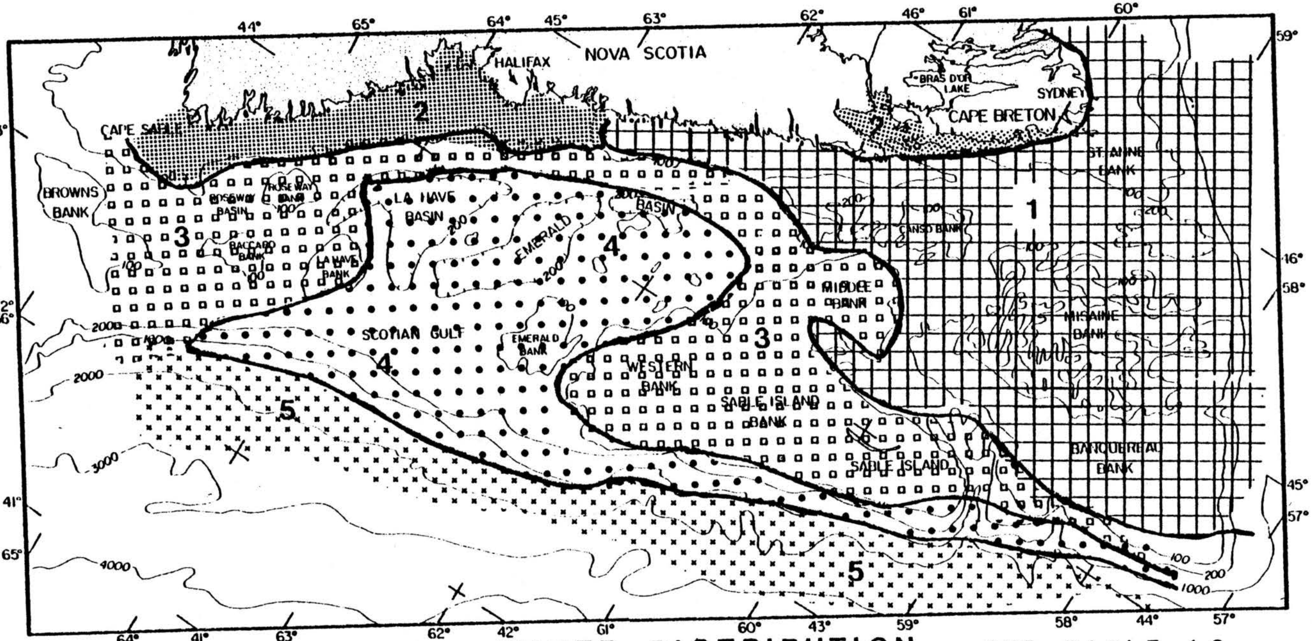
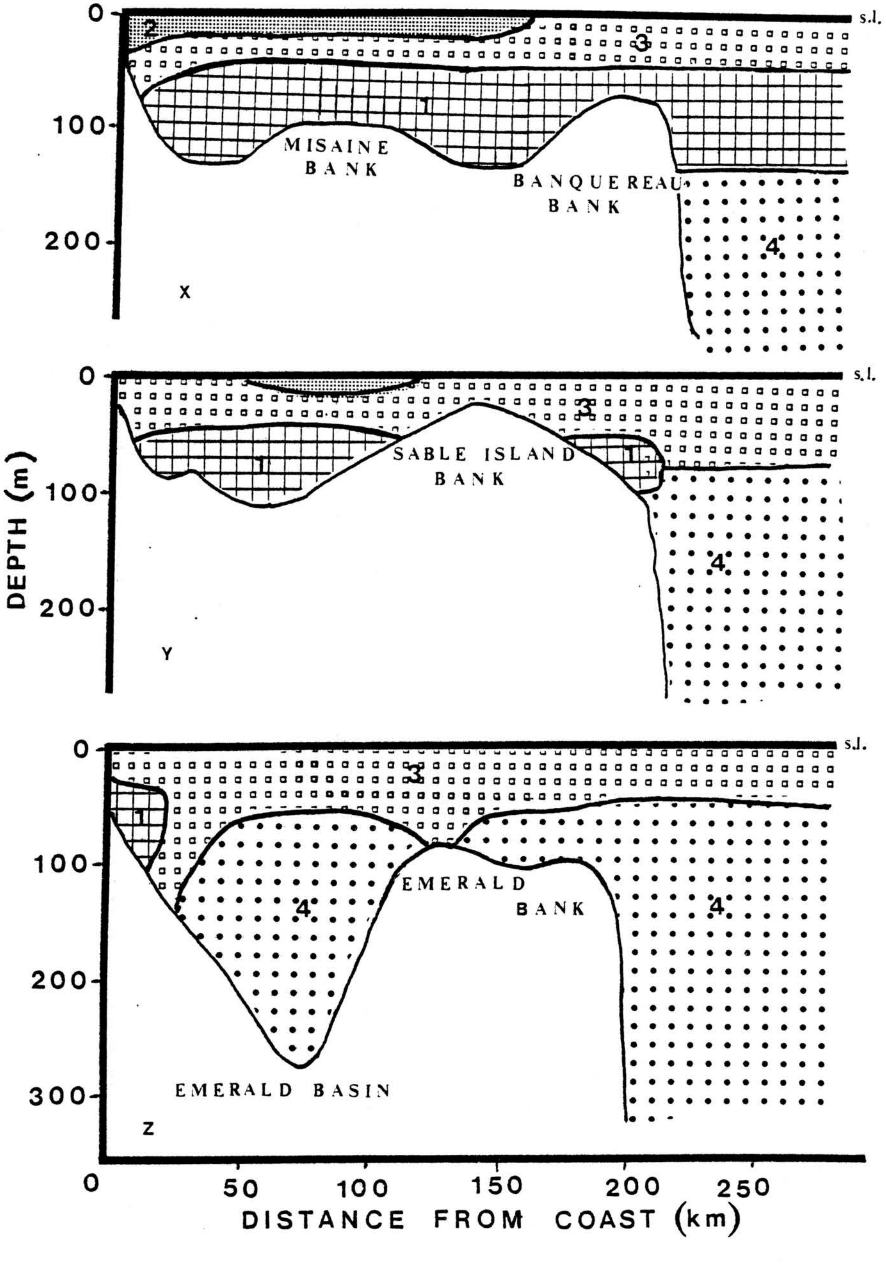


FIG. 1.3 BOTTOM WATER DISTRIBUTION SEE TABLE 1.2 FOR EXPLANATION

Figure 1.4 Hydrographic character along sections X,Y,Z.



SHELF WATERS OFF NOVA SCOTIA
(AFTER HOUGHTON 1978)

the cold water is subject to fluctuation). Sections 1,2 and 3, adapted and schematized from Houghton (1978), illustrate these relationships (Fig. 1.4.).

This enrichment of shelf waters with waters of slope origin is paralleled in the distribution of nutrients on the shelf. Fournier *et al*. (1977) have documented the sporadic advection of nutrient-rich slope waters onto the shelf off Nova Scotia.

The significance of this and other oceanographic influences upon the distribution of benthic foraminifera will be discussed later.

### 1.3.5. Sample Locations

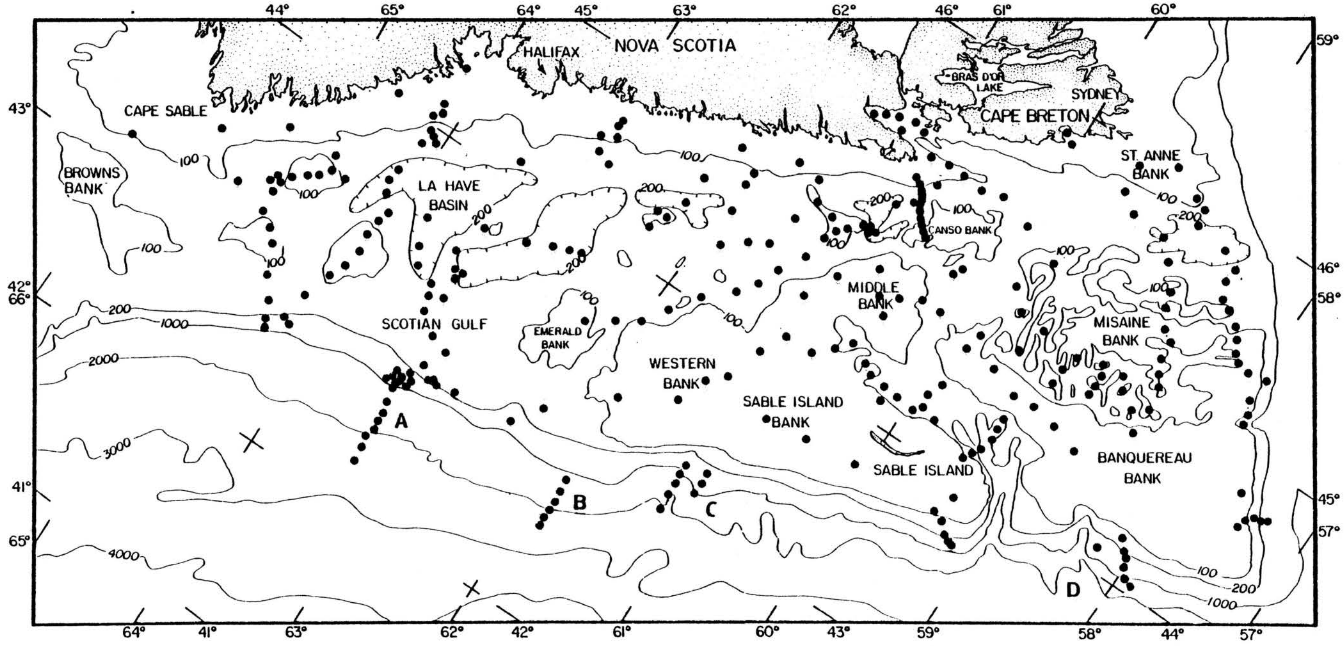
As can be seen on the map (Fig. 1.5.), many of the distinct physiographic, sedimentologic and oceanographic regions in the study area have been sampled. Appendix I tabulates the latitude and longitudes for these locations. The means and methods of obtaining these samples will be discussed in a later section.

Many studies have documented the changes of species abundance with season ( Walker, 1955; Douglas, 1976; Ellison, 1978). However, the scale and nature of this study render seasonal consideration impractical. The ultimate purpose is to apply the Recent distribution model for foraminifera to time-averaged fossil populations, which tend to aggregate seasonal perturbations ( Scott and Medioli, 1980). Faunal patchiness, as documented by Buzas (1970), must also be considered. Types of sample networks that would account for seasonal and spatial variations in foraminiferal populations would be more restrictive and effectively prohibitive to the stated aims of this study. The possible effects of faunal patchiness and seasonality however, will be discussed where pertinent.

### 1.3.6. Previous Foraminiferal Distribution Studies on the Scotian Shelf and Slope

The recent summary of Culver and Buzas (1980), documenting and analyzing the data available for recent foraminifera off the North American Atlantic Coast, shows some interesting locality concentrations. A dense coverage south of Georges Bank, with markedly less dense coverage on the margin off Nova Scotia and Newfoundland. The present study essentially fills in the Nova Scotian gap. Previous foraminiferal studies in the Nova Scotian area have hitherto been localized. Early work concerning the documentation of foraminifera off East Canada includes Dawson (1870) and Whiteaves (1901). Cushman, in a series of papers published between 1918 and 1931, recorded East coast U.S. and Canadian occurrences. Little was done until the work of Bartlett (1964), who documented occurrences in St Marys and Mahone Bays and, to some extent, on the inner shelf off Nova Scotia. Hooper (1970) and Shafer and Cole (1978) reported on Eastern Canadian foraminifera to the north and northeast of the present area. Similarly, Sen Gupta (1971) determined foraminiferal patterns on the Grand Banks. Hamdan's (1969) study concerned the ecology and distribution of foraminifera along a section of the shelf, from Halifax into Emerald Basin and the shelf edge, while Barbieri and Medioli's work (1969) concentrated on the western part of the shelf. Other areas studied include Cole and Ferguson's (1975) on Canso Strait foraminifera; Allen and Roda's (1977) on LaHave estuary; Walker's (1976), inshore, near Halifax; Clark's (1971), off Clam Bay; Gregory's (1970) in Halifax harbour and Scott and

Figure 1.5 Grab sample locations. Slope transects are marked A,B,C,D.


NOVA SCOTIA
HALIFAX
CAPE SABLE
BROWNS BANK
LA HAVE BASIN
SCOTIAN GULF
EMERALD BANK
WESTERN BANK
SABLE ISLAND BANK
SABLE ISLAND
MIDDLE BANK
CANSO BANK
BRAS D'OR LAKE
CAPE BRETON
SYDNEY
ST. ANNE BANK
MISAINE BANK
BANQUEREAU BANK
A
B
C
D
100
200
1000
2000
3000
4000
44°
65°
64°
45°
63°
62°
46°
61°
60°
59°
43°
42°
66°
41°
58°
57°

Medioli's (1979) off Chezzetcook. The most recent work by Rodrigues and Hooper (1982) documented benthic associations from the Gulf of St Lawrence.

All the above studies are similar in that they endeavour to document and show distribution features in relatively localized areas. This study is the first to attempt an overall synthesis of the regional benthic foraminiferal distribution off Nova Scotia. Reference to other studies off the eastern continental margin of North America will be made where pertinent

# CHAPTER 2 : METHODS

## 2.1. Shipboard

All samples were collected from Bedford Institute of Oceanography research vessels on the following cruises: February 1979, CSS Dawson; March 1980, CSS Dawson; October 1980, M. V. Pandora II; March 1981, CSS Dawson; May 1981, CSS Dawson. Cruise numbers and sample localities are shown in appendix I.

Control of sample type and quality is important in a study such as this. The type of sampling instrument used is known to affect the size and quality of the sample ( Douglas, 1978). Piston and gravity core tops have inherent inadequacies in preserving the surficial layer of sediment, especially in silty mud substrates ( Douglas, 1978). This is largely due to the flushing effect of a preceding bow-wave. Ideally, a large box core (100 cm2) would have been used. However, due to impracticalities of its use in rough sea conditions, length of time taken to deploy and recover the instrument as well as its unsuitability for sandy substrates, an alternative method was sought.

The device used was a Shipek grab sampler. This consistently produced good quality samples and was employed fast enough to enable the collection of many samples. A grading system similar to that of Douglas (1978) was devised in an effort to provide a quality control of the samples. The grading system is outlined in Table 2.1. All samples examined and analyzed rated 1-3. Other poorer samples were rejected. (

## TABLE 2.1

## RATING INDEX FOR SHIPEK GRAB SAMPLES

| Rate | |
|---|---|
| 1 | Surface mm present over entire sample; supernatant water clear sub-sample recovery good. |
| 2 | Surface mm present over part of surface only; supernatant water moderately to slightly turbid. Sub-sample recovery fair. |
| 3 | Surface present over part of sample only; supernatant water strongly turbid due to ship recovery and drainage. |
| 4 | Surface apparent, sufficient to warrent sample; very turbid waters. |
| 5 | Sample extremely poor in quality and quantity sample taken. |
| X | Sample not rated, seaweed/laminaria/pebbles. |

Comments: On sand and gravelly substrates if the larger clasts appear in situ (ie. as defined by algal growths etc.) rate 1. If macro-benthos are in life position rate 1 Gravity cores rate 4.

It was necessary to use a few gravity core tops to fill gaps in the sample grid. These are noted in the appendix.).

Procedures concerning sample recovery aboard ship were as follows: Immediately that the Shipek came shipboard, the quality of the sample was noted, together with the recording of other location data ( i.e. depth, latitude and longitude, sea state, sediment estimates, etc). Sediment was then scraped off the surface (20 ml) and placed in a plastic vial. This was subsequently topped with seawater and formaldehyde (buffered with borax), final pH of the liquid= 8.0

## 2.2 Laboratory.

In the laboratory, the samples were washed through a 63 micron sieve and stained in Rose Bengal to determine live foraminifera. After 24 hours, the samples were filtered, dried in air and concentrated by flotation in carbon tetrachloride. The samples were floated as many times as necessary to retrieve the maximum amount of foraminifera. The next step involved making a census of foraminifera in each sample or part of a sample. The census involved a determination of the relative abundance of each species in a sample. Other population characters evaluated and recorded at this stage included: the number of species (S), total number of individuals, live/total ratios, total non-live individuals and diversity values of S, H(S), E and $\alpha$. The latter will be discussed in chapter 5.

## 2.3. Discussion of Laboratory Methods

Although the methods and procedures outlined have been in use for many years, some discussion is warranted.

Three stages in the laboratory analysis have been described.

1. Initial treatment to clean and remove clay and silt.
2. Staining to determine live foraminifera.
3. Population counts on the samples.

Each stage may vary in approach and method from study to study.

1. All species retained on the 63 micron sieve were examined in this study. Other workers have often used different size fractions. Streeter (1973) and Miller and Lohmann (1981) used 250 microns and it is common practice in industry to restrict an investigation to a particular size range ( Haynes, 1981). There are two main reasons for looking at greater than 63 microns in this study:

a/ to take into account small species such as *Fursenkoina fusiformis*, *Adercotryma glomerata* and *Reophax arctica*, which may otherwise be lost.

b/ to retain juveniles; important in considering the effect of transportation and other phenomena, i.e. winnowing resulting in juvenile loss.

2. The ambiguous nature of Rose Bengal staining techniques is well documented in the literature ( e.g. Douglas, 1978). The main problems result from staining of bacteria and other organic material in the

chambers of dead tests and difficutlty in recognizing stains in thick shelled calcareous species and agglutinates.

Great care was taken in this study in the determination of live species. Individuals were recorded as living only if several chambers were stained. Some of the more heavily agglutinated forms were broken in order to determine the extent of staining.

An alternate method of staining was described by Walker et al (1974) and involved the use of Sudan Black. Difficulties involved with this method, however, precluded its use in this study.

Even with diligent live determinations, some ambiguity remained in the live data. Indeed, the live data proved unsuitable for exhaustive statistical treatment and is mainly used here as a tool to help determine the " in situ" nature of each assemblage (Chapter 4).

3. Counts of about 300 individuals have long been accepted as a practical method of accurately estimating species proportions within a sample. The derivation of this figure and other associated counting errors are described in Douglas (1978). Dennison and Hay (1967) and Dryden (1931) statistically estimated that a minimum of 300 specimens must be counted in order to detect a species that constitutes 1% of the total population with a certainty of 95% ( Douglas, 1978).

Some workers have used samples with as few as 100 specimens (and some even less) as a basis for quantitative analysis of ecology and palaeoecology ( Streeter, 1980; Schnitker, 1974; Osterman and Kellogg, 1980). Clearly, any ecological information obtained from low population counts have to be carefully evaluated. In the present study, between 250-350 individuals per sample were counted. Statistical aliquots were obtained using an Otto microsplitter where necessary.

In this study, all samples or parts of a sample were examined whilst dry. Douglas (1976) showed that, in some cases, wet counting procedures tend to introduce errors into the counts and had a low reproducibility. He also documented the difficulties involved in splitting a water/sediment mixture into statistical aliquots. The more efficient procedure and smaller size-shape bias in splits, determined that dry counting methods be employed in this study.

Finally, brief mention should be made of the foraminiferal identification and storage methods used.

The foraminifera were picked from a standard picking tray and placed into a gridded rectangular tray. This tray of around 300 individuals was then subjected to genetic and specific identification. Representative specimens of each species identified were stored in a one-hole slide as a reference collection. Identification methods were standard and are described in Haynes (1981).

## 2.4. Data analysis methods

Some 382 samples were available for foraminiferal analysis. Low sample quality reduced this number, as did the occurrence of barren samples and others containing less than 200 individuals. Investigation of the remaining 267 samples revealed the presence of 120 species ( of hyaline, agglutinated and porcellaneous types) resulting in a matrix of 267 samples by 120 species (N by n ) represented by their percentage abundance. This initial matrix was reduced to 75 species through elimination from further analyses of species not occuring greater than

3% in any one sample. Clearly, the designation of biofacies or species associations by simple observation was not feasible with this ammount of data. As well as unreliable, such an interpretation would not be in keeping with the stated aims. A statistical method was needed to make the huge data set more manageable. Computers provide the means for this data reduction ( Buzas, 1970): several procedures and methods have been developed over the past 15-20 years ( Joreskog, 1976; Buzas, 1979).

The basic concepts of factor, principal component, cluster and canonical analysis are outlined in Buzas (1979). From the above literature, it is clear that a wide variety of techniques are available to suit particular needs. Cluster analysis is commonly used in palaeontology. First devised for such use by Sokal and Sneath (1963), it has been used successfully by Kafescioglu (1975), Schafer (1978) and Brooks (1973) inter alia. Clustering algorithms either compare species with each other and their joint occurrence throughout the stations ( R-Mode); or stations are compared based on joint occurrences of foraminiferal species at each station ( Q-Mode). The end result is a dendogram i.e. a visual representation of the objects as grouped by the analysis. Although simple to understand, the method is not statistical and will pair off all the data provided. This, and the fact that it is based on simple presence/absence data or rough qualitative evaluations, rule out its use in this statistical study.

What is required for the present work is a method that will simply and objectively reduce a large body of data to a more manageable sized data set in which the relationships between samples and their species composition can be clearly seen. A quantitive method that can do this is factor analysis, in particular the method of Imbrie and Kipp (1971). Malmgren and Haq (1982) have recently shown that this method (Imbrie and

Kipp, 1971) is in fact a principal component analysis sensu stricto; however in order to be more easily compared with Imbrie and Kipp's results their terminology is retained. The method is capable of simplifying large data matrices by grouping co-varying species into statistically independant assemblages.

The geological application of this multivariate statistical technique has been documented by Imbrie and Kipp (1971) and Joreskog et al (1976), Kipp (1976) Molfino et al.(1982). In particular, it has been shown to be a useful quantitative method of data reduction in works with similar aims to the present ( Imbrie and Kipp, 1971; Osterman and Kellogg, 1979; Streeter and Lavery, 1980; Belanger and Streeter, 1980; Miller and Lohman, 1980; Mudie, et al. 1983; Lohmann, 1979).

The mathematical theory behind Q-Mode factor analysis is described in Imbrie and Van Andel (1964) and Manson and Imbrie (1964). The factor analytical computations in this study were carried out using a CABFAC program devised by Klovan and Imbrie (1971) and modified by C.E.Keen (Mudie et al 1983). This program gives a varimax solution to Q-Mode factor analysis, reducing the large initial data matrix into two smaller matrices. The varimax factor matrix describes the importance of each factor ( or assemblage) at each station, and the factor score matrix reveals the importance of each species in each factor ( or assemblage).

The computational steps required to derive these matrices are illustrated in Imbrie and Kipp (1971). They show that the varimax factor matrix is derived through calculation of the eigenvalues and eigenvectors of the row-normalized N by n matrix. The factor score matrix is a result of rotation to the "best fit" ( according to the varimax criteria) of the eigenvectors. ( The row-normalized matrix is a result of the multiplication of raw % values by a constant so that the transformed row vectors have unit length). Through the initial normalization is derived the sample communality ( square of the vector lengths) which is a useful measure of the degree to which a sample is adequately described by the factors.

Close inspection of the factor loading values displayed in the varimax factor matrix enables one to determine whether the produced factors ( or assemblages) are statistically and ecologically significant. They are assumed to be so if the factor loadings vary with known bathymetric, sedimentologic or oceanographic environmental gradients ( Imbrie and Kipp, 1971). The corresponding species compositions for each factor are shown by the factor score matrix.

The following chapters (3,4) of this thesis show the results of these analyses on the foraminiferal data obtained from the 267 samples. For reasons to be explained, the shelf and slope data were treated separately. Several maps plot the distribution of the factor assemblages determined ( factor loadings are listed in Appendix II, III) whilst several sections across assemblage boundaries on the shelf illustrate their nature and gradient. The specific compositions of each factor assemblage are summarized by the factor score matrix shown in the appendices.

The proper perspective of this type of analysis should be borne in mind. This is highlighted in Imbrie and Kipp (1971):

> " The proper role of the machinery of matrix algebra used in factor analysis is to summarize parsimoniously, objectively and quantitatively general tendencies in a given body of faunal data, to make tendencies clear which are obscured by random error, or other, quantitatively

> dominant effects; and to focus attention on ecological or diagenetic questions worthy of further inquiry".

In this way, the techniques described permit the primary objective of the thesis to be attained. The secondary aims ( i.e. assemblage verification using live data) are also reached in chapter4. The tertiary objective, i.e. quantifying the relationship of assemblage and environment, is investigated in chapters 6-9. The factor analysis results can be used to do this in the form of multiple regression analysis techniques. The relevant theory and procedures will be discussed in chapter 6.

# CHAPTER 3 ASSEMBLAGE DISTRIBUTION AND COMPOSITION

## 3.1 Introduction

This chapter describes the results of Q-Mode factor analysis of the total foraminiferal (live and dead) abundance data.

In order to maximise the advantages of the analytical technique and to overcome certain inherent ambiguities within the data, three groups of abundance data were analysed.

a/. Group One data: 258 shelf and slope stations;
b/. Group Two data: 223 shelf only stations;
c/. Group Three data: 43 slope only stations.

The descriptions of each assemblage are taken from the varimax factor matrix and the factor score matrix (appendices II,III). Reference will be made to several maps which plot for each assemblage the appropriate factor loadings ( i.e. assemblage importance) and to several figures which illustrate the variation of these with depth.

## 3.2.1. Group 1 Shelf and Slope Data

Q-Mode factor analysis of 258 stations determined 9 factor assemblages accounting for 85% of the observed variance. Table 3.1 summarizes the factor analysis and interpretive results.

It can be seen that ,with two exceptions, several well defined

## TABLE 3.1

## FACTOR SCORES FOR SHELF AND SLOPE ANALYSIS--A SUMMARY

| FACTOR ASSEMBLAGE | % VAR. | DOMINANT SPECIES WITH FACTOR SCORES | | DISTRIBUTION | SUBSTRATE |
|---|---|---|---|---|---|
| 1 | 24.9 | *Adercotryma glomeratum* | 8.1 | N.E. Shelf between Cape Breton shore and Middle and Banquereau Banks and basins. 80-350 m | sand, gravels, silts, clays. |
| | | *Recurvoides turbinatus* | 1.7 | | |
| | | *Spiroplectammina biformis* | 1.2 | | |
| | | *Cribrostomoides crassimargo* | 1.2 | | |
| 2 | 13.1 | *Cibicides lobatulus* | 8.5 | Mainly on banks and innershore. 50-100 m | coarse sands, bedrock. |
| | | *Cassidulina reniforme* | 1.2 | | |
| 3 | 8.6 | *Elphidium excavatum* | 7.1 | Deep waters (+2000 m) and on shelf near Emerald basin. | clays, silts. |
| | | *Uvigerina peregrina* | 4.5 | | |
| 4 | 7.8 | *Globobulimina auriculata* | 6.4 | Central shelf basin complex. Emerald, LaHave, Roseway. 150-220 m | clays, silts. |
| | | *Nonionellina labradorica* | 3.6 | | |
| | | *Bulimina aculeata* | 2.9 | | |
| | | *Brizalina subaenariensis* | 2.1 | | |
| | | *Islandiella teretis* | 1.7 | | |
| 5 | 7.6 | *Saccammina atlantica* | 8.0 | Periphery to central basin complex. | clays, silts, sands. |
| | | *Reophax scorpiurus* | 1.9 | | |
| | | *Cribrostomoides jefferysi* | 1.1 | | |
| 6 | 7.4 | *Trifarina angulosa* | -7.9 | Shelf break regions. 150 - 400 m | sands, silts. |
| | | *Brizalina spathuleata* | 2.0 | | |
| | | *Buccella frigida* | 1.0 | | |
| 7 | 4.7 | *Eggerella advena* | 8.2 | Chedabucto and Gabarous Bays. Sable Island Bank. | muds, silts, well sorted sands. |
| | | *Spiroplectammina biformis* | 1.6 | | |
| | | *Cribrostomoides crassimargo* | 1.0 | | |
| 8 | 5.0 | *Cassidulina reniforme* | 8.4 | Same as F.2. | see F.2. |
| 9 | 5.6 | *Bulimina aculeata* | 3.8 | Middle to Upper slope regions. Scotian Gulf near Emerald Basin. | silts. |
| | | *Bulimina exilis* | 3.4 | | |
| | | *Fursenkoina fusiformis* | 3.3 | | |
| | | *Elphidium excavatum* | 3.0 | | |
| | | *Trifarina occidentalis* | 2.3 | | |
| | | *Buccella frigida* | 2.3 | | |
| | | *Nonionellina turgida* | 1.2 | | |

assemblages are present on the shelf and slope.

Two assemblages, factors 3 and 9, create a problem (Table 3.1) seen in both their distribution and composition. The distribution of factor 3 in deep water of greater than 1000 m. depth; in shallow waters of 150-200 m. around Emerald Basin; and its composition,(ie. dominantly Elphidium excavatum and Uvigerina peregrina) conflicts with what is observed in the raw data. The latter reveals a complete absence of Uvigerina peregrina at any depths less than 900 m. This would be misleading in the light of its occurrence as a major component of factor assemblage 3.

The discrepancies are due to the occurrence of large amounts of Elphidium excavatum present on both the slope (at depths greater than 1000 m.) and the shelf. This distribution enables the analytical technique to 'lump' together two assemblages, one that is clearly deepwater and one that is shallow-water. The problem of combining two assemblages together by virtue of their possessing similar dominant species is an important one to recognise, in view of the potential for relict and transported populations to dilute and flood otherwise dissimilar samples with a common species.

Factor 9 represents a similar anomaly. The result there is more complex due to the greater number of species involved.

In order to more rigorously define these assemblages, factor analysis was applied to "shelf only" (Group 2) and "slope only" (Group 3) data matrices. This removes the misleading common shelf/slope components from both the shelf and slope distributions. Later discussion will show how, in the light of the living data collected, most of the assemblages reflect the distribution patterns of the main species presently living in the area.

The following describes the results and interpretations obtained from this procedure.

### 3.2.2. Group 2 Shelf Data

Factor analysis of 223 shelf stations delimited 8 factor assemblages accounting for 87.5% of the variance. The assemblages are essentially the same (ie. composition and distribution) as those defined from Group One 1 (Table 3.1) The exclusion of slope stations removed the problems highlighted in the previous section. Table 3.2 summarizes Group 2 analysis results; Figures 3.1-3.9 plot assemblage distributions.

The following is a more detailed description of these assemblages, their compositions and their distributions. The assemblages thus defined can be seen to be more in accordance with the observed raw data. This also explains more of the between sample variance and the higher communalities. The assemblages are named after the most dominant species as defined by the factor scores (appendix III).

#### Factor assemblage 1: Adercotryma glomerata

This completely arenaceous assemblage accounts for 29.4% of the observed variance and is the most important assemblage found on the shelf. It is predominant throughout the north east of the study area and is restricted to central and innershelf regions (fig. 3.1) The southern

## TABLE 3.2

## FACTOR SCORES FOR SHELF ANALYSIS--A SUMMARY

| FACTOR ASSEMBLAGE | % VAR. | DOMINANT SPECIES WITH FACTOR SCORES | | DISTRIBUTION | SUBSTRATE |
|---|---|---|---|---|---|
| 1 | 29.4 | Adercotryma glomeratum<br>Recurvoides turbinatus<br>Spiroplectammina biformis<br>Cribrostomoides crassimargo | 7.7<br>1.6<br>1.1<br>1.2 | As for F.1 in Table 3.1. | As for F.1 in Table 3.1. |
| 2 | 14.9 | Cibicides lobatulus<br>Cassidulina reniforme | 8.0<br>1.0 | As for F.2 in Table 3.1. | As for F.2 in Table 3.1. |
| 3 | 9.0 | Globobulimina auriculata<br>Nonionellina labradorica<br>Bulimina aculeata<br>Brizalina subaenariensis<br>Islandiella teretis | 5.8<br>3.3<br>3.1<br>2.3<br>1.6 | As for F.4 in Table 3.1. | As for F.4 in Table 3.1. |
| 4 | 8.4 | Saccammina atlantica<br>Reophax scorpiurus<br>Cribrostomoides jefferys | 5.8<br>1.7<br>1.0 | As for F.5 in Table 3.1. | As for F.5 in Table 3.1. |
| 5 | 7.7 | Trifarina angulosa<br>Brizalina spathuleata<br>Buccella frigida<br>Elphidium excavatum | 7.6<br>1.5<br>0.6<br>1.1 | As for F.6 in Table 3.1. | As for F.6 in Table 3.1. |
| 6 | 5.4 | Eggerella advena<br>Spiroplectammina biformis<br>Cribrostomoides crassimargo | 7.8<br>1.5<br>0.8 | As for F.7 in Table 3.1. | As for F.7 in Table 3.1. |
| 7 | 5.9 | Cassidulina reniforme | 8.0 | As for F.8 in Table 3.1. | As for F.8 in Table 3.1. |
| 8 | 6.1 | Elphidium excavatum<br>Bulimina aculeata<br>Fursenkoina fusiformis<br>Buccella frigida | -6.0<br>-2.7<br>-2.5<br>-1.9 | Within and approaching the southern extremities of Emerald Basin. | silts, clays, sands. |

limit of this assemblage is bounded by the northern edges of Banquereau, Sable Island and Middle Banks. It characterizes both banks and basins within this area (Misaine and Canso). The assemblage is seen in three other smaller areas but with much reduced factor loadings (ie. importance). The relatively wide depth range of this shelf assemblage (fig. 3.14, 50-300 m.) is a reflection of its occurrence both in banks and basins in this region of the shelf. Other significant but less important species include Recurvoides turbinatus, Cribrostomoides crassimargo and Spiroplectammina biformis. Within the limits of its main occurrence (fig. 3.1) this assemblage only becomes sub-dominant in two areas: in shallow bays (Chedabucto, Gaberouse; where factor 8 predominates) and wherever substrate character favours Cibicides lobatulus (assemblage 2).

### Factor assemblage 2: Cibicides lobatulus.

Accounting for 14.9% of the variance, this calcareaous assemblage is marked by its sporadic but widespread spatial occurrence (fig.3.2) It occurs on parts of the outer banks (Banquereau, Baccaro, LaHave, Emerald), the central banks (Roseway, Canso, Misaine) and the inner shelf areas of the Eastern Shore and St-Annes Bank. The restriction of this assemblage (which is almost monospecific) to coarse sands, rough bedrock and boulders throughout the study area seems to support the many reports suggesting a substrate related occurrence for this species. The absence or slow rate of sedimentation in the areas where this assemblage occurs (mainly between 50-150 m. ; fig. 3.2) is reflected in the very large total foraminiferal counts.

Figures 3.1--3.8 Spatial distribution of each factor assemblaage (F.1--F.8) on the shelf. Areas with factor loadings greater than that shown (i.e. F. L. = ) are shaded.

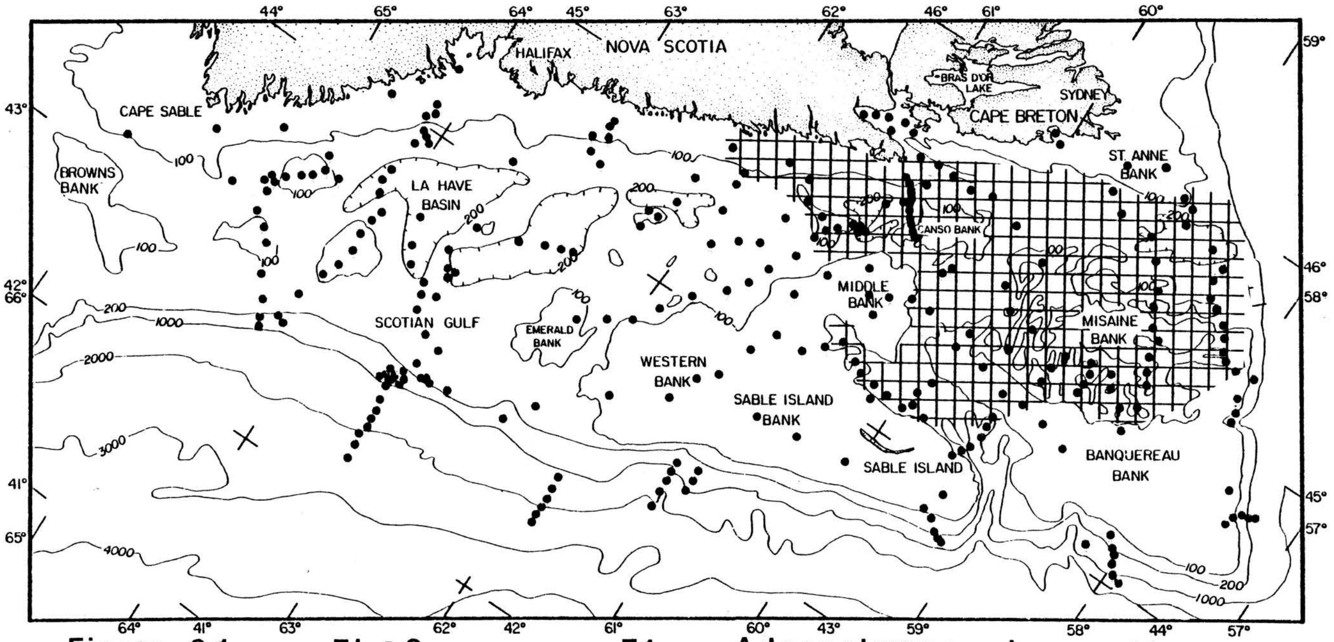


Figure 3.1 F.L.=.9 F.1 *Adercotryma glomerata*

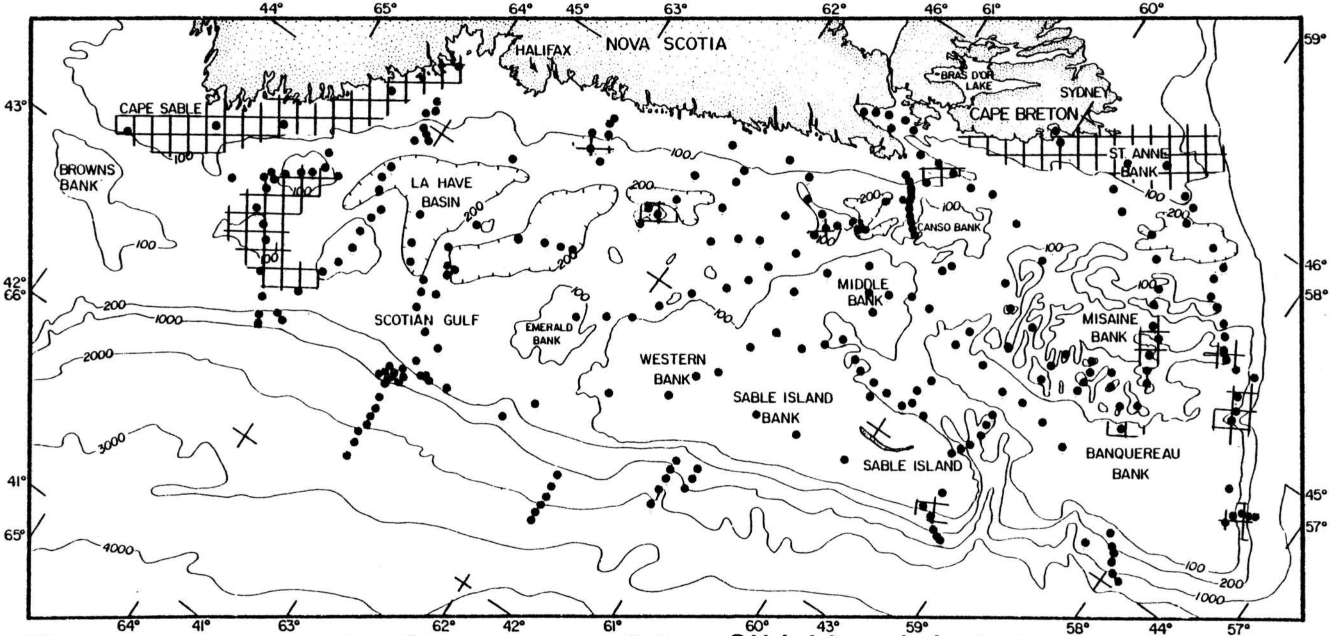


**Figure 3.2** F.L.=.9 F.2 ***Cibicides lobatulus***

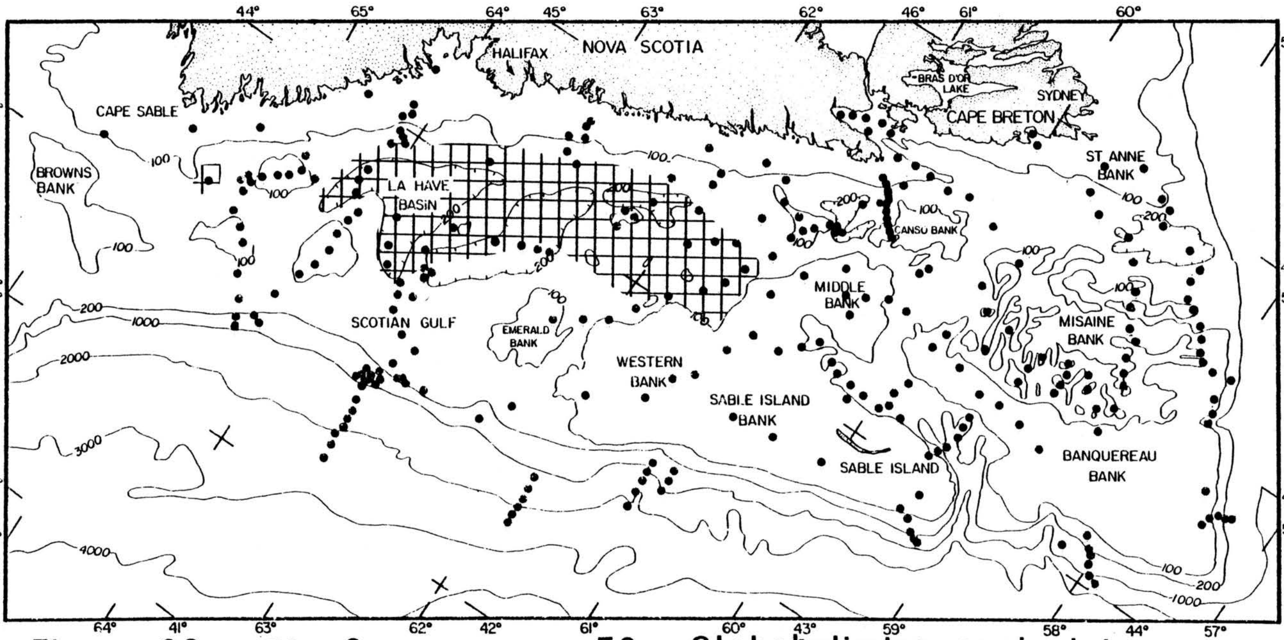
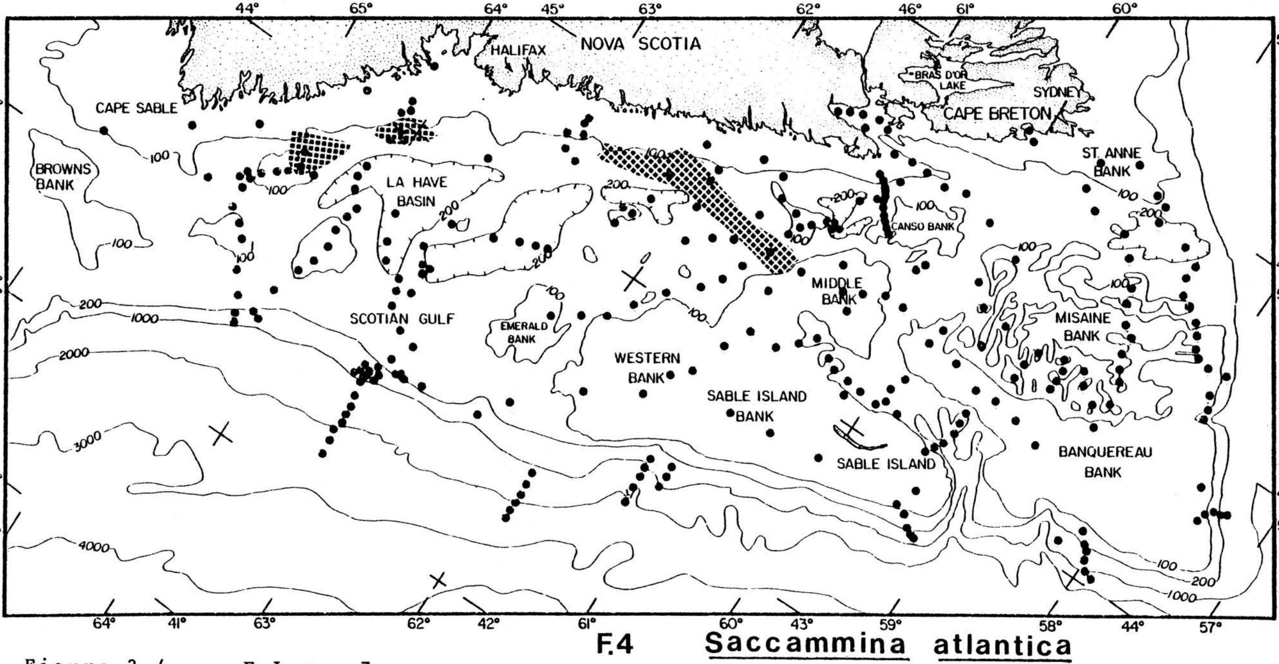
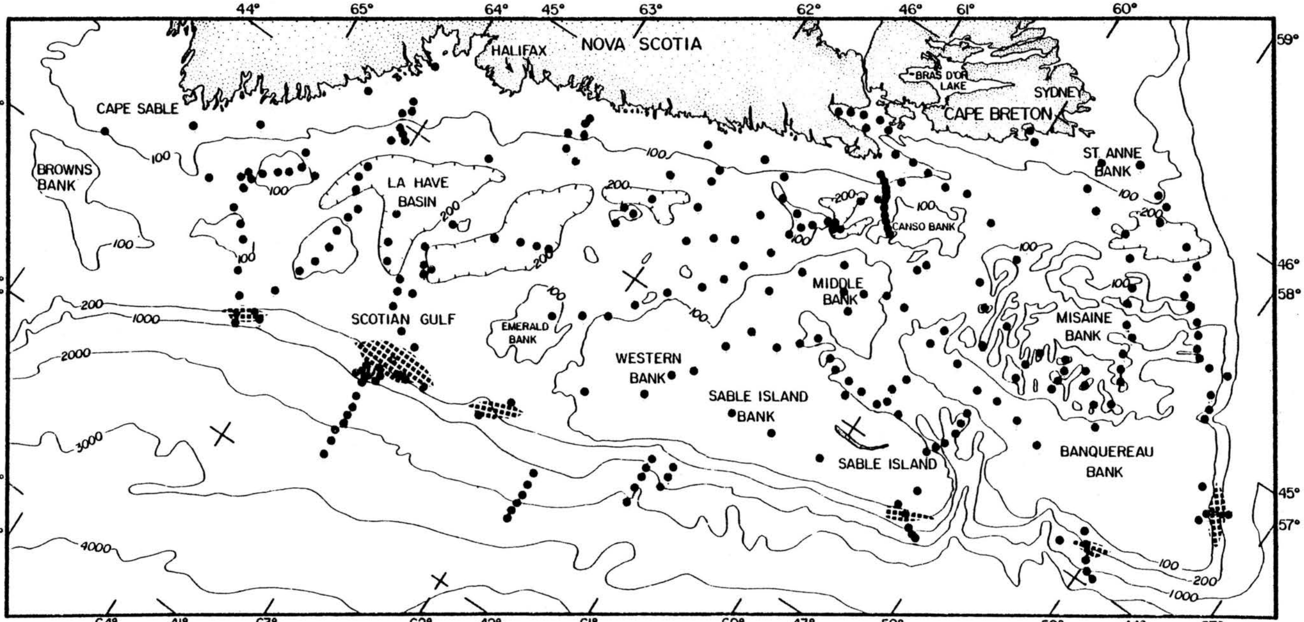


Figure 3.3 F.L. = .9 F.3 Globobulimina auriculata



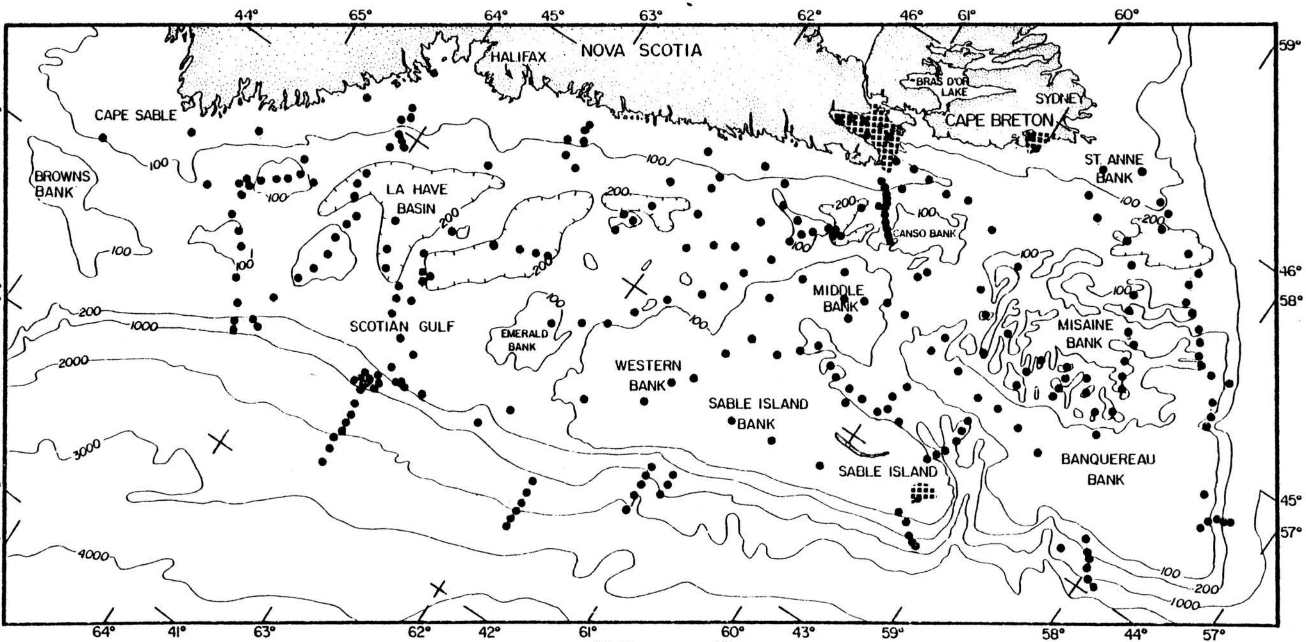
**Saccammina atlantica**

Figure 3.4 F.L.= .7



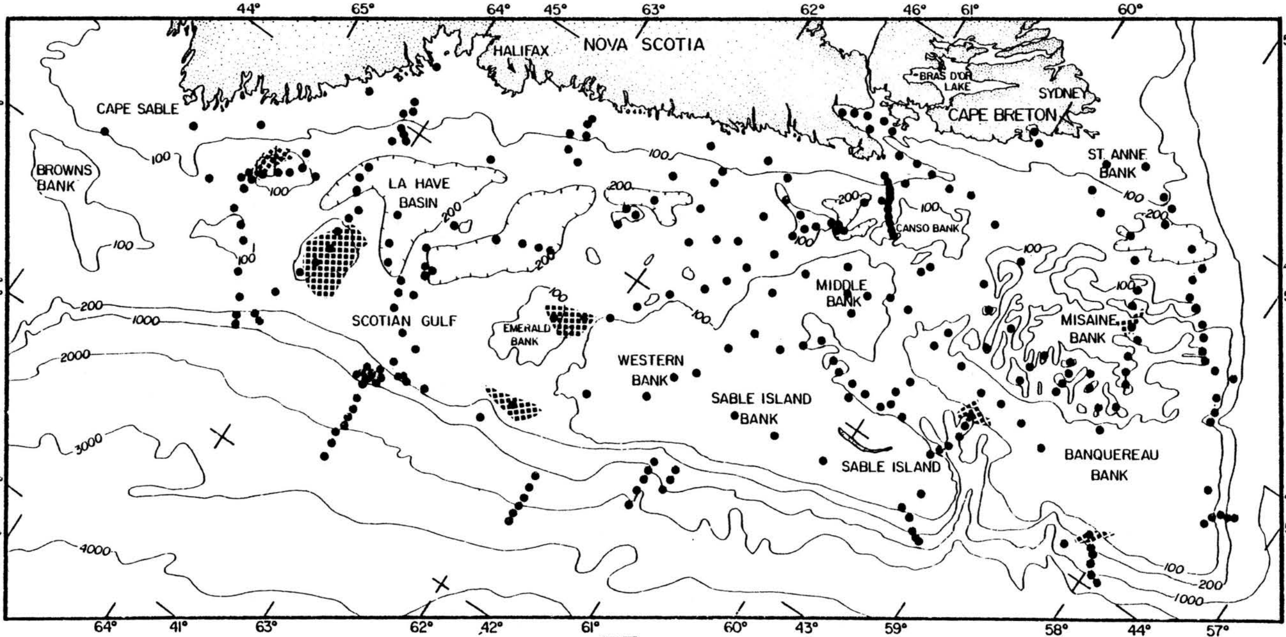
**F.5** ***Trifarina angulosa***

Figure 3.5 F.L.= .7



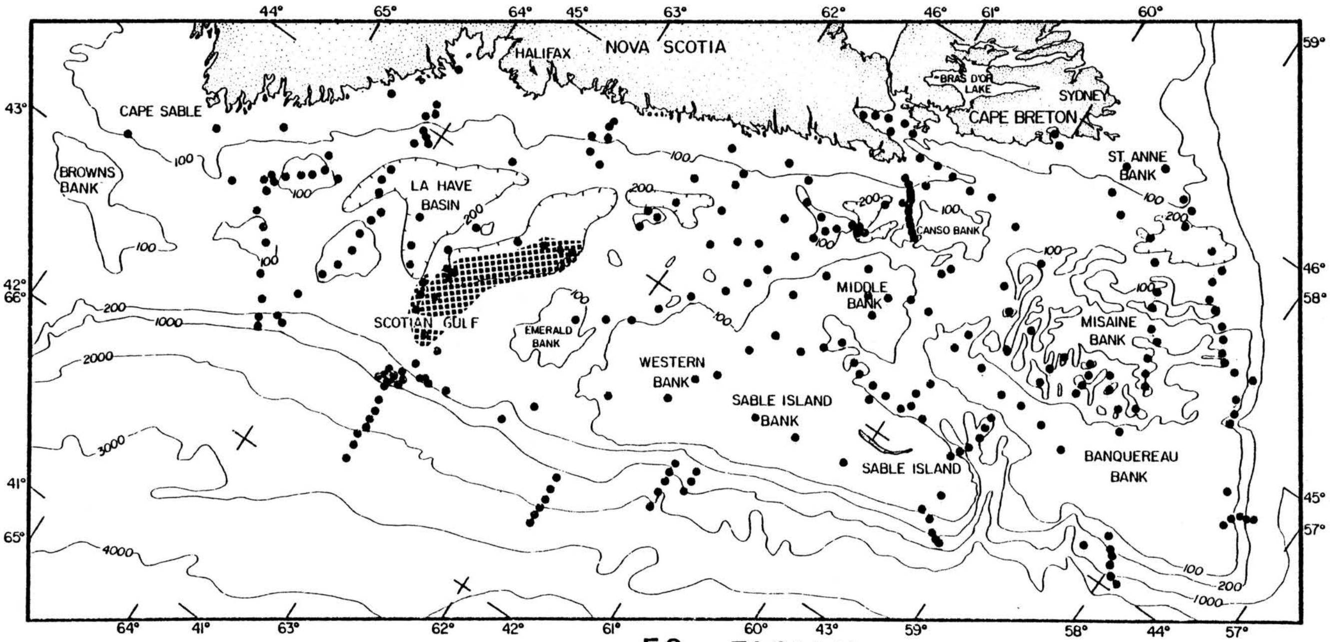
F.6 **Eggerella advena**

Figure 3.6 F.L.= .9



F.7 **Islandiella islandica**

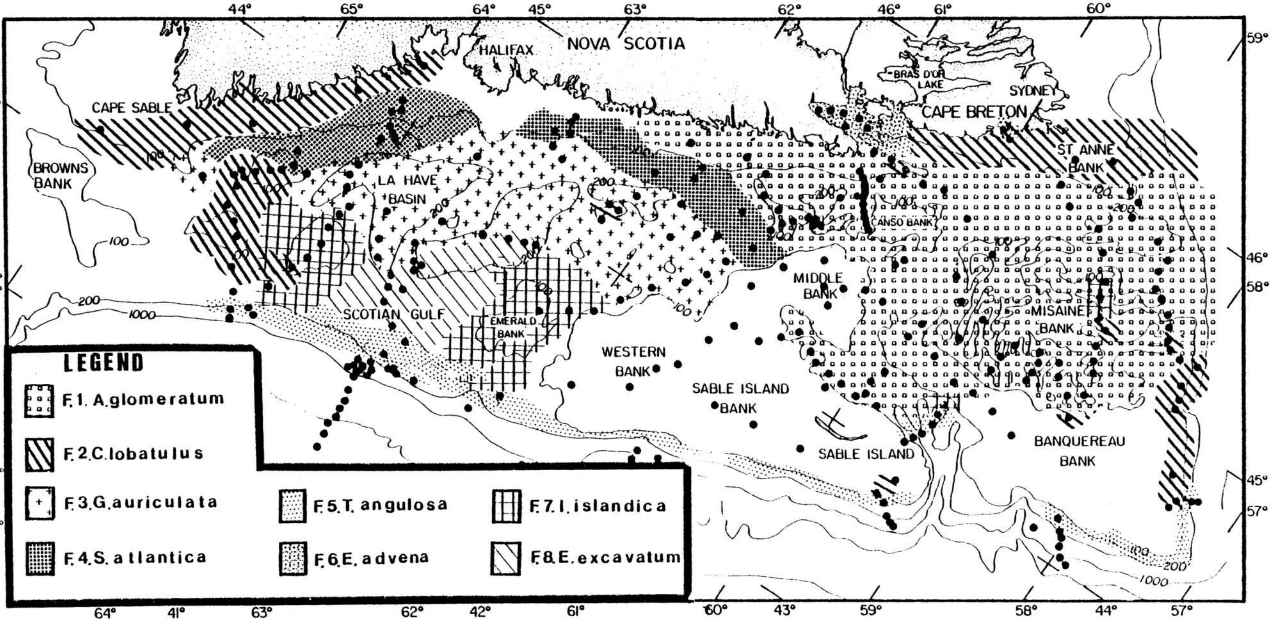
Figure 3.7 F.L.= .7



**F.8 Elphidium excavatum**

Figure 3.8 F.L.= .8

Figure 3.9 Summary of shelf factor assemblage distributions.


NOVA SCOTIA
HALIFAX
CAPE SABLE
BROWNS BANK
LA HAVE BASIN
SCOTIAN GULF
EMERALD BANK
WESTERN BANK
SABLE ISLAND BANK
SABLE ISLAND
MIDDLE BANK
CANSO BANK
MISAINE BANK
BANQUEREAU BANK
ST ANNE BANK
CAPE BRETON
SYDNEY
BRAS D'OR LAKE
100
200
1000
44°
65°
64°
45°
63°
62°
46°
61°
60°
59°
43°
42°
66°
58°
41°
65°
45°
57°
64°
41°
63°
62°
42°
61°
60°
43°
59°
58°
44°
57°
LEGEND
F. 1. A. glomeratum
F. 2. C. lobatulus
F. 3. G. auriculata
F. 4. S. atlantica
F. 5. T. angulosa
F. 6. E. advena
F. 7. I. islandica
F. 8. E. excavatum

### Factor assemblage 3: Globobulimina auriculata.

This calcareaous assemblage accounts for 9% of the observed variance. Its species diversity is higher than any of the other assemblages and it occurs only in the central shelf basin areas of Emerald, LaHave and Roseway (ie.fig. 3.2 in LaHave clay and Emerald silts). The northern limit of this assemblage appears gradational with factor assemblage 5, the latter forming a rim to the central basin complex. Other subdominant but important components of this assemblage include Nonionellina labradorica, Bulimina aculeata and Bolivina subaenariensis. The assemblage does not occur at all in those basins to the northeast of the area. Depth distribution is restricted to 150-250 m., ie. basin depths.

### Factor assemblage 4: Saccammina atlantica.

Accounting for 8.4% of the variance, this arenaceous assemblage is restricted entirely to the northern periphery of the central basin complex (assemblage 3). It is characterized by low factor loadings (ie. proportional significance) and is not predominant at any station being associated with assemblages 1 and 3 (Appendix II). Although in lesser amounts than the extremely dominant Saccammina atlantica; Reophax scorpiurus and Cribrostomoides jefferysi also occur. The assemblage is found between 90-200 m. depth.(fig. 3.4)

Factor assemblage 5: Trifarina angulosa.

This calcareaous, relatively diverse assemblage, accounts for 7.7% of the variance. It is completely restricted to shelf edge regions, being found slightly downslope in some places (fig. 3.5.) Its depth distribution is mainly 150-250 m. (shelf edge), with deeper occurrences at 300-400 m. Other important species (Table 3.2 ) include Bolivina spathulata and Buccella frigida.

Factor assemblage 6: Eggerella advena.

This entirely agglutinating assemblage accounts for only 5.4% of the variance. Its occurrence is very restricted, being confined to two areas (fig.3.6). It dominates in the northeast portion of the study area, in the inner shelf bays of Chedabucto and Gaberouse. Its other occurrence is south of Sable Island, on the well sorted sands of Sable Island Bank. The assemblage is almost monospecific; other species include Spiroplectammina biformis and Cribrostomoides crassimargo.

Factor assemblage 7: Islandiella islandica.

This calcareous assemblage accounts for 5.9% of the variance. This almost monospecific assemblage is restricted entirely to shelf occurrences, mainly on the banks. It generally co-occurs with factor assemblage 2 (Cibicides lobatulus), mostly on the outer banks but also on the inner shelf along the Eastern Shore. As with factor 2, this assemblage again occurs upon coarse rocky substrate (fig. 3.7).

Factor assemblage 8: Elphidium excavatum f. clavata.

This calcareous assemblage accounts for 6.1% of the variance. It occurs on the shelf between LaHave and Emerald Banks (Scotian Gulf), in the approaches to Emerald Basin (fig. 3.8) To the north, it gives way to assemblage 3 and southwards, to the shelf edge factor assemblage 5. Other species present include Bulimina aculeata, Fursenkoina fusiformis and Buccella frigida.

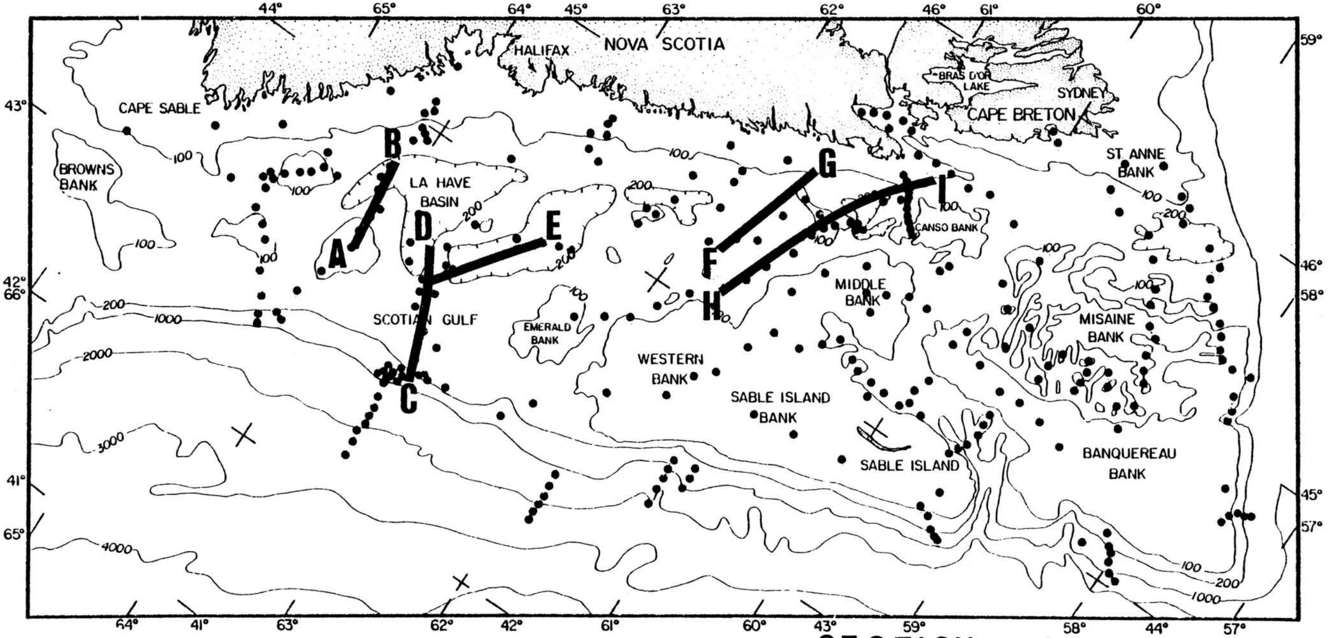
### 3.2.3 Discussion

The assemblage distribution on the continental margin off Nova Scotia is seen on fig. 3.9. However, this map and indeed the previous 8 maps fail to show the nature of the assemblage boundaries. The character of these boundaries (i.e. gradational or of a sharp nature, etc) is an important clue to understanding the response of an assemblage to various limiting environmental gradients. The nature of these assemblage boundaries on the shelf are illustrated by a series of cross-sections.(figs. 3.10-3.15) These were examined with respect to their bathymetry and the corresponding factor loadings. Other parameters, such as the substrate, temperature and salinity gradients along these cross-sections, will be examined in a later chapter.

Section A-B extends from LaHave Bank into LaHave Basin, a decline in dominance of factor 7 as the section enters the Basin is seen. A corresponding increase in importance of factor 3 is observed.

Similarly in section C-D, the shelf edge assemblage 5 gradually

Figure 3.10 Location of faunal boundary sections seen in figures 3.11--3.15.



SECTION LOCATIONS

Figures 3.11—3.15 Variation of factor loadings (vertical) of several shelf assemblages with bathymetry and distance (horizontal).

Figure 3.11

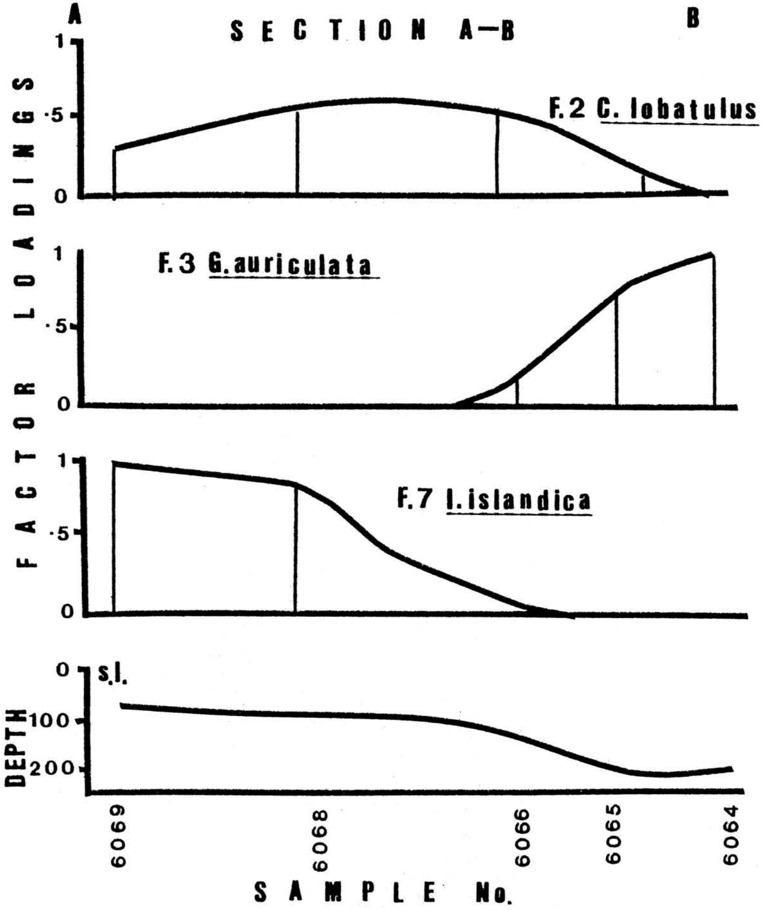

A
SECTION A—B
B
FACTOR LOADINGS
1
·5
0
F.2 C. lobatulus
1
·5
0
F.3 G.auriculata
1
·5
0
F.7 I.islandica
DEPTH
0
s.l.
100
200
6069
6068
6066
6065
6064
SAMPLE No.

Figure 3.12

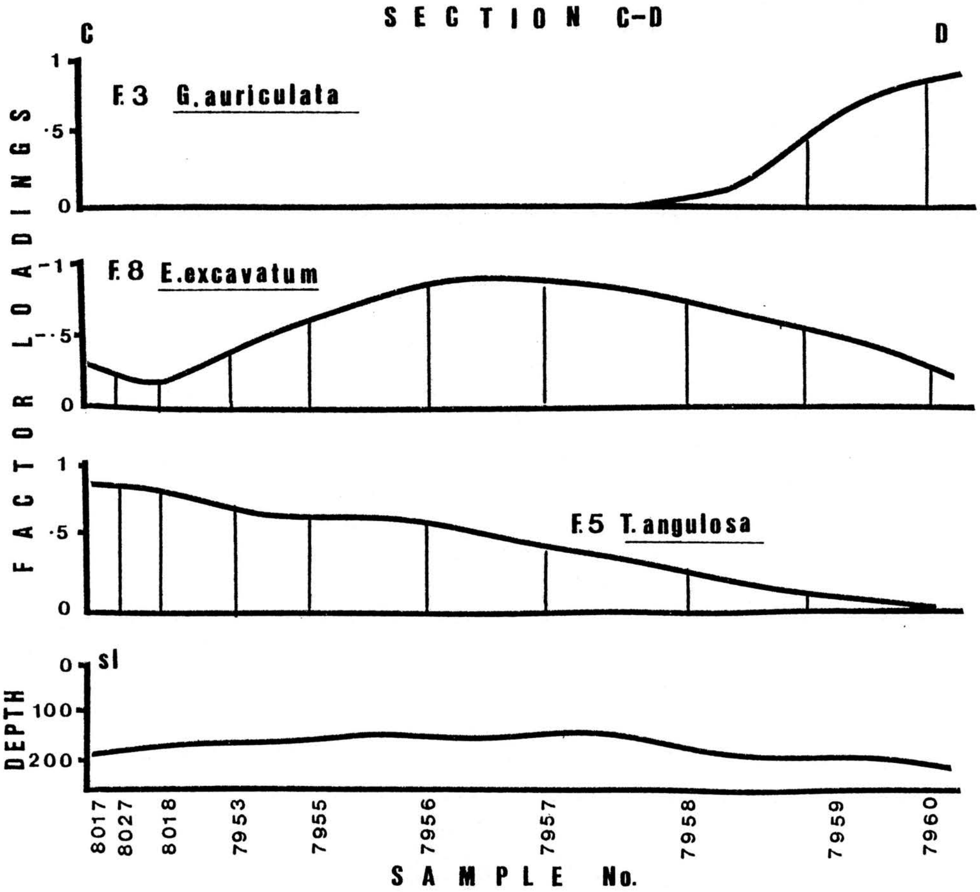

SECTION C-D
C
D
FACTOR LOADINGS
1
·5
0
F.3 G.auriculata
-1
-·5
0
F.8 E.excavatum
1
·5
0
F.5 T.angulosa
DEPTH
0
sl
100
200
8017
8027
8018
7953
7955
7956
7957
7958
7959
7960
SAMPLE No.

Figure 3.13

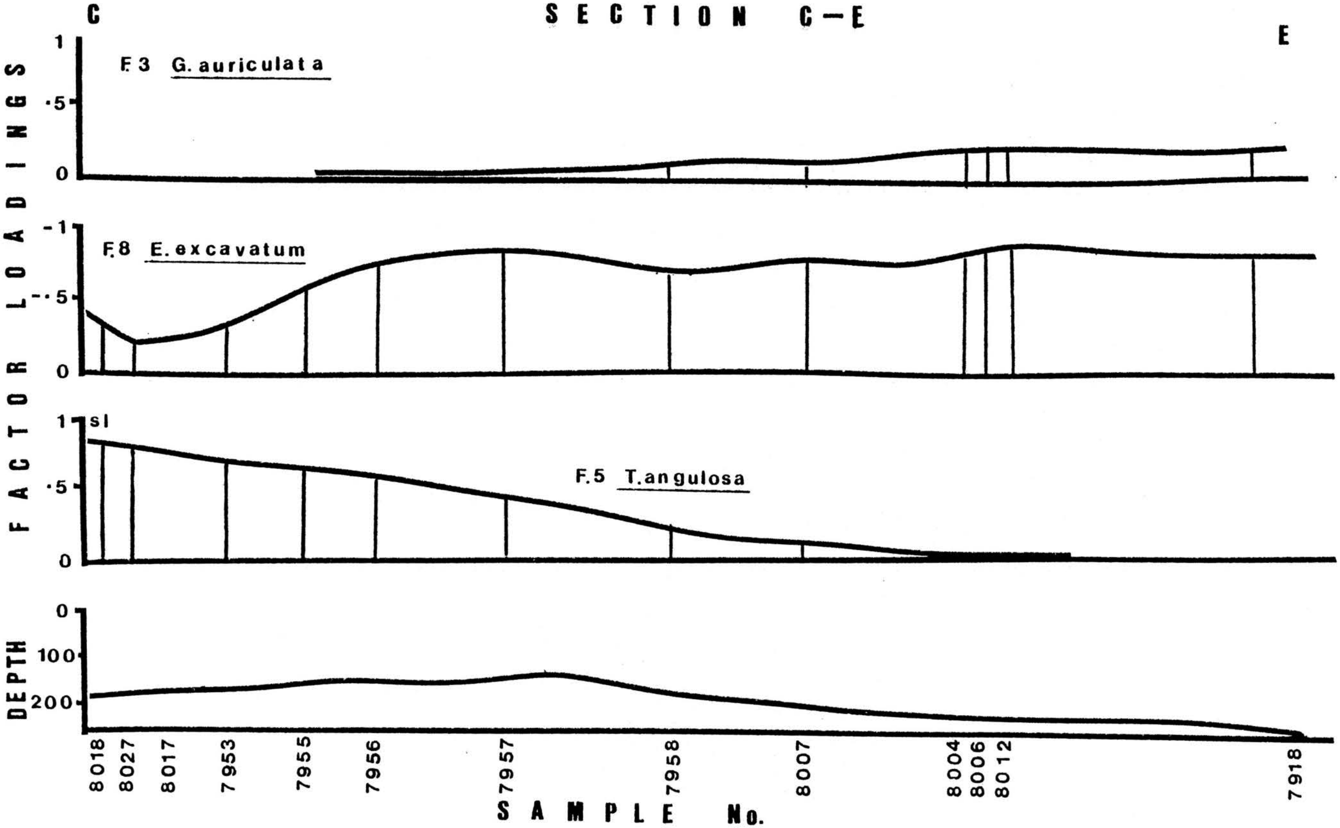

C
SECTION C—E
E
FACTOR LOADINGS
1
·5
0
F.3 G. auriculata
-1
-·5
0
F.8 E. excavatum
1
sl
·5
0
F.5 T. angulosa
DEPTH
0
100
200
8018
8027
8017
7953
7955
7956
7957
7958
8007
8004
8006
8012
7918
SAMPLE No.

Figure 3.14

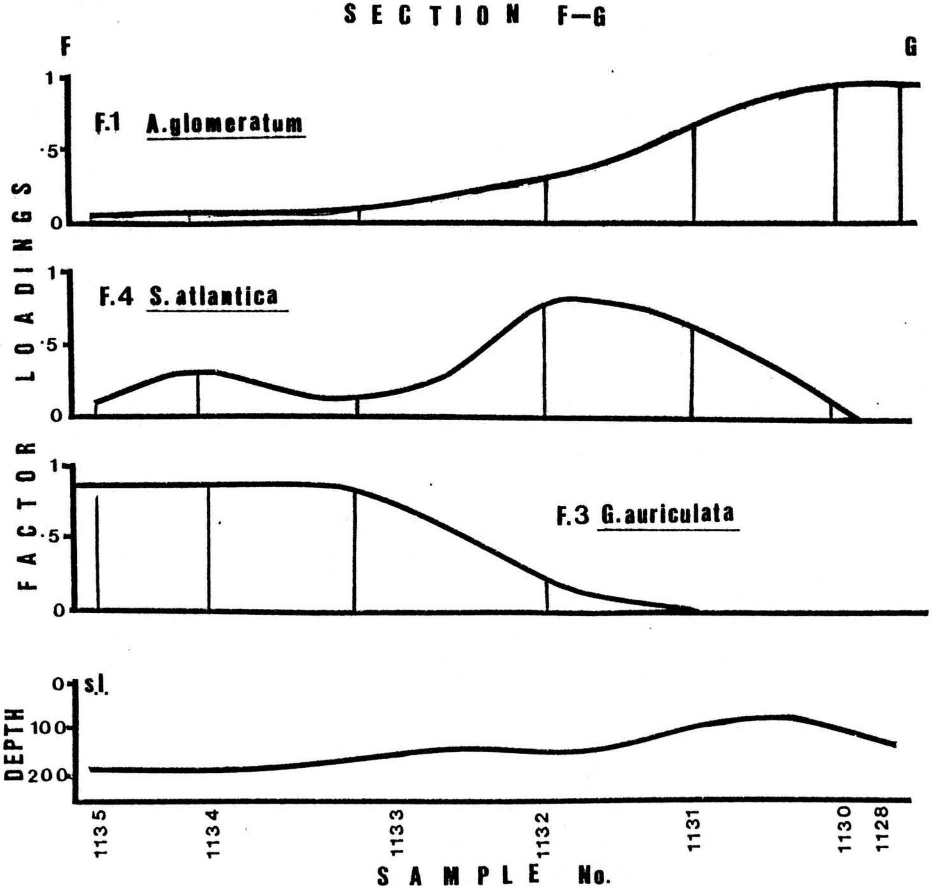
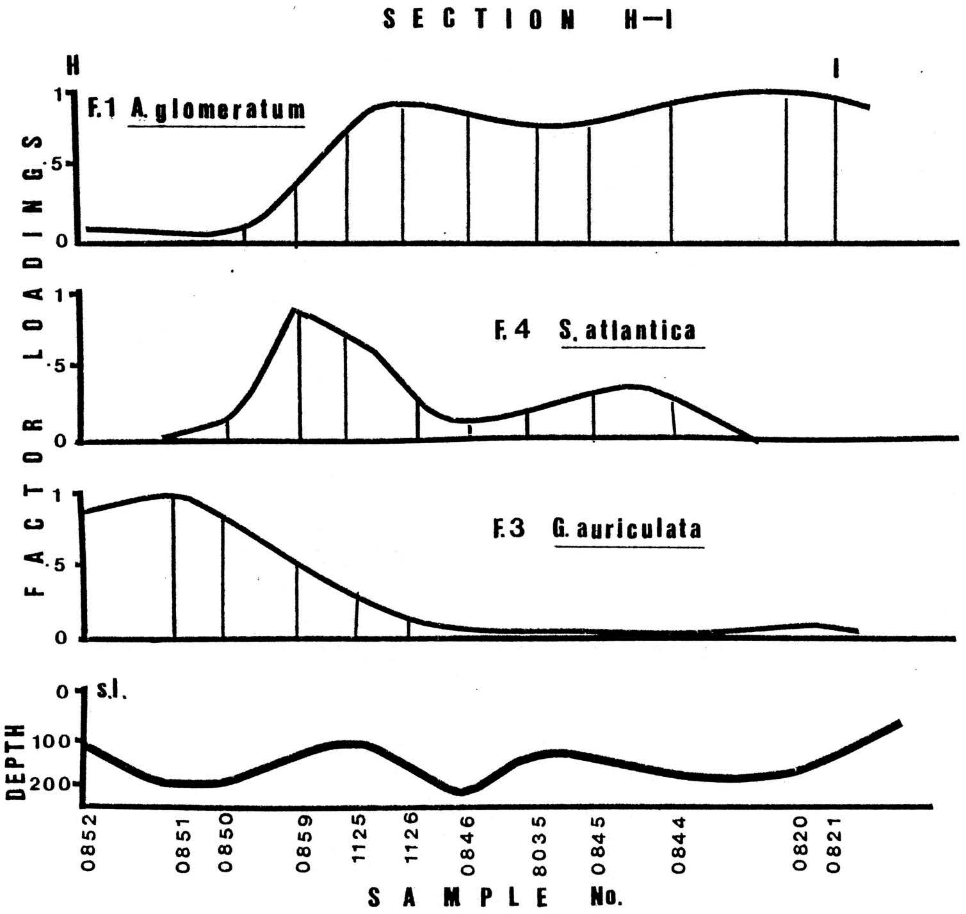

SECTION F—G
F
G
1
·5
0
F.1 A.glomeratum
1
·5
0
F.4 S. atlantica
1
·5
0
F.3 G.auriculata
LOADINGS
FACTOR
0
s.l.
100
200
DEPTH
1135
1134
1133
1132
1131
1130
1128
SAMPLE No.

Figure 3.15


SECTION H—I
H
I
FACTOR LOADINGS
1
.5
0
F.1 A. glomeratum
F.4 S. atlantica
F.3 G. auriculata
DEPTH
0
s.l.
100
200
0852
0851
0850
0859
1125
1126
0846
8035
0845
0844
0820
0821
SAMPLE No.

decreases in significance shoreward, across the Scotian Gulf and into LaHave Basin. As this factor decreases, there is a corresponding increase in basin assemblage factor 3. Factor 8 peaks in the middle of the Scotian Gulf and for reasons to be explained, is thought to be relict.(fig. 3.12.)

Section C-E is similar, although the section crosses Emerald Basin. Again, factor 5 gradually decreases with a corresponding increase in factor 3. It is believed that factor assemblage 3 is here masked by the occurrence of the relict transported factor 8 in part of Emerald Basin. This will be explained in chapter 5.(fig. 3.13)

Section F-G illustrates rather well the transition of the central basin assemblage 3 into the northeast bank/basin assemblage 1. Assemblage 4 appears to be a transitional assemblage between the two. These relationships are seen also in section H-I (figs. 3.14,3.15).

These sections illustrate the gradational nature of most of the assemblages on the shelf. Further chapters will more thouroughly discuss the ecological implications of these faunal gradients.

### 3.2.4: GROUP 3 SLOPE DATA.

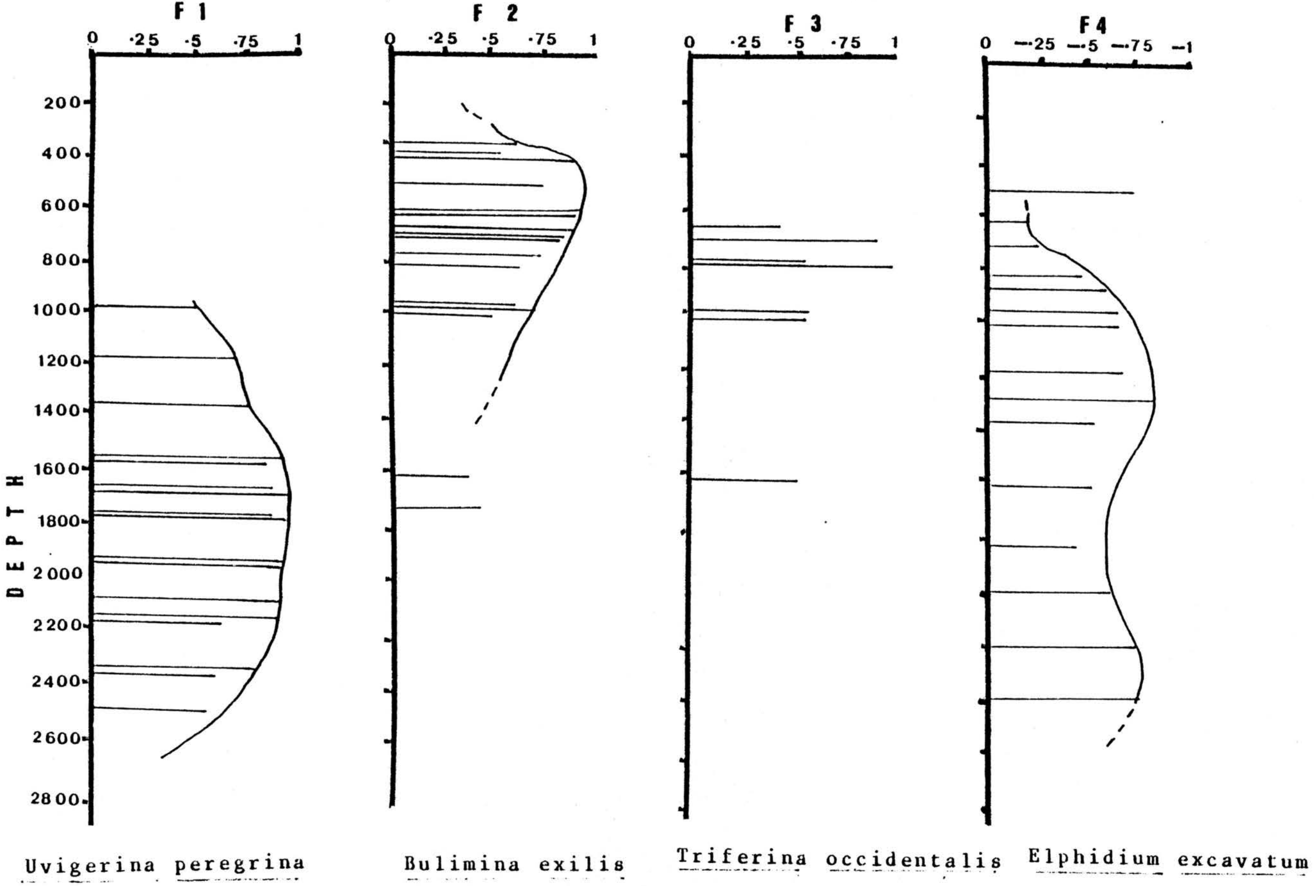
Q-Mode factor analysis of these 43 stations determined 4 factor assemblages accounting for 76% of the observed variance. Table 3.3 shows the nature of the factor assemblages, their composition and distribution. This table is extracted from the varimax factor matrix and the factor score matrix ( Appendix III). The depth distribution of these factor assemblages ( i.e. factor loading versus depth) are shown

## TABLE 3.3

## FACTOR SCORES FOR SLOPE ANALYSIS--A SUMMARY

| FACTOR ASSEMBLAGE | % VAR. | DOMINANT SPECIES WITH FACTOR SCORES | | DISTRIBUTION | SUBSTRATE |
|---|---|---|---|---|---|
| 1 | 27.0 | Uvigerina peregrina | 7.7 | Deep slope. +1200 m | silts. |
| | | Elphidium excavatum | 3.1 | | |
| 2 | 15.5 | Bulimina exilis | 7.3 | Upper slope.<br>400-1000 m | silts. |
| | | Bulimina aculeata | 2.2 | | |
| | | Cibicides lobatulus | 1.2 | | |
| | | Nonionellina turgida | 1.2 | | |
| | | Elphidium excavatum | 1.1 | | |
| | | Buccella frigida | 1.2 | | |
| | | Nonionellina labradorica | 1.0 | | |
| 3 | 8.5 | Trifarina occidentalis | 8.0 | 700-1000 m | silts. |
| | | Nonionellina turgida | 1.2 | | |
| 4 | 18.0 | Elphidium excavatum | -7.5 | 400-2400 m | silts. |

Figure 3.16 Depth distribution for slope assemblage factor loadings. (vertical=depth in m, horizontal=factor loadings)



SLOPE FACTOR LOADINGS

in fig.3.16. Factor assemblages 1 ( U. peregrina, table 3.3) and 2 ( B. exilis) are restricted to lower and upper slope regions respectively. Factor 4 ( E. excavatum) has a wide depth range whilst factor 3 is restricted to a few upper slope occurrences; this latter assemblage is not thought to be important.

The following describes the main features of each assemblage. Maps depicting the occurrence of the highest factor loadings for each assemblage in each slope area (figs. 3.17-3.23) are shown. The insets in these maps are the appropriate factor loading versus depth plot for each assemblage at each transect.

### Slope Factor assemblage 1: Uvigerina peregrina.

This deep slope calcareous assemblage explains 33.6% of the observed variance. Figs.3.17 and 3.18 show the spatial occurrence of this assemblage ( i.e. occurrence of stations with factor loadings greater than 0.9) and along with their insets reveal the consistency of this assemblage at 1200-2400 m. depth and the gradational nature of its limits.

### Slope Factor assemblage 2: Bulimina exilis.

This calcareous assemblage accounts for 21.6% of the variance. Figs.3.19, 3.20, and 3.21, reveal its constant occurrence at upper slope depths ( between 400-100 m. ). It is absent in slope area B, i.e. at stations which appear too deep.

### Slope Factor assemblage 3: Trifarina occidentalis.

Figures 3.17--3.23. Spatial distribution of slope factor assemblages (F.L.-+.8). Inserts show depth distribution of assemblage factor loading at each transect.

Figure 3.17. Distribution of slope factor 1 *Uvigerina peregrina*
3.18. " " " " 1 " " "
3.19. " " " " 2 *Bulimina exilis*
3.20. " " " " 2 " "
3.21. " " " " 2 " "
3.22. " " " " 4 *Elphidium excavatum*
3.23. " " " " 4 " " "

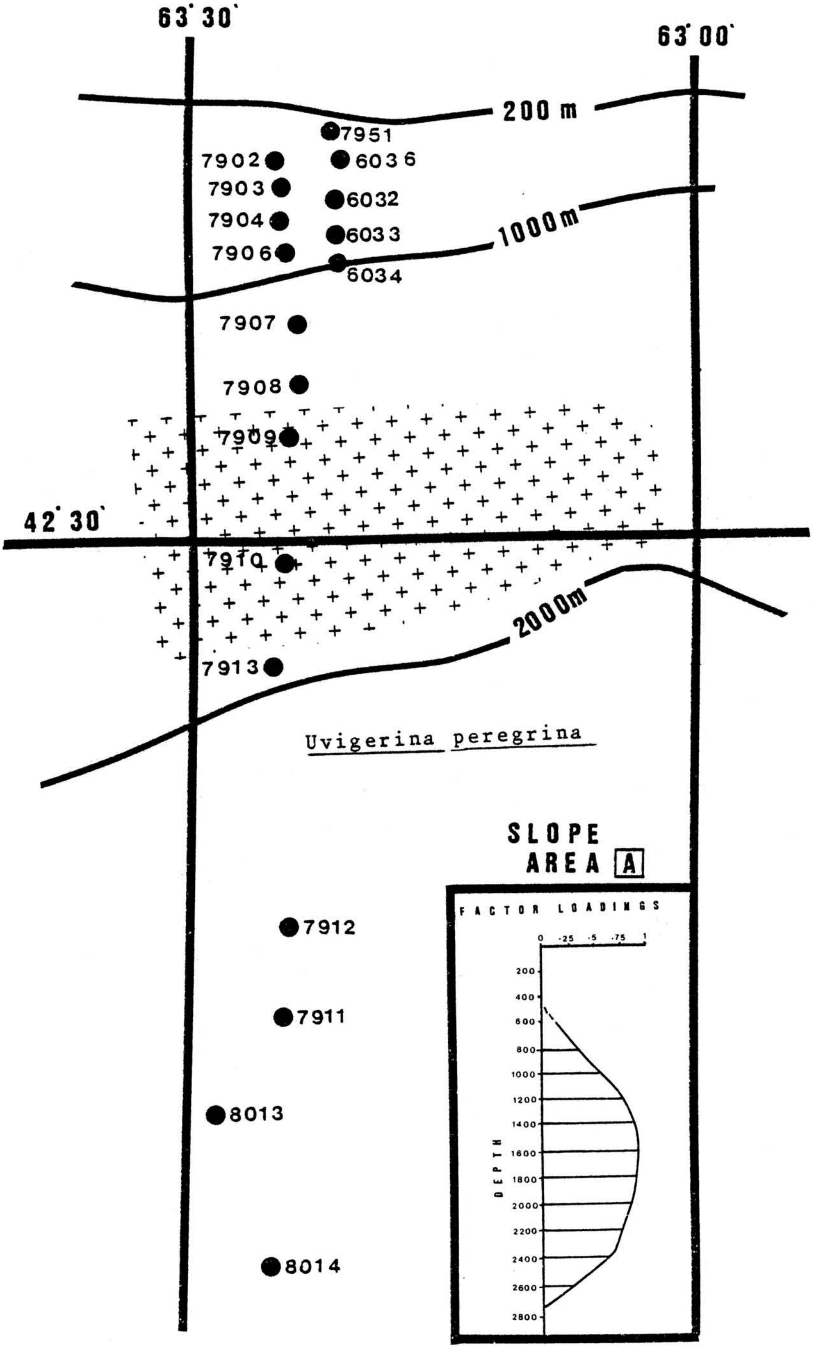

63°30'
63°00'
200 m
7951
7902
6036
7903
6032
7904
6033
7906
6034
1000m
7907
7908
7909
42°30'
7910
2000m
7913
Uvigerina peregrina
SLOPE
AREA A
FACTOR LOADINGS
0
.25
.5
.75
1
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
DEPTH
7912
7911
8013
8014

Figure 3.17.

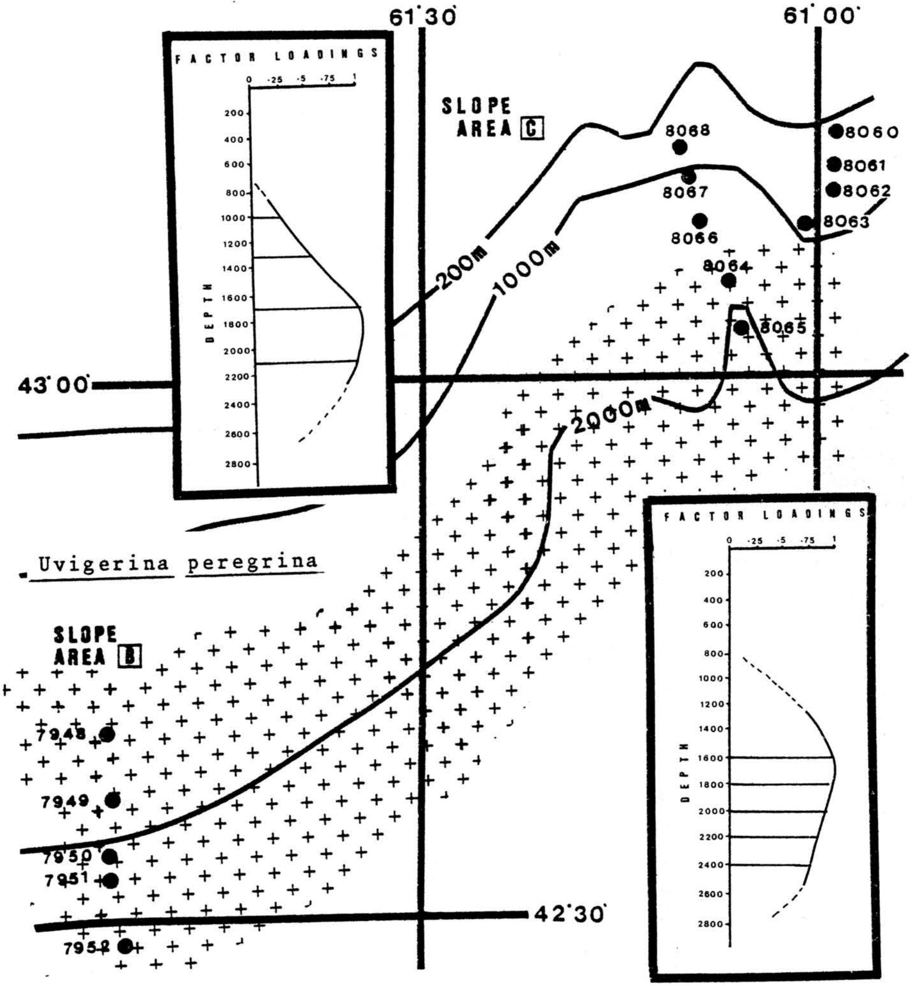

61°30'
61°00'
43°00'
42°30'
SLOPE AREA C
SLOPE AREA B
Uvigerina peregrina
200m
1000m
2000m
8060
8061
8062
8063
8064
8065
8066
8067
8068
7948
7949
7950
7951
7952
FACTOR LOADINGS
0 ·25 ·5 ·75 1
DEPTH
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800

Figure 3.18

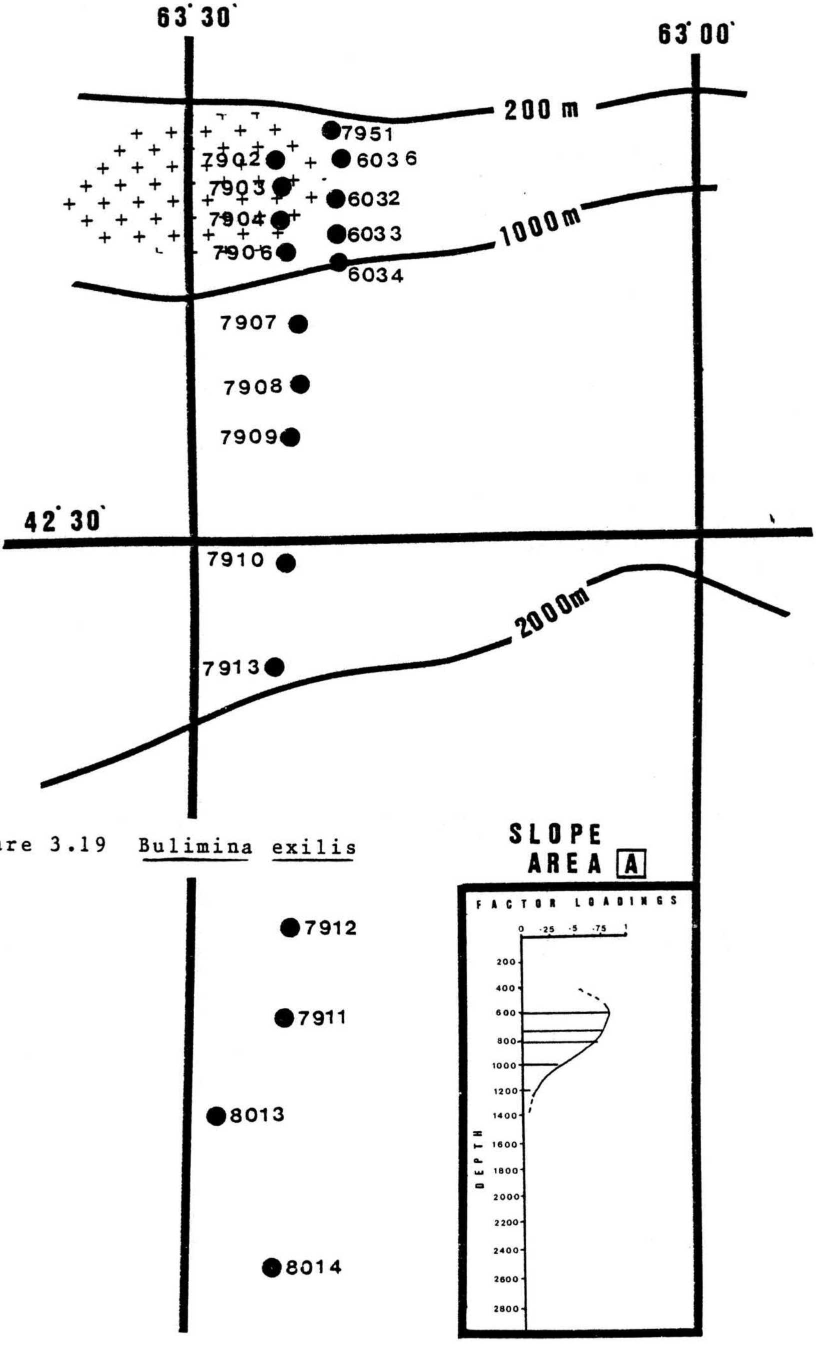


Figure 3.19 Bulimina exilis

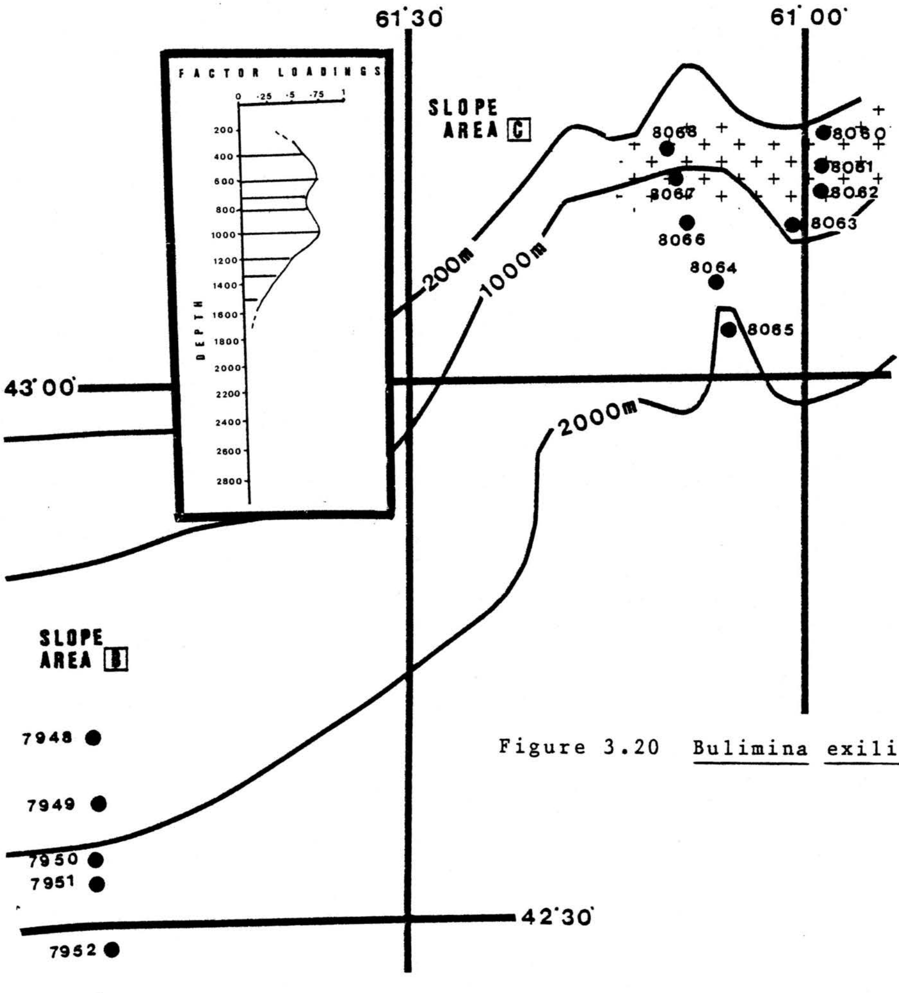


Figure 3.20 Bulimina exilis

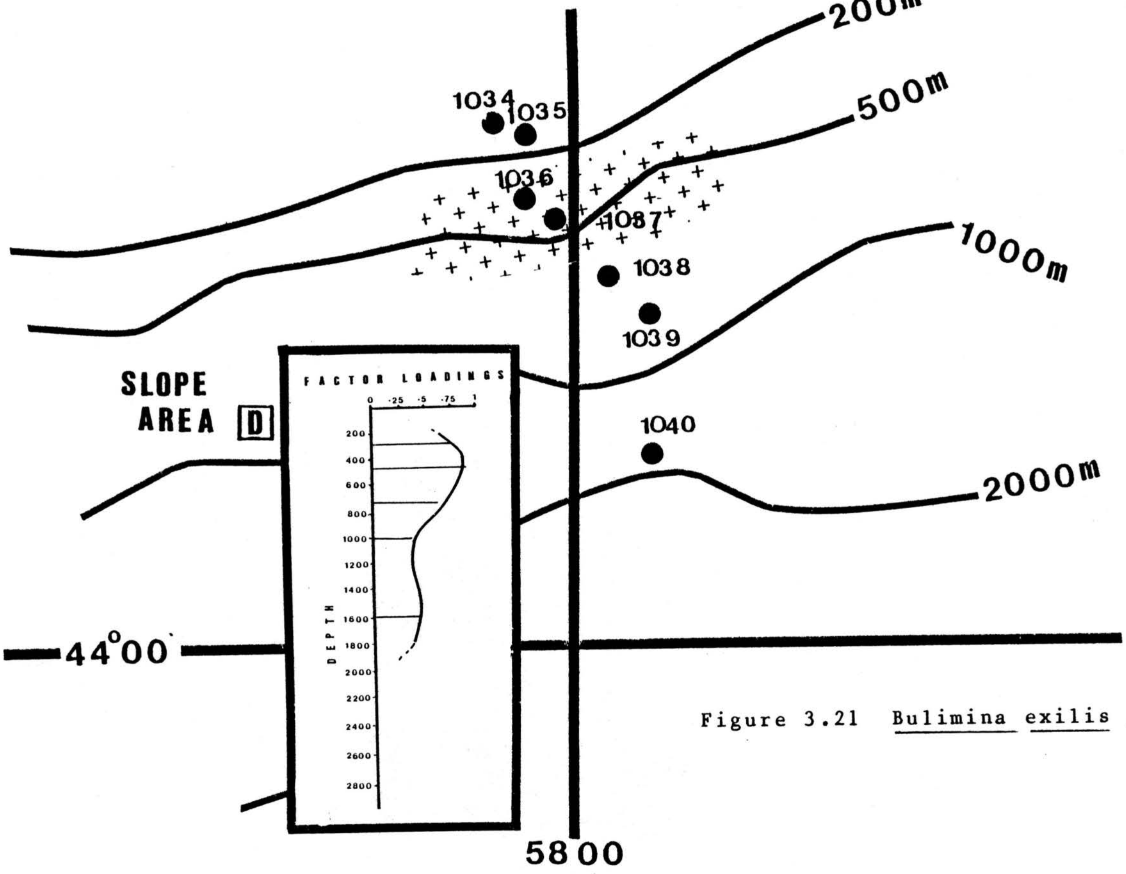


Figure 3.21 *Bulimina exilis*

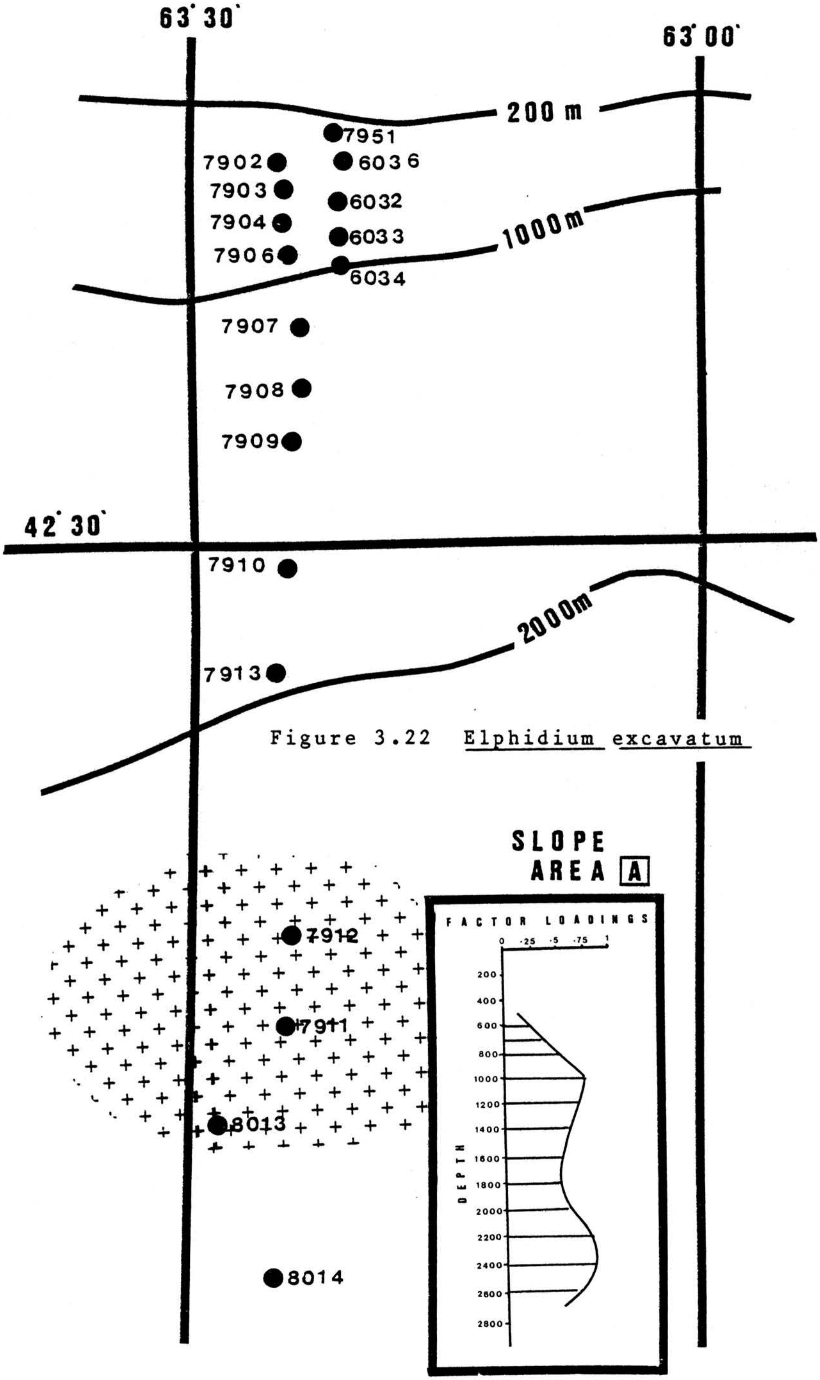


Figure 3.22 Elphidium excavatum

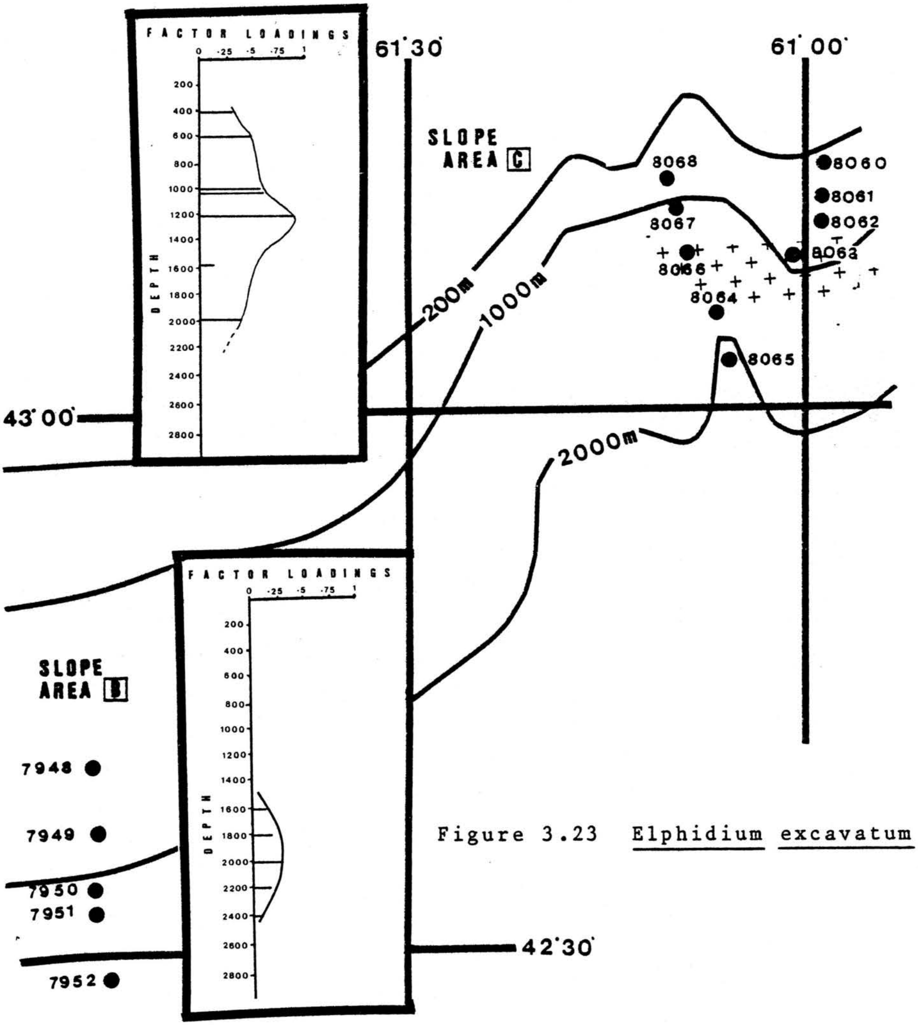


Figure 3.23 Elphidium excavatum

Accounting for only 9.0% of the variance, this assemblage is restricted to a few stations in the upper slope areas, and could possibly be a local variation of assemblage 2. It is very likely that this assemblage is dominated by a megalospheric form of T. angulosa

Slope Factor assemblage 4: Elphidium excavatum f. clavata.

This calcareous assemblage accounts for 12% of the observed variance and is entirely dominated by E. excavatum. Its main occurrence is in slope area A and less importantly in slope area C ( Figs. 3.22, 3.23). Its non-occurrence in other transects will be discussed later.

### 3.2.4: Shelf and Slope Distribution Summary

The factor analysis techniques have described and summarized the shelf and slope raw data. Their validity is shown by close scrutiny and comparison of the raw data and the factor assemblages produced. That the factor assemblages explain well the initial data input is shown through the high communalities of most stations (i.e. the degree to which a sample is adequately described by each factor). The total variance, which is the % of the original data explained by the technique, is also high.

In summary, eight shelf and four slope factor assemblages are produced by the analysis and have been described. They represent an accurate appraisal of the total (i.e. live + dead) foraminiferal distribution characteristics. Separate analysis of the slope and shelf data proved more accurate, removing certain ambiguities inherent to the data.

In the next chapter, the live data is used to investigate whether the described assemblages are in equilibrium with presently occurring oceanographic regimes. This is a necessary precursor to the sections on environmental relationships, etc

# CHAPTER 4: ASSEMBLAGE MODIFYING PROCESSES

## 4.1 Introduction

The scientific objective of the distribution analysis, as undertaken in this study, is to attempt accurate, quantitative correlations with the causative and constraining oceanographic parameters that influence assemblage occurrences. If conclusions drawn from this study are to be applicable to the present day and for palaeoecological settings, account must be taken of processes that may affect an assemblage composition, and render such conclusions invalid.

The present section investigates the extent to which the defined assemblages are in equilibrium with the acting hydrographic regimes.

## 4.2 Assemblage modifying processes.

Most of the processes which modify assemblages have been well documented (Murray, 1976; Douglas and Heitman, 1979; Douglas et al, 1980; Murray et al, 1982; Schafer and Prakash, 1982). These works explain observed disparities between living and total foraminiferal populations as the result of relictness, shell dissolution, transportation, fossil reworking, predation or variations in rates of shell production, sample type and inadequate staining. Each of the defined assemblages was examined for evidence of these modifying influences through an appraisal of the raw data for living organisms. Unfortunately, the live data presented in this study was insufficient for exhaustive quantitative methods. They do, however, allow subjective appraisal of the validity of each assemblage.

Before the live data is examined, further discussion on these modifying influences is warranted.

### a/ Relictness: Fossil Reworking

Relict assemblages or relict species within an assemblage are the result of a low sedimentation rate over a period of time. Some or all of the fossils lived under hydrographic conditions not now operating. Relictness is indicated by the occurrence of species or assemblages that have no apparent living representatives, either within the immediate limits of the assemblage or throughout the study area. The physical appearance of the test may also indicate whether an assemblage has been long exposed at the sediment-water interface and therefore perhaps, relict. Certainly, the sediments on parts of the shelf off Nova Scotia have previously been described as not being in equilibrium with the present hydrographic conditions ( Drapeau 1971, Swift *et al*, 1972). Modern, post-glacial sediment dispersal processes have produced a "spillover" effect of reworked relict sands from shelf to slope environments (Swift, 1971). The potential then, for some or parts of the defined assemblages to be relict and not indicative of the present regimes is quite great. The extent to which they are is discussed in a later section.

Reworked Tertiary or older fossil material being present in an assemblage should also be recognized. Being in disequilibrium with the hydrography, they have the same effect as relictness and imply derivation through the stripping of the Quaternary cover, leaving fossil assemblages exposed.

### b/ Dissolution

Active shell destruction resulting from solution is not thought to be a problem within this study area. Etching of the test surface does occur on some species and possibly indicates relict sediments. Discussion on the effect of various levels of calcium carbonate availability is reserved for a later section.

### c/ Transportation

Several effects of the sediment transportation of foraminifera must be discussed. Transportation may deplete one or more of the components (or rather a particular size range of its components), on the other hand, an assemblage may become enriched with particular species. A whole assemblage may become mobilized and then selectively transported; whole scale slumping may result in assemblages occurring at deeper levels than usual or depth restricted bathyal microfaunas may become uplifted to shallower depths (Silver, 1971; Murray, 1976; Douglas and Heitman, 1979; Douglas _et al_, 1980, Coulbourn, 1980). Murray (1982) has recently described the occurrence of benthic foraminifera throughout the water column being actively transported landward in near surface waters or seaward as bottom load. He observed that the tide and storm-swept seas of the Western Approaches off Britain may serve as a model for other continental shelves subject to vigorous tidal currents and wave attack (e.g. Nova Scotias exposure to western Atlantic seas). The extent and magnitude of this type of transportation process off Nova Scotia needs further examination.

In this study, the recognition of transported assemblage components involves the use of live population counts as well as a close examination of the test sizes themselves i.e. size sorting of juveniles or adults, etc.

d/ Sample type and staining inadequacies.

Both these features may introduce ambiguities into the live counts. Their effects have been discussed in an earlier section (Chapter I).

## 4.3. Comparison of Shelf Factor Assemblages with Live Data.

This section examines each factor assemblage produced through the analysis of total population data and compares its composition with observed live data. Stations within a factor assemblage area that exhibit similar live species rankings to factor score species rankings suggest that the factor assemblage is representative of the actual bioceonosis. In this way it is possible to determine which assemblages were in equilibrium with and thus good indicators of the present oceanographic regimes. Discrepancies between the live data and the factor assemblages are explained with reference to the previous section.

Appendix IV Tables 1-8 show stations from within each factor assemblage area, their respective factor loadings and dominant species components. For each dominant species within a given factor, the corresponding live per cent. value is given per station. Living species that do not figure prominently in the factor score matrix are noted.

### a/ Factor assemblage 1: Adercotryma glomerata

The main species components defined for this factor reflect closely the observed live percentage data (i.e. rankings in factor score matrix are essentially the same as the live rankings, Appendix IV Table 1). Two of the subdominant species within this factor assemblage, Spiroplectammina biformis and Cribrostomoides crassimargo, lack significant live representation. The difficulties concerning the observation of stains in agglutinating foraminifera, as explained in chapter I, may explain this feature (in particular for small forms such as S. biformis). The second most dominant species within this factor, R. turbinatus, occurs in greater proportions living, indicating that it may play a greater role within the assemblage than is otherwise implied. It is clear then, that factor assemblage one reflects the observed live data to an extent that it is representative of the presently occurring oceanographic regime in the area. In other words, relictness and transportation are not a problem here.

### b/ Factor assemblage 2: Cibicides lobatulus

This C. lobatulus dominated factor compares well with the observed living percentages (Appendix IV Table 2). Several other live species occur but do not figure prominently in the factor scores. Many of these, however, do not occur consistently in the assemblage throughout the stations (e.g. B. frigida and E. advena, Table 2). The live data suggests there are rather more species indigenous to this assemblage than the factor scores imply. It is thought here that the Bank and Nearshore regions, to which this factor is commonly associated, provide large ammounts of attachment surfaces for its main species, C. lobatulus. The death and subsequent deposition of this form tend to flood the assemblage, thus masking other live components. All these species must be considered in an ecological study.

### c/ Factor assemblage 3: Globobulimina auriculata

This assemblage (Appendix IV Table 3) reflects the observed live data reasonably well. Several discrepancies, however, are seen. Both G. auriculata and N. labradorica are prominent in the factor scores and the live data. Their values in the latter vary quite appreciably. There are also a large number of species that occur living but do not figure prominently in the factor scores. Several are consistently present living (e.g. F. fusiformis and C. crassimargo) whereas the remainder are not so persistent.

The species G. auriculata and N. labradorica are both characterized by globular, lightweight tests. Kontrovitz (1978) has shown that high operational sphericity (i.e. globularity) and thin light weights are correlated to low traction velocities and thus low velocity currents would be required to quickly put these two species into suspension. This may partially explain the variation observed in the live occurrences of these two species. The transportation may have occurred on a small local scale, concentrating the species and perhaps making them appear more important within the assemblage than they really are.

B.aculeata does not occur live at all, even though it is an important component in the assemblage. Absence of spines and general worn nature may imply transportation. Hamden (1969) has also noticed predominance of dead tests of this form. In general terms, this factor does reflect the live distribution. However, the assemblage is more diverse in terms of the live data. Ecological study will have to consider this.

### d/ Factor assemblage 4: Saccammina atlantica

This rather subdominant assemblage is restricted to peripheral regions of assemblage 3. Despite the difficulties in recognizing staining in heavily agglutinated forms, the live data compares well with the factor scores. Confusion between Saccammina atlantica and broken chambers of R. scorpiurus may have produced error. Several species occur live but do not figure in the factor scores. A. glomerata is consistently present and G. auriculata is present in some stations. This is to be expected as factor 4 occurs between factor 3 and 1.

Despite these problems, this factor is thought a reliable indicator of the oceanographic conditions prevailing.

### e/ Factor assemblage 5: Trifarina angulosa

This assemblage occurrs consistently along the shelf edge margin, and is dominated by Trifarina angulosa. However it is not often seen in the live assemblage. Table 5 shows that the live assemblage is dominated by Bolivina spathulata. Other species, although not figuring prominently in the factor score matrix, do occur in the live data. Buccella frigida, Cibicides lobatulus, Cassidulina laevigata and B. subaenariensis all occur consistently in the living population. The assemblage then, when the living data is considered, is rather more diverse than the factor score matrix suggests and is in reality less dominated by *T. angulosa*.

Several explanations can account for large amounts of dead *T. angulosa*. The shelf/slope waters off Nova Scotia have recently been described by Fournier (*et al*, 1977) as being highly productive, nutrient-rich and of enhanced biological activity. On the shelf edge, this could be reflected by a rapid turnover of *T. angulosa*- perhaps seasonal - with a resulting large accumulation of dead tests. Alternatively the oceanographic conditions that lead to the dominance of *T. angulosa* may not be operating, implying relictness. The majority of the tests, however, do not appear etched or decayed; neither is there much evidence of transportation downslope or shorewards into the central basin areas (as will be described later in further detail).

Transportation would be expected if the *T. angulosa* component was relict on the shelf edge, which appears to be an axis for sediment dispersal (Stanley, 1972). It is thought here that the assemblage does reflect present conditions well, although consideration of the live data is essential to an ecological analysis of this assemblage. No shortage of live *T. angulosa* has been observed in several other works (Hamden, 1969), leading to the conclusion that, in the case of this study, seasonal effects might explain why *T. angulosa* is rarely found living.

### f/ Factor assemblage 6: *Eggerella advena*

The factor score results in Table 6 show that this assemblage, which is restricted to nearshore bay areas, compares very well with the observed live data, i.e. *E. advena* dominates with subdominant *S. biformis*. A wide variation in live percentages of both these species is seen. This is most likely due to local variation, sample difficulties and the previously discussed errors in recognizing stains in agglutinates. It is clear that this assemblage, based on the total data, is representative of the live occurrences and has no relict or transported components.

### g/ Factor assemblage 7: *Islandiella islandica*

This assemblage is similar in occurrence to assemblage 2 and is almost monospecific. The living data however (Table 7), reveals that it is less dominant. Other species are consistently present living but do not figure in the factor score matrix. These include *C. lobatulus*, *F. fusiformis* and *E. advena*. Low sedimentation coupled with a high production of *I. islandica* results in a masking of the total and live occurrences mentioned. The factor assemblage is partly a reflection of the actual live distribution but consideration of the other live species is necessary in any ecological study.

### h/ Factor assemblage 8: *Elphidium excavatum*

The factor score matrix indicates that this assemblage is dominated by *Elphidium excavatum* with several subdominants of *F. fusiformis* and *B. aculeata*. The live data reveals only these subdominants together with *C. laevigata*, *C. lobatulus*, *B. subaenariensis* and *R. guttifera*. The dominant species, *E. excavatum*, does not appear live anywhere within this assemblage or indeed, within the study area. Several explanations can account for this.

The etched and ragged nature of the Elphidium tests indicate that they have been lying on the sea bottom for some time and are possibly relict. However, a large part of this assemblage lies within Emerald Basin (Chapter III, fig. 3.8) where, at the present time, active sedimentation is in progress: clays or silts would have long since covered relict sediments.

The southern part of this assemblage lies on the outer bank area around the Scotian Gulf where little or no sedimentation is presently occurring. This area is also periodically swept by strong currents capable of putting sediment including E. excavatum into suspension and transporting it (Hill, 1981).

From the above, it appears that assemblage 8 is dominated by a relict species which has been transported from its source area to the south of the assemblage and deposited in and on the approaches to South Emerald Basin. Further evidence to this is provided through an observation of the size distribution of E. excavatum in the relevant samples. Samples to the south (i.e. in the "source area") have a higher average size (maximum diameter) and greater standard deviation than those to the north, approaching and within Emerald Basin. The decrease in mean and standard deviation is gradational. This essentially means that the source area has a mixed population of E. excavatum that includes juveniles and adults. Subsequent sorting of this relict population has occurred and smaller fractions (i.e. juveniles) were deposited further north.

B. aculeata does not appear living and is here thought to be a transported assemblage also. This is reflected in the relative predominance of adult forms, all etched; broken spines.

In summary, this assemblage does not reflect the observed live data very well. If one takes into account that the dominant species of this assemblage is relict transported, then ecological conclusions may be reached.

### 4.4 Comparison of Slope Assemblages with Living Data

Unlike the shelf assemblages which exhibit a close, albeit subjective similarity to the living, the slope assemblages are not directly comparable to the live data. Significant liva data are completely lacking. The following considers each slope assemblage and, through a process of elimination of the previously discussed modifying influences on an assemblage, will determine its reliability with respect to the present environment. This is not an eminently desirable method, but considering the paucity of live data in these areas, it is the only one possible. Relictness, transportation, sample methods, staining methods, etc, are but some of the possible explanations for the depauparate live data.

#### a/ Slope Factor assemblage 1 Uvigerina peregrina

This deep slope assemblage becomes dominant at 1200 m., peaks at 1800 m. and generally declines in importance at depths greater than 2400 m. It is almost monospecific. The presence of well preserved tests ( i.e. not etched) with both juveniles and adults, seems to preclude relictness and transportation. The nature of the test, thick with coarse costae often infilled with mud, may have prevented observation of staining. The surface sediment may have been lost in sampling; most of the samples from these stations are core tops and the problems encountered with good core top recovery have been discussed ( Chapter

I).

This species is rarely reported living.( Streeter and Lavery, 1982; K. Miller, 1982), perhaps for the reasons outlined. Available evidence suggests that this assemblage is in place and in equilibrium with its present environment.

b/ Slope Factor assemblage 2 Bulimina exilis

This upper slope diverse assemblage also has no live data. Like assemblage 1, there are good proportions of adults and juveniles, with well preserved tests ( i.e. no etching). Lack of apparent sources on the shelf edge and shelf or apparent displacement into deeper slope waters seem to rule out transportation. Some tests appeared slightly stained but not enough for positive identification. All this implies an in situ, assemblage. Lack of live data may be explained by the highly productive surface waters and the warm, nutrient-rich slope waters. This would lead to increased and rapid turnover of foraminiferal populations wihich would tend to dilute the living representatives.

c/ Slope Factor assemblage 3 Trifarina occidentalis

This small, relatively minor assemblage, often co-occurs with assemblage 2. It is thought reliable for the same reasons.

d/ Slope Factor assemblage 4 Elphidium excavatum

This monospecific assemblage reveals a large depth range, 400-1200 m., although it is only dominant from 800-1200 m. It is marked by its restriction to the A transect ( fig. 1.5).

Unlike other slope assemblages, several features of this factor ( or of the E. excavatum monospecific assemblage) cast doubt on its validity, both with respect to being "in situ" and the extent of its present interaction with the environment.

The etched and worn nature of the tests would imply both transportation and relictness. Most of its previously documented occurrences restrict this species to shelf depths. Several workers, however, have found Elphidium species living in deeper slope waters ( Matoba, 1976; Schnitker, 1980; Schafer, 1981). Based on this, Streeter and Lavery (1981) and Miller and Lohman (1981) have recently assigned their slope assemblages as being in situ. Data presented here, however, implies transported relict assemblages of E. excavatum from shelf depths. A source area is the previously defined relict assemblage on the Scotian Gulf ( this chapter). The mechanism and process of sediment transportation over the shelf edge in this area has recently been determined by Hill (1981). The non-importance of this assemblage in any other of the slope transects, all of which do not have a corresponding prospective source area similar to the Scotian Gulf, would support this notion of transportation. The size distribution of measured diemeters of E. excavatum is similarly supportive, i.e. low s.d. would imply some size sorting of juveniles and adults.

It would appear that the use of E. excavatum fauna to characterize presently operating hydrographic regimes would lead to erroneous results.

## 4.5 Summary of assemblage distribution and composition

Eight shelf and four slope assemblages have been recognised with the aid of Q-Mode factor analysis. The shelf assemblages appear restricted to several physiographic and hydrographic regimes. Seven of the shelf assemblages compare well with the observed live data and are thus assumed to be representative of the presently occuring environmental conditions. An eighth assemblage is thought to be relict and transported. The degree to which these assemblages are a result of the environment will be discussed in later chapters.

Slope assemblages appear to show better depth limitations and with one exception are consistantly present along contours. No slope assemblage shows significant live foraminiferal data, three of them however, for reasons discussed earlier do appear representative of existing conditions. The fourth is thought to be the down slope equivalent of shelf assemblage 8.

A consideration of the more general faunal trends, such as diversity, is an important precursor to any investigation of the relationships between these statistically independant assemblages and the limiting oceanographic influences. This will be discussed in the next chapter.

# CHAPTER : 5 FAUNAL DIVERSITY, TRENDS AND CHARACTERS.

## 5.1 Introduction

The aims presented in the introduction are directed towards establishing a quantitative distribution model of foraminiferal occurrences on the continental margin off Nova Scotia. Hitherto, the approach to this study has involved analysis at the recurrent species or assemblage level, enabling distinct groupings of foraminiferal associations to be established. Much useful information can also be obtained from the general faunal aspects which illustrate the regional trends and characteristics of the population data. Furthermore, it is necessary that any ecological conclusions made from the distribution of foraminiferal assemblages be compatible with these general population data.

The methods used to determine faunal trends in this study involve an analysis of diversity, standing crop determinations and Live Total ratios. Prior to showing the results of these investigations, short discussion is warranted concerning the usefulness and nature of these various measures.

## 5.2 Diversity.

The diversity of an assemblage has two distinct components: the number of different species, and the relative frequency of each species (Deevey, 1969). Several indices of diversity have been used in foraminiferal studies, the calculatation, use and relative advantages of which are well documented in Buzas and Gibson (1969), Murray (1973) and

Buzas (1979). Indices frequently employed include: the species number (S), Yule-Simpson Index, Fisher Index, Information Theory Index and an index using cumulative curves.

The Yule-Simpson Index has been shown by Murray (1973) to have an abundance bias whereas measured angles on cumulative curve slopes are time consuming according to an earlier study (Murray, 1968).

The Fisher Index ($\alpha$) is favoured by Murray (1973) although this index is known to increase with sample size.

$$\alpha = \frac{n_1}{X}$$

where $X$ = constant value less than 1;
$n$= a value calculated from $N=(1-X)$ where
$N$= size of population

The calculation of $\alpha$ is simplified through reading off a graph (Murray, 1973)

The advantage of the Fisher index is that it takes the rare species into account (Williams, 1964). When the underlying distribution is log series in form, which it often is, Buzas (1982), it is a consistent index.

Several workers have used the information theory to obtain measures of diversity. One such index, known as the Shannon-Weiner information function, H(s), (Patten, 1962) measures the average diversity.

$$H(s)=-\sum p_i \ln p_i$$

$p_i$= proportion of the $i^{th}$ species;

$s$= no. of species in the sample.

Maximum values are reached when all the species are equally distributed. It has been shown to be informative for palaeoecological studies by Williams (1964), Murray (1968), Beerbower and Jordan (1969), Buzas and Gibson (1969), Douglas (1979) and Sen Gupta (1981). It also accounts for both components of diversity, as noted by Deevey (1969).

A derivative of the H(s) value is the species equitability E as defined in Buzas and Gibson (1969); this gives a better view of the relationship of the dominant and rare species to total populations:

$$E = \frac{e^{H(s)}}{S}$$

where e = base of natural logarithms
S = number of species in sample

As the value of E approaches 1.0, the distribution of the species within a sample approaches equality.

Many workers have simply used S, the number of species per sample, as a measure of diversity. As this does not take account of relative proportions, great care must be exercised with its use and interpretations.

There are thus several well used measures of diversity, all measuring different relationships within a sample. Buzas (1979) notes that no single index is sufficient to describe and measure differences (between samples) in diversity and recommends that:

> "...S, H(s) and E or their counterparts should be measured to ascertain the nature of these differences".

This study investigates spatial variations of S, H(s), $\alpha$, and E. These values for each station are recorded in Appendix V. Figures 5.1-5.4 show the main variations in these values across the shelf and slope.

## 5.3. Diversity patterns.

The figures (5.1-5.4) intend to show the major groupings (as discerned by eye) of the diversity values recorded at each station. The data has been simplified into three classes: low, medium and high diversity. Low values include those barren stations that are confined mainly to Western and Sable Island banks. Within each region of the map characterized by a particular diversity value, very few anomalous values occur

### 5.3.1 Species number $\underline{S}$ (fig. 5.1)

Lowest values of species numbers are seen on the outer Banks, Central Banks and nearshore coastal areas. The whole of the northeast portion of the shelf (including Misaine Bank-Basin complex and Canso Bank-Basin) is characterized by low values for S. Medium to high values are found within LaHave and Emerald Basins, Roseway Basin and slope areas greater than 1800 m. depth. Highest values are seen along the shelf edge and upper slope and lower slope depths off Banquereau Bank (fig. 5.1). High values are also seen pushing into the shelf region around the Scotian Gulf.

### 5.3.2 Shannon-Weiner index $\underline{H(s)}$ (fig. 5.2)

The lowest values for this index also occur on the outer, central banks and inner coastal areas (reflecting S distribution). Several discrete areas of medium values are seen within this low H(s) region. Medium values occur in LaHave, Emerald and Roseway Basins, the Scotian Gulf and along the shelf edge. Highest values are observed on the upper slope regions. Again, lower values are seen in lower slope areas.

### 5.3.3 Fisher index $\underline{\alpha}$ (fig. 5.3)

Low, medium and high values of this index again seem to reflect the

Figures 5.1--5.4. Diversity trends on the continental margin off Nova Scotia.

| | | |
|---|---|---|
| Figure 5.1 | S | Species number |
| 5.2 | H(s) | Shannon-Weiner index |
| 5.3 | E | Equitability |
| 5.4 | $\alpha$ | Fisher index |

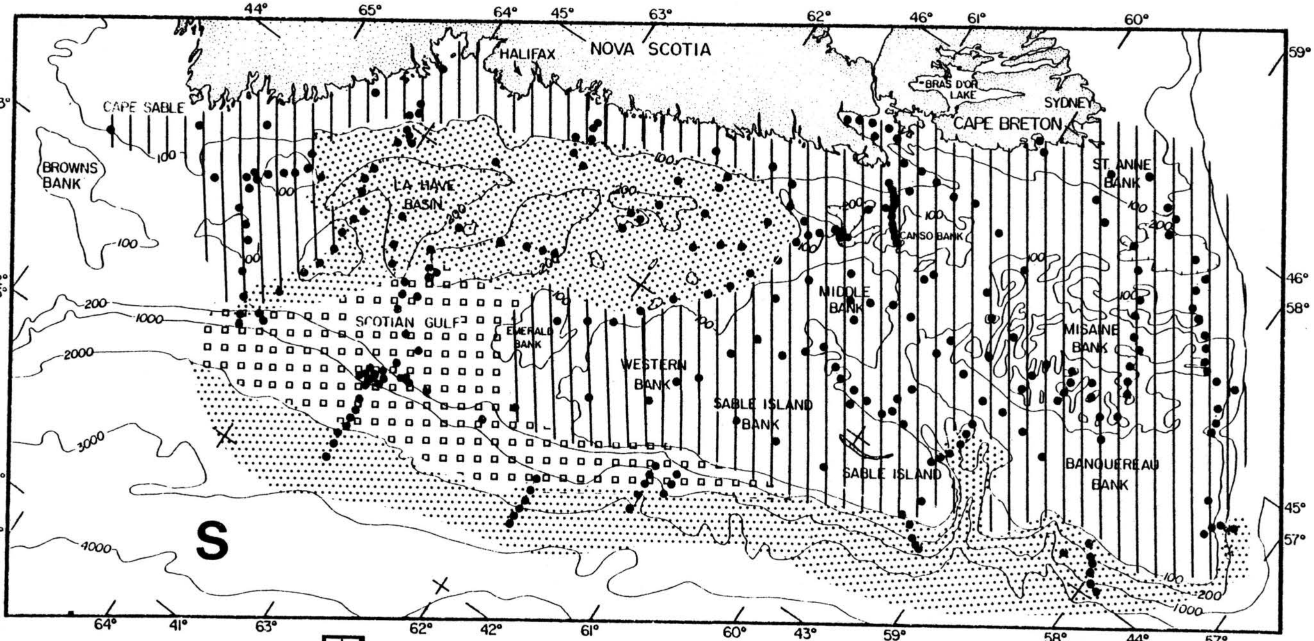
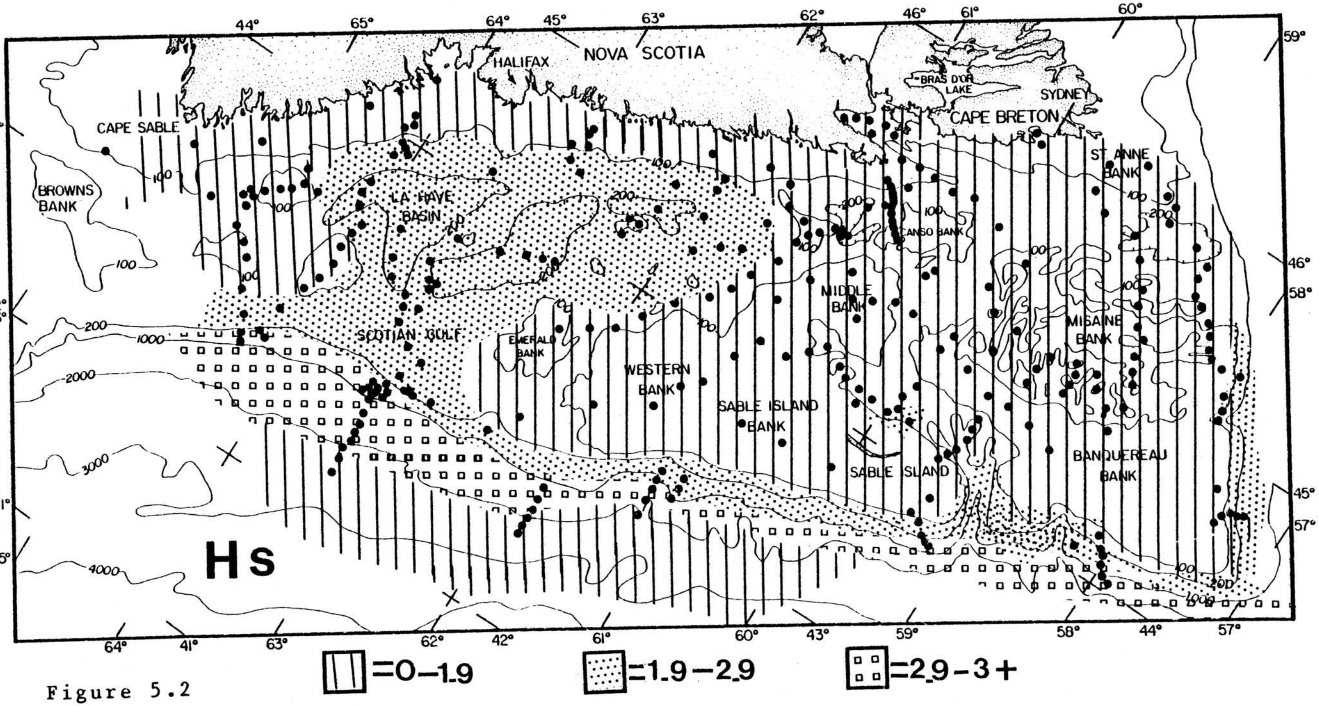

NOVA SCOTIA
HALIFAX
CAPE SABLE
BROWNS BANK
LA HAVE BASIN
BRAS D'OR LAKE
SYDNEY
CAPE BRETON
ST. ANNE BANK
CANSO BANK
MIDDLE BANK
MISAINE BANK
SCOTIAN GULF
EMERALD BANK
WESTERN BANK
SABLE ISLAND BANK
SABLE ISLAND
BANQUEREAU BANK
S
100
200
1000
2000
3000
4000
44°
65°
64°
45°
63°
62°
46°
61°
60°
59°
43°
42°
66°
58°
41°
57°
│=0-15
▨=15-25
□=25-30+

Figure 5.1


Hs
NOVA SCOTIA
HALIFAX
CAPE BRETON
SYDNEY
BRAS D'OR LAKE
CAPE SABLE
BROWNS BANK
LA HAVE BASIN
SCOTIAN GULF
EMERALD BANK
WESTERN BANK
SABLE ISLAND BANK
SABLE ISLAND
MIDDLE BANK
CANSO BANK
ST. ANNE BANK
MISAINE BANK
BANQUEREAU BANK
100
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4000
44°
65°
64°
45°
63°
62°
46°
61°
60°
59°
43°
42°
66°
41°
58°
57°
=0–1.9
=1.9–2.9
=2.9–3+

Figure 5.2

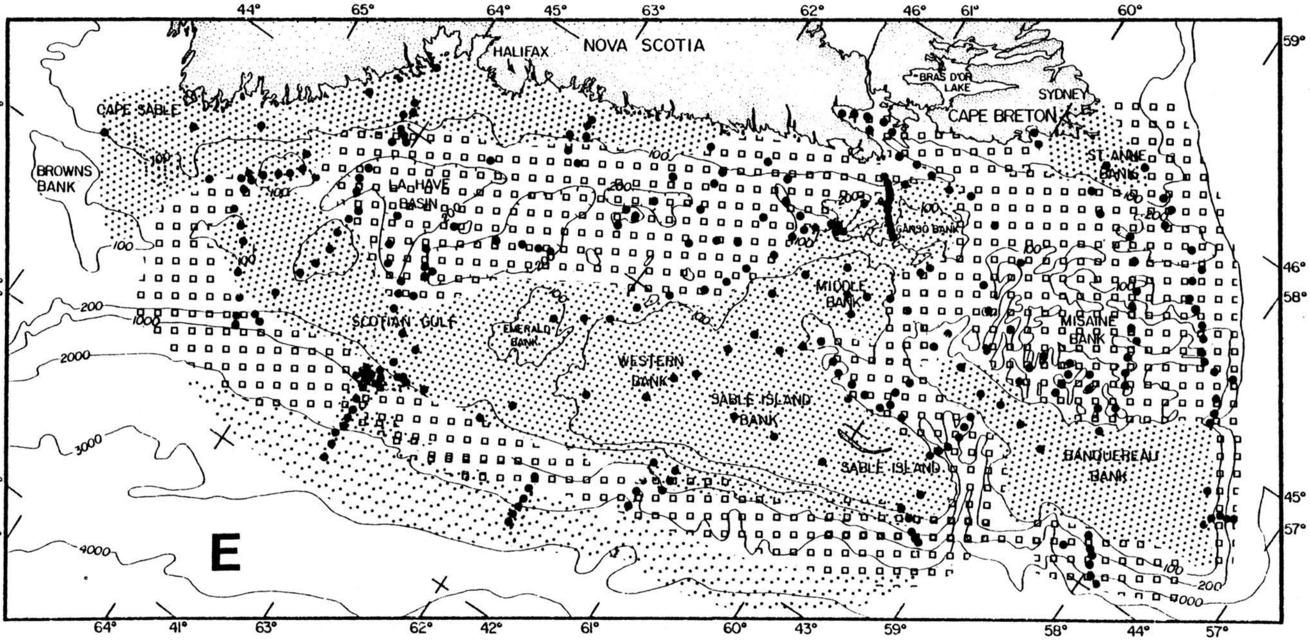


Figure 5.3

▨ = 0–.4 ▣ = .4–.7

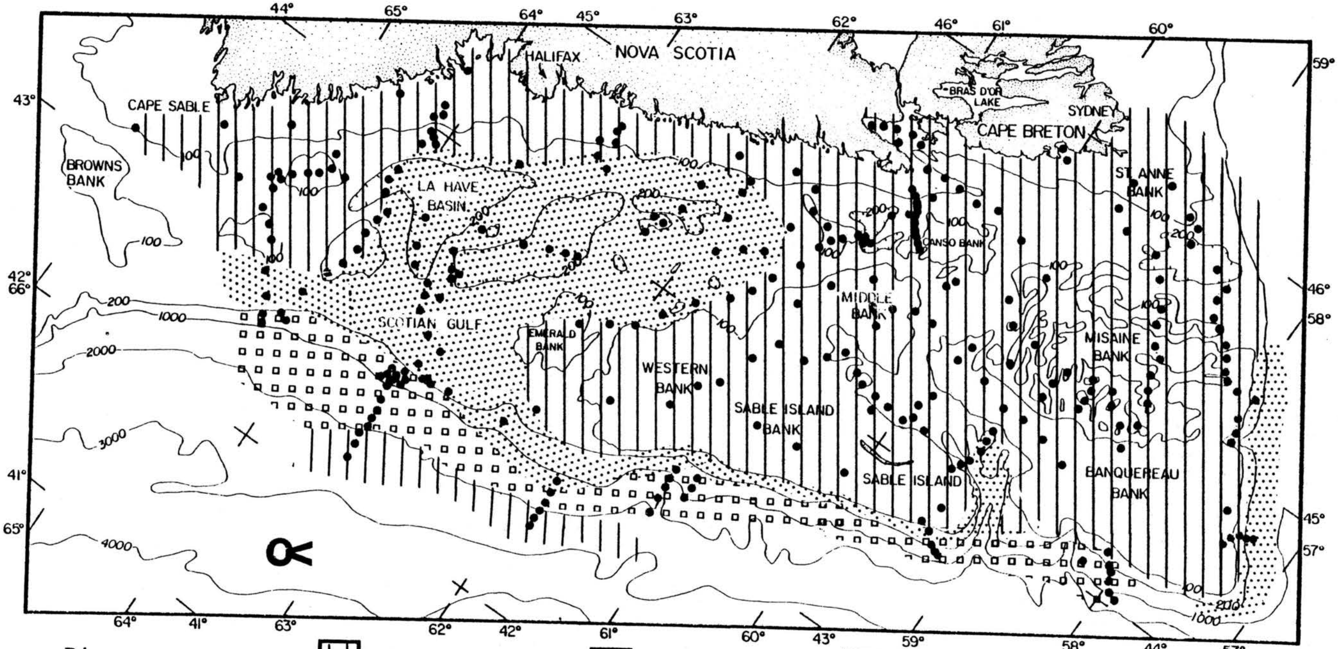


Figure 5.4 ▥ =0–3.5 ░ =3.5–5 ⊡ 5+

regional patterns of H(s) and S, with the highest values in the upper slope regions.

### 5.3.4 Equitability E (fig. 5.4)

Values of equitability show more variation between stations than the other indices; it was consequently harder to define important trends. (Values from 0-0.4 were taken as low trends and 0.4-0.7, as high). Lowest values (i.e. lowest equitability, and therefore more likely to be mono- or duo specific stations) occur on the outer banks, most of the inner shore areas and lower slope regions. Higher values are found on the shelf edge-upper slope, LaHave and Emerald Basins and Misaine Bank-Basin regions.

## 5.4 Summary of Diversity Patterns.

Figures 5.1-5.3 enable several generalizations to be made concerning species diversity in this area.

Whichever index is referred to, the lowest values are consistently found in the nearshore, outer and central Banks and the northeast Bank and Basin complex. These areas are for the most part shallow (less than 80 m.) with a boulder, gravel or sandy substrate (exceptions to this lie in the northeast section around Misaine; some of the basins there exceed 300 m. and have silty clay sediment substrates). Values increase in the central basin area as does depth (greater than 180 m.) with silty clay sediments becoming predominant. Maximum values are seen along the shelf edge and upper slope regions with fine sand-silty substrates. The Scotian Gulf area also maintains a medium to highly diverse fauna.

Values for E are not as well defined. Table 5.1 shows four broad geographic areas that may be defined in terms of H(s), E, S and $\alpha$ .

## 5.5 Standing crop and live determinations.

Standing crop is the total number of benthic foraminifera found living at any instant in a specified sample volume. Various sample sizes for measuring this value have been used as described by Gregory (1971). This study measured the live totals in a 20 ml sample. Live Total ratios are the relationship between numbers of living and total populations in each sample. Both these values have, in the past, been found to exhibit great variability within areas of interest (Bartlett, 1964; Murray, 1968; Nichols and Norton, 1969; Gregory, 1971; Douglas, 1978). The present study area is no exception (fig. 5.6)

Several factors are thought responsible for this variability (Douglas, 1978). The effects of sampling techniques on live recovery have been described in an earlier section (chapter 1). Low rates of sedimentation would tend to lower both values, as would unstable and reworked sediments (Gregory, 1971; Douglas, 1978). Variations in rates of reproduction such as seasonal effects result in different values obtained at different times of the year. Relict sediments would also have an effect on the values obtained.

These factors essentially reduce the importance of Live Total ratios and standing crop in defining general faunal patterns. Since it is important to know the extent of these error producing factors, consideration will be given to their spatial variability.

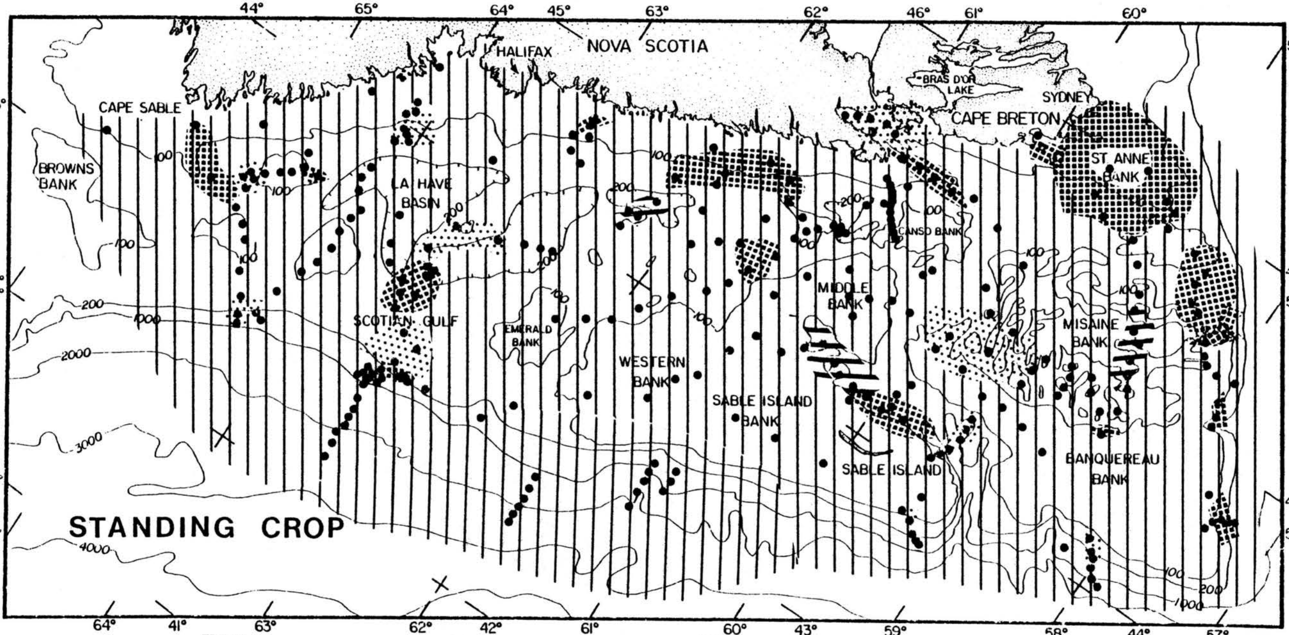
### 5.5.1 Standing crop.

The largest living populations are present (Fig. 5.5) along the Eastern boundaries of the study areas, St-Ann's Bank, Misaine Bank and Basin as well as inner shelf areas East of Halifax. Other high values are seen near Emerald Basin and Cape Sable. As can be observed on the map, large areas are devoid of any live populations. These include most of the outer Bank regions ( very low or no sedimentation) and the Central shelf bank areas (as well as some basins). Variability in the values is apparently not correlated with depth. It remains to discuss the variability shown within this area and the low values of standing crop when compared with those of other areas.

Phleger (1956,1960,1964) has previously noted larg living populations near river mouths. It is generally thought that these are a response to high organic productivity associated with mixing of nutrient-rich fresh water. This might explain the high values for standard crop in and around the approaches of Chedabucto Bay. The high values off St-Ann's Bank may equally be associated to an upwelling along Cape Breton Island's southern shore (Cok, 1970) or the adjacent St-Lawrence outflow. Upwelling of nutrient-rich waters has been cited as a possible factor in producing high standing crop values (Phleger, 1964; Douglas, 1978). Certainly, relatively high values for standing crop are seen in some places along the shelf edge, where upwelling is in operation. The cause for increased biological activity in the shelf/slope region is not well understood. Fournier et al (1977) have shown that it may be the result of nutrient concentrations caused by increased vertical turbulence. If so, this would explain these "highs".

The low values associated with much of the outer bank areas is a

Figure 5.5 Standing crop distribution on the continental margin off Nova Scotia.


STANDING CROP
NOVA SCOTIA
HALIFAX
CAPE SABLE
BROWNS BANK
LA HAVE BASIN
SCOTIAN GULF
EMERALD BANK
WESTERN BANK
SABLE ISLAND BANK
SABLE ISLAND
MIDDLE BANK
CANSO BANK
BRAS D'OR LAKE
CAPE BRETON
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61°
60°
59°
43°
42°
66°
41°
58°
57°

Figure 5.5

▯ = 0
▒ = 0 – 50
☰ = 50 – 100
▦ = 100 +

Figure 5.6 Live/Total ratios off Nova Scotia.

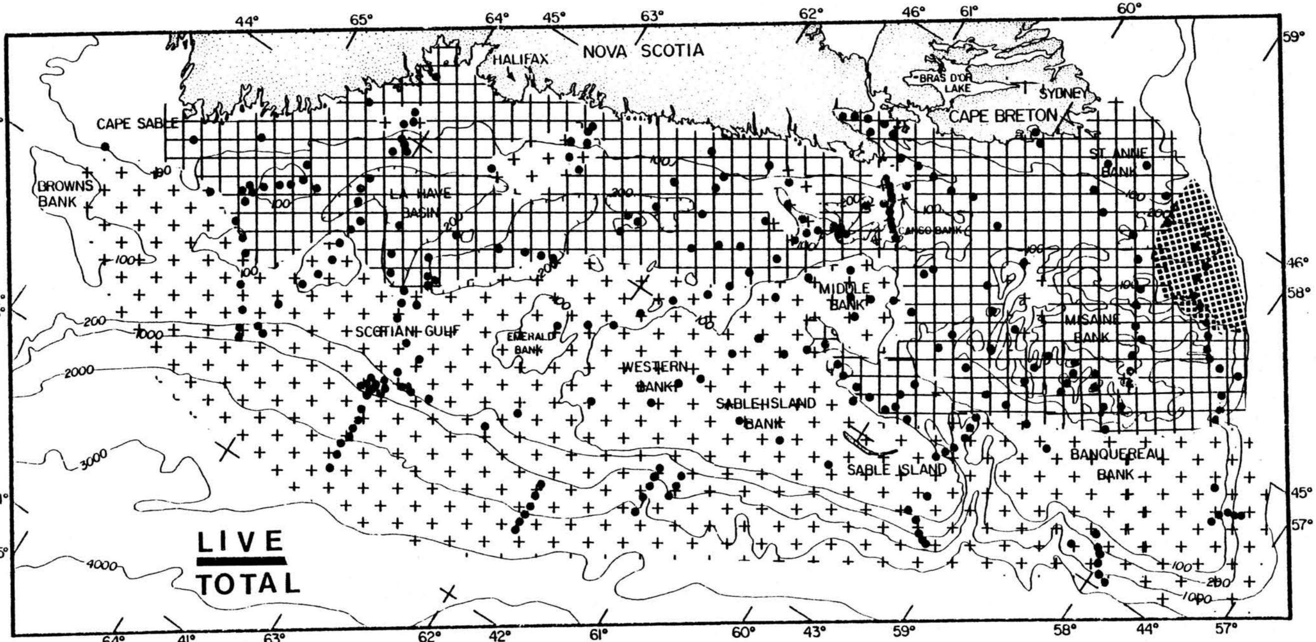


Figure 5.6 + =0 – 0.1 ⊞ =0.1 – 0.3 ▦ =0.3 – 0.5

result of the overall lack of foraminiferal populations on these banks due mainly to their reworked nature. Some of the coarser inner banks are dominated by Cibicides lobatulus and show higher standing crop. Values are very low or absent on the slope and is a feature commanly recorded for slope assemblages (Miller and Lohmann, 1982). This may be explained by dilution through transportation, relictness or increased turnover.

Compared to other areas on both the eastern and western seaboard of continental North America values observed for standing crop in this area are low. Ellison (1979) recorded higher densities of foraminifera on the Mid-Atlantic Bight with large variability from the swales (depressions)— high values, to the ridges-- low values. He also recorded a general increase from shallow to deeper waters. Akpati (1975) described high values from Long Island Sound although again with a high variability. This variability in standing crop is a consistent feature within areas and has been documented in Ellison, 1977; Akpati, 1972; Murray, 1969; Douglas, 1979; and Buzas, 1965, 1969. Gregory's data (1971) from Halifax H arbour Nova Scotia also exhibits great variability and overall low values when compared with other areas. Low values of staanding crop on the slope off Nova Scotia are most likely a result of low sedimentation rates which increase the relative abundance of dead tests. On the shelf itself low values could be the result of several factors including (as seen in chapter 4) relictness, transportation etc. and perhaps the type of reproduction; whether sexual or asexual (the former capable of producing millions of offspring which subsequently would be added to the dead population).

Not much importance should be attached to the distribution of standing crop seen in this study as these values are known to vary with season. For reasons stated in chapter 1 and 2 seasonality of the foraminiferal occurrences could not be directly examined in this study.

### 5.5.2 Live/Total Ratios.

Lowest values of this ratio occur consistently on the outer banks and some central shelf banks (fig. 5.6). This is likely to be a reflection of the low level or absence of sedimentation in these areas. Medium to high values occur landward of the outer banks, within the central basin complex, inner shelf areas and Misaine Bank/Basin complex. Live/Total ratios have been used in the past to estimate rates of sedimentation. In this study, such estimates would be of doubtful validity. Not only has there been transportation and winnowing of some of the tests but there is also a lack of data on species' life cycles. This, together with the observed erratic variations in values on the shelf, would preclude its use in estimating rates of sedimentation. Bartlett (1964) and Gregory (1971) came to similar conclusions. Gregory (1971) also documented, as did Bolstovskoy and Lena (1969), some infaunal habits of benthic foraminifera which seem to further affect these estimates.

## 5.6. Discussion of faunal trends.

Previous observations (Deevey, 1969; Hessler and Sanders, 1967; Schnitker,1971.) show that under extreme adverse environmental conditions, individuals of only a few species in a faunal assemblage will comprise a large number of the population and that, under normal conditions, individuals of the dominant species are less abundant, allowing a greater number of ecological niches and resulting in an increase in diversity. Within these assumptions lies the usefulness of faunal diversity measure.

It is the purpose of this section to account in some part for the geographical variations in diversity values. Consideration will be made further, in a later chapter following the discussion, of the ecological constraints controlling assemblage distributions.

The full nature and extent of these variations should be considered. Buzas (1979) has shown that there are a limited number of possibilities when comparing such indices as S, H(s), E and $\alpha$. Areas with apparently similar diversities may not be directly comparable in terms of the general ecological constraints influencing these values. For example, low values of H(s) in the deep slope areas and on the northeast Misaine Bank/Basin areas. These values are low for differing reasons, indicated with reference to their S and E values. It appears that the slope region has a greater number of species (S) and lower equitability (E) than the Misaine area i.e. the greater number of species is less evenly distributed. This implies that slope areas are more dominated by one species with large numbers of less frequent species. This further implies a less stable environment than the relatively higher equitable Misaine area. Observation of the lower slope assemblages (Chapter 4) has revealed a dominance of Elphidium excavatum and a belief that this form has diluted an original Uvigerina peregrina assemblage (via transportation of relict fauna from the shelf). The low E values seem to support this idea. On the other hand, the high E values in the Misaine area tend to reflect a more stable assemblage, unaffected by transportation processes, etc.

A similar effect is seen in the Scotian Gulf area. Figures 5.1-5.4

show very high S values, with medium to high values of $\alpha$ and H(s). Values of E, however, are low and indeed, these stations are dominated by E. excavatum with large amounts of less frequent species. It is thought here that the E. excavatum component of the assemblage is relict, imprinting and masking an otherwise diverse fauna.

Similar diversity values are seen for the northeast Misaine Bank area and the inner shelf nearshore regions west of Halifax. Both regions exhibit low H(s), $\alpha$ and S. Values for E, however, are much lower in the inner shelf area. It has previously been shown that the shelf assemblage 2 Cibicides lobatulus (Chapter 3) is predominant in this area. The monospecificity of this assemblage is a direct cause of the low E value and possibly a reflection of the relatively extreme environmental conditions prevalent here (e.g. shallow, turbulent, bedrock-coarse sand-gravel environment). The higher values of E in the Misaine area imply a stability associated with more "open", marine conditions. Low values also occur within this Misaine, northeast area but are restricted to St-Ann's Bank which is the only pocket in this region that maintains a C. lobatulus fauna. Finally, the central basin complex, upper slope and shelf edge, which consistently exhibit medium to high values of S, H(s), $\alpha$ and E imply stable diverse faunas. According to time stability theories (Hessler and Sanders, 1967), this could mean that these areas have been submerged longer. The same case can apply to the upper slope but is unlikely for the central western Basins. It is probably more correct to invoke the characters of the slope waters in the latter area, with its relatively high temperatures and salinities, nutrient-carrying capabilities and ability to frequently incurse into the central Basin areas. This will produce a less stressed environment with a resultant increase in diversity relative to the remainder of the shelf. This explains why the diversities in the eastern central shelf Basin complex (around Misaine) are lower when compared to central basin areas: the colder, more restricted circulation in the former (St-Lawrence bottom waters) causing more adverse conditions.

Previous studies have well documented diversity trends off the North American eastern continental margin. A general increase in diversity values with distance from shore has been observed by Schnitker (1971), Ellison (1979) and Arnold and Sen Gupta (1981) in transects off Delaware, North Carolina and Georgia's continental margins, respectively. These studies also show peaks of diversity at the shelf edge.

Gibson (1966) has related population diversity to environmental variability. This is possible for large scale gradients. On the other hand, Gregory (1971) was unable to correlate local environmental changes within Halifax inlet with diversity indices. Murray (1968), working through the literature, observed low $\alpha$ values (averaging 1-4) in Tracadie, St-Margarets, Miramichi and Buzzards' Bays as well as in Long Island Sound. All inner shelf areas are similar in diversity to this study.

In these respects, the present study reflects previous observations. However, as has been shown in the maps and discussion, the simple idea of an increase in diversity with distance from shore and increasing depth is not strictly tenable for this investigation.

By way of a summary, several aspects of the varying physiography, bathymetry, sedimentology and oceanography appear to explain the variation in diversity values and the occurrence of four geographic regions on the shelf, each with distinctive values.

It has been seen that where cold St-Lawrence bottom waters lie on the shelf and the inner shelf area west of Halifax (areas 4 and 2 on Table 5.1), the populations have a low diversity (cold, poorly circulating, harsh environment, lower niche availability). However, local effects of substrate and wave energy (i.e. bedrock, wave-swept area of the inner shelf west of Halifax) lead to an even lower diversity (as seen, for example, in values of E).

Those areas that are influenced by warmer slope waters; (the upper slope, shelf break and Central Basin complex) by incursions through the Scotian Gulf are more diverse due to increased availability and optimum conditions of temperature, salinity, nutrients, etc. Low values of diversity observed on the lower slope are believed to be a result of faunal mixing through transportation of Elphidium excavatum downslope, creating a virtually monospecific population.

The basic control then, of diversity values on the continental margin off Nova Scotia, appears to be hydrographic. Local conditions, however, such as substrate and wave energy, may act to negate this influence, locally depressing diversity values.

In a general way, these observations fit in with the idea of Slobodkin and Sanders (1969) whose "unpredictable" environments (Sen Gupta and Kilbourne, 1974) display a greater variability of physical energy concurrent with depressed values of diversity (as observed in the inner shelf and outer Bank areas of this study).

A later section more thourghly discusses the relationship between diversity and the environmental parameters.

## 5.7. Implications of diversity for Pleistocene to recent studies.

It has been seen, that values of diversity (including E) are associated in this study area with certain properties of the environmental regimes, in particular, high diversity correlate with warm nutrient-rich waters. The implications of this for palaeoceanographic study of the Pleistocene to Recent distribution of these watermasses are clear. At the very least, they will provide qualitative support to more quantitative studies based on assemblage distributions. At the most, they could provide independent quantitative evidence concerning palaeoceanographic distributions of watermasses off Eastern Canada. These aspects will be further investigated after the ecological section.

# CHAPTER 6: ASSEMBLAGE / ENVIRONMENT RELATIONSHIPS

## 6.1. Introduction

The philosophy and evolution of thought concerning foraminiferal ecological studies, from Natlands' (1933) impetus to present day quantitative methods, is well reviewed in Douglas (1979). This work shows the development from purely depth related assemblage considerations to the complex analyses of many interacting physical and biological variables. All these historic and more recent works aim to apply the present to the past. They attempt to observe present day distributions and their causative factors and apply them to geological occurrences. Similarly, the stated aims of this present work are based on this concept. This decidedly geological approach has often led biologists to argue that it neglects rigorous scientific treatment and observation.

The art of geological science, in particular for those of us who are interested in palaeoenvironmental interpretation of past climatic and geologic events, in both the Recent and the more distant geological past, requires us to make some assumptions which are untenable to most biologists and all theoretical ecologists. For instance, purely biological or ecological study of foraminiferal habitat requires intense seasonal and controlled study. Such an approach, in a study whose aim is to make and apply estimates of past conditions on the basis of time averaged populations (Walker and Bambach, 1971), would be time consuming and prohibitive for regional studies of an area as large as the shelf off Nova Scotia.

Basic biological and ecological theory states that each species has its own tolerance range for a particular environmental factor under consideration. Biologists then, would rightly argue that many computer-identified biofacies are not true natural entities (Pielou, 1979) and that to assume that they are (i.e. in terms of the environment) is erroneous. The fact that many palaeoenvironmentalists seek a "safety in numbers approach" (i.e. assemblages) is due to the fossil material to be dealt with and its inherent problems of selective preservation, transportation, vertical mixing etc.

The previously stated aims of this study are to identify recurrent foraminiferal assemblages and to relate them quantitatively to the present day watermasses off Nova Scotia. No assumptions are made concerning the relationships of individual species to strict environmental ranges. The only assumption is that the species together within an assemblage find their optimum conditions there, and together, reflect these conditions.

Several tenets of ecological theory may help to put the present study in better perspective.

The hitherto defined factor assemblages are assumed to be communities in that they comprise a system of species "living and linked together by their effects on one another and their responses to the environment they share" (Whitaker, 1970). Exceptions to this are seen in some of the assemblages, the main components of which are relict, i.e. not in equilibrium with their environment or with the other species in the assemblage.

Community theory shows two aspects of community composition:

1. Taxonomic composition, i.e. a list of all species found in the community;
2. The rank and relative abundance of these species.

The nature of these aspects are controlled by environmental factors and chance (the latter being bias and error introduced through sampling and spatial inhomogeneities within communities). More specifically, in division 1, the taxonomic composition is controlled by one or more of the following: space, light, salinity, trace elements, temperature, pressure, substrate, dissolved gases, nutrients, biological interactions (predation, parasitism, symbiosis, commensalism) and factor combinations of turbidity, abrasion, etc (Walker and Bambach, 1974). Biological activity is capable of depleting some of these (space, light, $O_2$, nutrients); these are termed "limiting resources". It is the competition for these limiting resources (plus chance) that controls the nature of division 2, i.e. the relative and rank abundance of the species. Walker and Bambach (1971) show that elements of chance are reduced due to the time averaged nature of fossil communities.

Another, often neglected, aspect of community study is community function, or its autecology. This is the relationship of an individual species to its physical and biological environment (Walker, 1974). Autecological studies involve the investigation of feeding, metabolic, reproductive and protective mechanisms within the organisms.

With this hierarchical approach mentioned above in mind, it remains to investigate the degree and extent to which the assemblages on the continental margin off Nova Scotia (as outlined in chapter 3, and 4 of this study) are related to their environment. Particular aspects of the environment to be investigated include: depth, temperature,salinity, gravel, sand and mud contents. Their intercorrelation will be examined quantitatively. In addition, several aspects of nutrient, organic carbon, $O_2$ and their potential for affecting distributions will be examined in a qualitative manner. The source of these oceanographic data, methods and procedures of correlation, together with their results, will be discussed in the following section.

## 6.2 Environmental and Oceanographic data.

The nature and spatial distribution of various environmental variables have been described in a general way in Chapter 1 (i.e. Bathymetry, Surficial Geology and Oceanography). These particular environmental regimes, presently occurring on the shelf and slope off Nova Scotia, are the main variables under investigation in this study, in terms of their influence on the benthic foraminiferal distributions.

Data pertaining to percentage values of gravel, sand and mud contained at each station were obtained from the unpublished files of Dr. L.H. King at the Bedford Institute of Oceanography. This data formed the basis of the surficial sediment maps of King, (1969). Temperature and salinity values were extracted from the Oceans IV files of the Canadian Marine Environment Data Service. These were made available, along with help and advice, by Dr. C. E. Keen also at the Bedford Institute of Oceanography, Dartmouth. These data, together with information provided in various publications (McLellen, 1957; Houghton *et al*, 1977; Fournier, 1978) provided a good coverage of the study area in terms of temperature, salinity and substrate characters. Values of temperature and salinity are annual averages and represent time averaged measurements of bottom waters up to 20m above the sea bed. Reasons for this were described earlier and include the averaged nature of the assemblages, time averaged fossil populations to be considered and the limited and patchy nature of the data available for seasonal analysis.

The remainder of this chapter endeavours to illustrate the degree and significance of assemblage environment associations. Section 6.3 describes the statistical methods involved and is followed (in 6.4) by a section that describes the more obvious assemblage environment associations, such as are seen in correlation matrices and through simple plots of assemblage importance (factor loadings) versus observed values of each environmental variable. The statistical significance of these relatioships are presented and discussed towards the end of the chapter (6.5, 6.6).

## 6.3 Statistical method.

The problem at hand then, is to investigate the nature of the relationships between the previously defined, statistically independent factor assemblages and a set of observed environmental variables.

In order to be directly comparable with similar studies underway off the east coast of Canada (Mudie *et al*, 1983), these relationships are best investigated through regression analysis. Input to the regression analysis consists of a set of dependent variables and a set of independant variables. The former are taken from the varimax factor matrix and comprise the factor loadings at each station for 8 shelf and 4 slope factors. The independent variables consist of a set of observations or extrapolations on 6 environmental variables at each station (depth, temperature, salinity, substrate nature). The regression analysis program used in this study (from SPSS) employs the method of least squares to obtain equations which relate the independent variables (environmental variables) to dependent variables (factor assemblages). Imbrie and Kipp (1971) obtained both linear and curvilinear solutions for their planktonic foraminifera data with the curvilinear equations containing the squares and cross-products of the factor assemblages. They found the curvilinear solution gave a more accurate fit between observed and predicted environmental variables. The ecological meaning of the curvilinear solutions however remain rather vague. In a recent paper, Mudie _et al_ (1983) compared the results of the two solutions in a study of benthic foraminifera and found an increase in the standard errors of the estimates when the curvilinear solution was used. For this reason, the more robust and conceptually simpler linear solution was used in this study. Lohmann (1979) also found the linear solution more useful for study of slope foraminifera.

The statistics and methodology of regression analysis are well treated in many texts such as Mendenhall (1971) and Lapin (1975). The regression procedures employed in this study uses standard stepwise multiple regression techniques (Imbrie and Kipp, 1971) involving the addition, at successive stages, of single "factor" terms to the equation for a selected environmental variable. The program selects the variable (factor assemblages) that contributes most to the efficiency of the prediction as the first step, then proceeds to add the variable accounting for the next closest fit to a regression line etc. Statistical evaluations are made of the success of each equation at each step in the analysis. In this way, one is able to determine which assemblage is the best criterion for each environmental variable, the second and third best, and so on, and subsequently to characterize each assemblage in terms of its environment.

The application and use of regression analysis in similar studies to the present is described in Imbrie and Kipp (1971), Molfino _et al_ (1982) and Mudie _et al_ (1983). In simple terms, the regression procedure fits a "best line" to the data input. The line is such that the sum of squares of the vertical deviations from all points to the line is a minimum. From the regression equations are derived estimates of the particular environmental variable under examination, the standard error of these estimates being equal to the square root of the mean squared deviations. The coefficients produced are derived through minimizing the sum of squares of errors of the estimates. An _F_ test indicates the significance level of each multiple regression equation; a _t_ test quantifies the significance of the individual regression coefficients. The multiple correlation coefficient indicates the correlation between the observed measures and their estimates. The proportion of variance of the observations explained by the equation is equal to the square of the multiple correlation coefficient. Unexplained portions are, according to Imbrie and Kipp (1971) a result of random error, this aspect will be discussed later.

Prior to a description and discussion of the regression analysis results, the more obvious features of assemblage - environment relationships will be examined in the next section.

## 6.4. Main Assemblage - Environment Associations.

Some idea as to the main relationships may be obtained from the correlation matrices. These correlation matrices only show the strength of associations. Large positive or negative values do not indicate whether high values of one caused the others to be large, etc, i.e. do not measure causality. They do, however, permit some general trends to be observed and as such are useful.

For shelf stations (Table 6.1) increasing depth is accompanied by an increase in mud % (i.e. as observed from bank to basins) and a decrease in sand %. Temperature values appear associated with salinity but neither of these vary much with depth. The correlation matrix (Table 6.2.) for the slope samples shows strong associations of temperature with depth and salinity but not much between salinity and depth.

From the shelf correlation matrix (Table 6.1.), Factor assemblage 1 shows some association with temperature and salinity but little else. Factor 3 appears positively related to depth, temperature, percent mud and salinity but not to gravel. Factor assemblage 4 is marked by its apparent lack of association with any other variable. Factor assemblage 5 shows relatively high correlation with temperature, salinity and percent sand whereas factor 6 is only associated with depth and sand. Factor 7 is associated in the correlation matrix with percent gravel, unlike factor 8, which exhibits some association with temperature,

## Table 6.1 Correlation matrix for shelf assemblages:environmental parameters.

| | DEPTH | TEMPERAV | SALINIAV | PERCGRAV | PERCSAND | PERCMUD | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DEPTH | 1.000 | | | | | | | | | | | | | |
| TEMPERAV | .264 | 1.000 | | | | | | | | | | | | |
| SALINIAV | .359 | .829 | 1.000 | | | | | | | | | | | |
| PERCGRAV | -.362 | -.095 | -.180 | 1.000 | | | | | | | | | | |
| PERCSAND | -.333 | -.089 | .037 | -.128 | 1.000 | | | | | | | | | |
| PERCMUD | .502 | .135 | .065 | -.421 | -.844 | 1.000 | | | | | | | | |
| F1 | .084 | -.579 | .448 | -.174 | -.080 | .172 | 1.000 | | | | | | | |
| F2 | -.386 | -.088 | -.071 | .463 | .263 | -.496 | -.475 | 1.000 | | | | | | |
| F3 | .350 | .359 | .281 | -.209 | -.387 | .464 | -.356 | -.268 | 1.000 | | | | | |
| F4 | .076 | .018 | -.127 | -.199 | -.156 | .247 | .151 | -.335 | .022 | 1.000 | | | | |
| F5 | .120 | .333 | .421 | .049 | .348 | -.342 | -.427 | .285 | -.157 | -.222 | 1.000 | | | |
| F6 | -.306 | -.007 | -.111 | -.045 | .240 | -.193 | -.067 | -.190 | -.168 | .037 | -.131 | 1.000 | | |
| F7 | -.256 | .027 | .070 | .352 | .158 | -.338 | -.279 | .368 | -.135 | -.182 | .111 | -.075 | 1.000 | |
| F8 | -.285 | -.636 | -.637 | .058 | .120 | -.142 | .424 | .333 | -.248 | .233 | -.237 | .167 | .115 | 1.000 |

Table 6.2 Correlation matrix for slope assemblages:environmental parameters.

| | DEPTH | TEMPERAV | SALINIAV | F1 | F2 | F3 | F4 |
|---|---|---|---|---|---|---|---|
| DEPTH | 1.000 | | | | | | |
| TEMPERAV | -.715 | 1.000 | | | | | |
| SALINIAV | -.300 | .747 | 1.000 | | | | |
| F1 | .696 | -.638 | -.133 | 1.000 | | | |
| F2 | -.649 | .483 | .109 | -.597 | 1.000 | | |
| F3 | -.222 | .074 | -.169 | -.368 | -.092 | 1.000 | |
| F4 | .280 | -.363 | -.412 | .044 | -.066 | .128 | 1.000 |

salinity and little else.

Similarly, slope factor assemblage 1 shows high correlation values with temperature and depth but not with salinity (Table 6.2.). Slope factor 2, however, is more associated with depth than temperature. Factor 3 appears weakly related to depth. Finally, slope factor 4 shows association with salinity and, more slightly, with temperature and depth.

The correlation matrices for the shelf and slope therefore suggest some assemblage - environment associations. Further detail on these associations is provided in Figs. 6.1-10. These diagrams plot factor loadings (assemblage importance) for each assemblage against observed values for some of their associated environmental variables (Raw data is given in appendix VI). The diagrams permit comparison of the differing response of an assemblage to various aspects of environment, and show the degree of sensitivity of a particular assemblage to certain conditions of that environment. As described in Molfino *et al* (1982) and seen in an earlier section of the present work (Chapter 3), these diagrams allow more detailed comparison of whole assemblages (i.e. including low and high factor loadings from each assemblage) and their individual response to environment than would a consideration of high factor loadings only (i.e. as are used to produce factor assemblage maps - Chapter 3). The lines shown on Figs. 6.1-6.10 are fitted by eye and are meant only to point out any obvious associations or non associations. It will be the purpose of a later section to statistically assess the strength of these associations. The following describes the main features illustrated by these Figures.

### 6.4.1 Shelf Assemblages.

Factor assemblage 1: Adercotryma glomerata.

Factor loadings of this assemblage appear to be related to temperature and salinity (Fig. 6.1; a,b). From these diagrams, it appears that factor 1 may be more responsive to temperature change than to salinity, the latter showing greater amounts of scatter. The highest factor loadings lie within a range of 1.5-2.3oC and 31.5-32.5o/oo salinity. Similar plots for factor 1 against depth and substrate characters (not shown) show large amounts of scatter with no discernable trends. Considering the distribution of this assemblage, this is not entirely unexpected. It is found both in deep basins and on shallow banks (and therefore on muds, gravels and sands) as well as inner shelf nearshore areas.

Factor assemblage 2: Cibicides lobatulus.

An inverse trend with depth can be distinguished for assemblage 2 (Fig. 6.2a). Highest factor loadings occur at 50 to 100 m depth, as would be expected in view of this assemblages distribution in nearshore areas or on shallow banks. The importance of this assemblage can be seen to decline steadily with depth. A less clear trend is seen with temperature (Fig, 6.2b) highest factor loadings seem related to a wide temperature range of 1.5-6oC, with lesser values (factor loadings) at higher temperatures (7-10oC). The increased scatter implies lesser dependence on temperature. Figures 6.2, c and d, may partly explain this. These diagrams show a direct relationship between the assemblage and substrate characters of percent sand and gravel, high percent values

Figures 6.1—6.10 To graphically illustrate the main assemblage environment associations, or non-associations. Plots of assemblage factor loadings (vertical) against values of; temperature, salinity,depth, and substrate character (horizontal).

Figure 6.1 Assemblage 1 *A. glomerata* with temperature,salinity.

Figure 6.2 Assemblage 2 *C. lobatulus* with temperature, depth gravel and sand.

Figure 6.3 Assemblage 3 *G. auriculata* with temperature salinity depth and mud.

Figure 6.4 Assemblage 5 *T. angulosa* with depth, temperature salinity.

Figure 6.5 Assemblage 6 *E. advena* with depth and sand.

Figure 6.6 Assemblage 7 *I. islandica* with salinity and gravel.

Figure 6.7 Assemblage 8 *E. excavatum* with temperature and salinity.

Figure 6.8 Slope assemblage 1 *U. peregrina* with depth temperature and salinity.

Figure 6.9 Slope assemblage 2 *B. exilis* with depth.

Figure 6.10 Slope assemblage 4 *E. excavatum* with temperature and salinity.

Lines fitted by eye

Figure 6.1

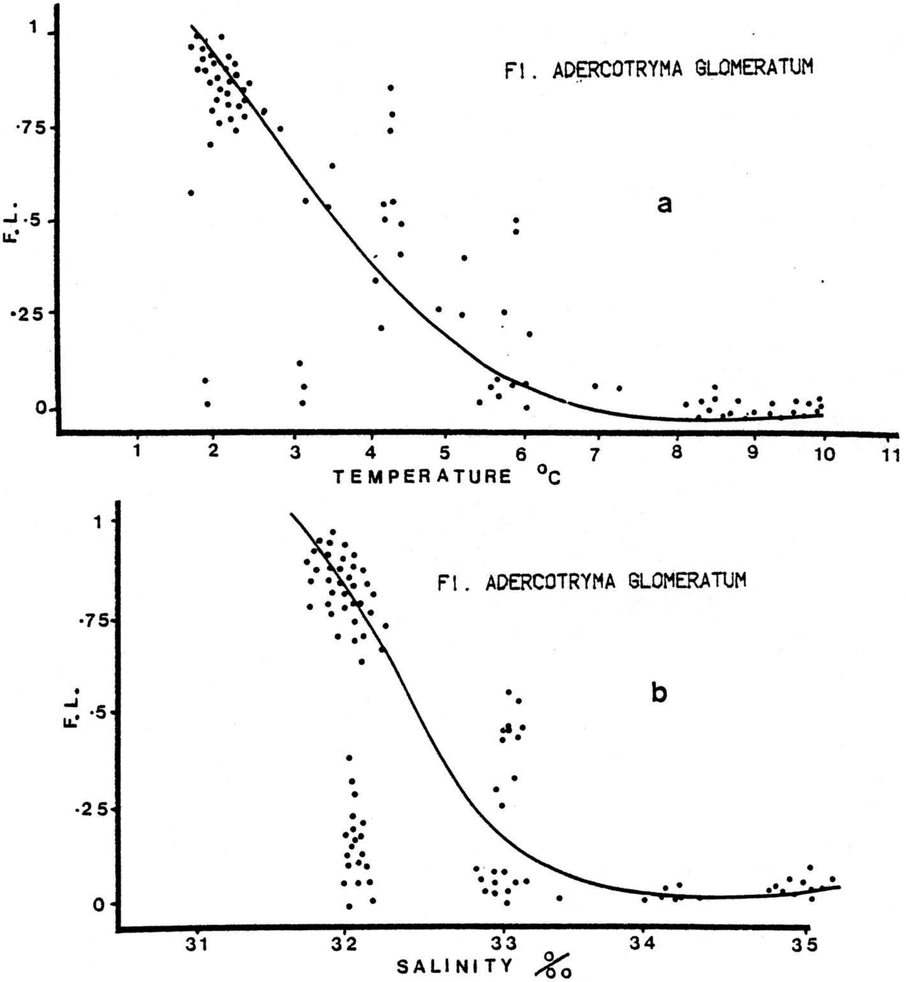

F1. ADERCOTRYMA GLOMERATUM
a
F.L.
1
·75
·5
·25
0
1
2
3
4
5
6
7
8
9
10
11
TEMPERATURE °C
F1. ADERCOTRYMA GLOMERATUM
b
F.L.
1
·75
·5
·25
0
31
32
33
34
35
SALINITY ‰

Figure 6.2

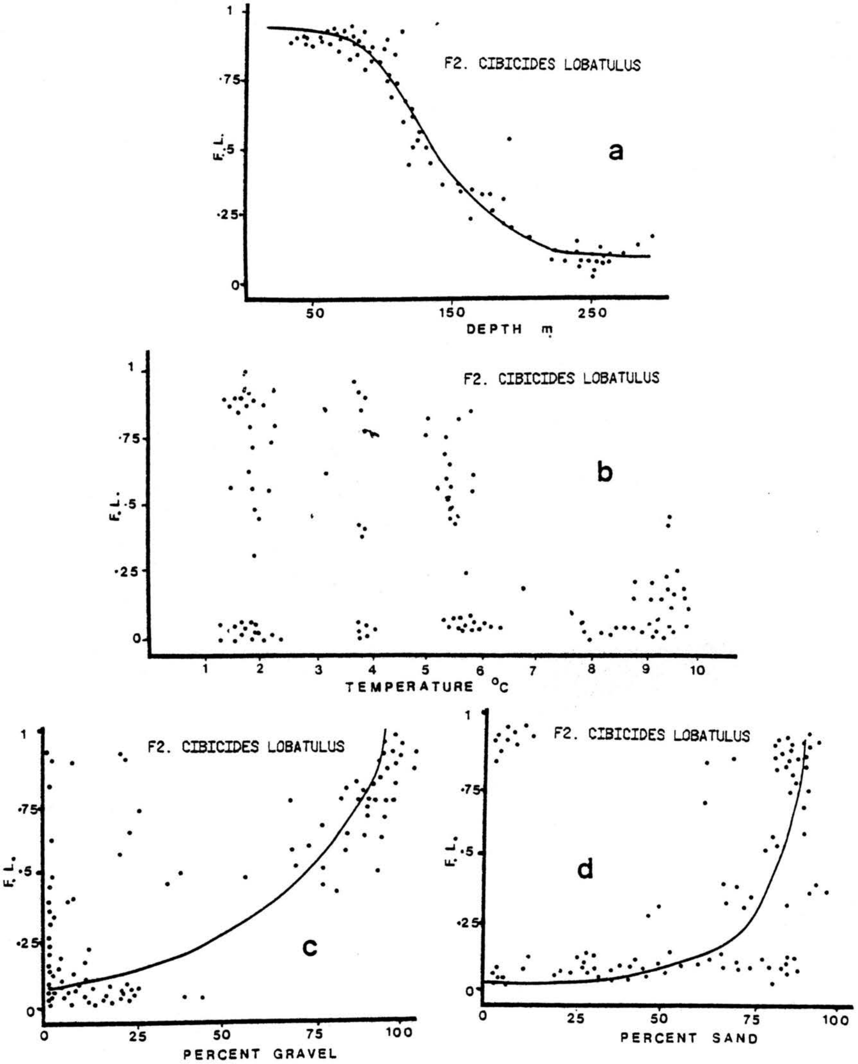

F2. CIBICIDES LOBATULUS
a
F.L.
1
·75
·5
·25
0
50
150
250
DEPTH m
F2. CIBICIDES LOBATULUS
b
F.L.
1
·75
·5
·25
0
1
2
3
4
5
6
7
8
9
10
TEMPERATURE °C
F2. CIBICIDES LOBATULUS
c
F.L.
1
·75
·5
·25
0
0
25
50
75
100
PERCENT GRAVEL
F2. CIBICIDES LOBATULUS
d
F.L.
1
·75
·5
·25
0
0
25
50
75
100
PERCENT SAND

Figure 6.3

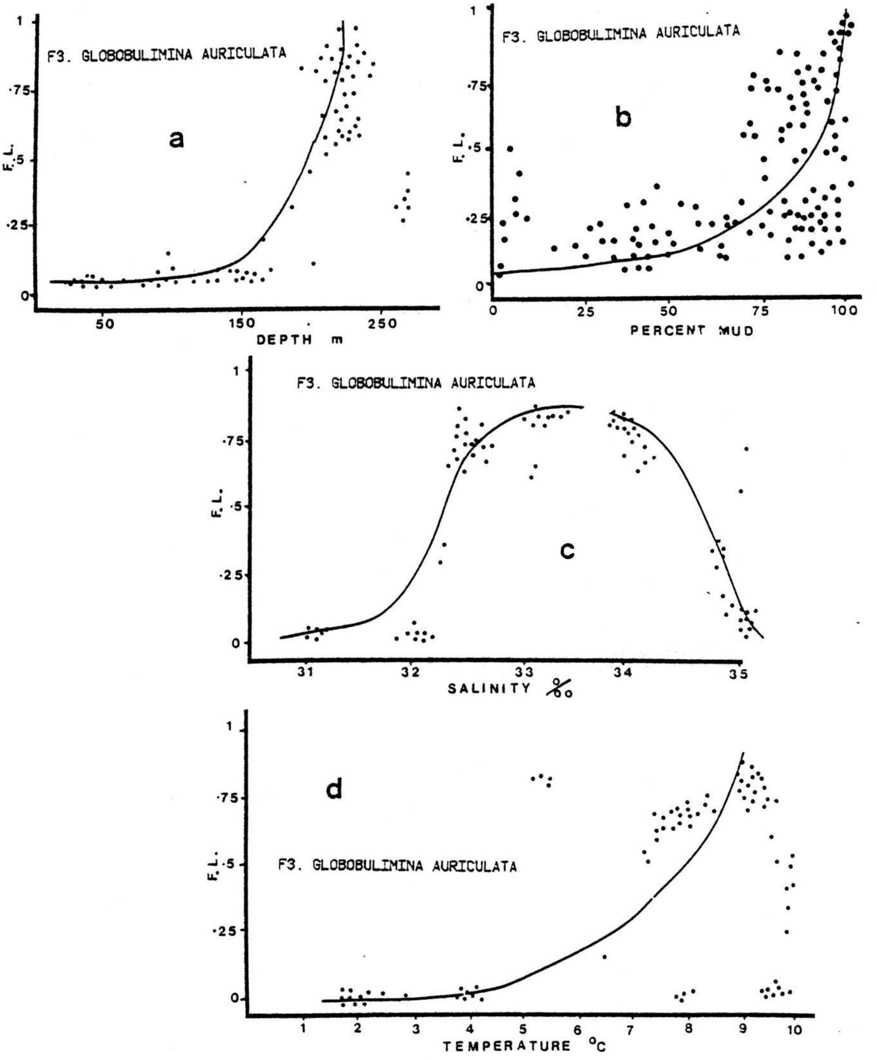

F3. GLOBOBULIMINA AURICULATA
a
F.L.
1
·75
·5
·25
0
50
150
250
DEPTH m
F3. GLOBOBULIMINA AURICULATA
b
F.L.
1
·75
·5
·25
0
0
25
50
75
100
PERCENT MUD
F3. GLOBOBULIMINA AURICULATA
c
F.L.
1
·75
·5
·25
0
31
32
33
34
35
SALINITY ‰
d
F3. GLOBOBULIMINA AURICULATA
F.L.
1
·75
·5
·25
0
1
2
3
4
5
6
7
8
9
10
TEMPERATURE °C

Figure 6.4

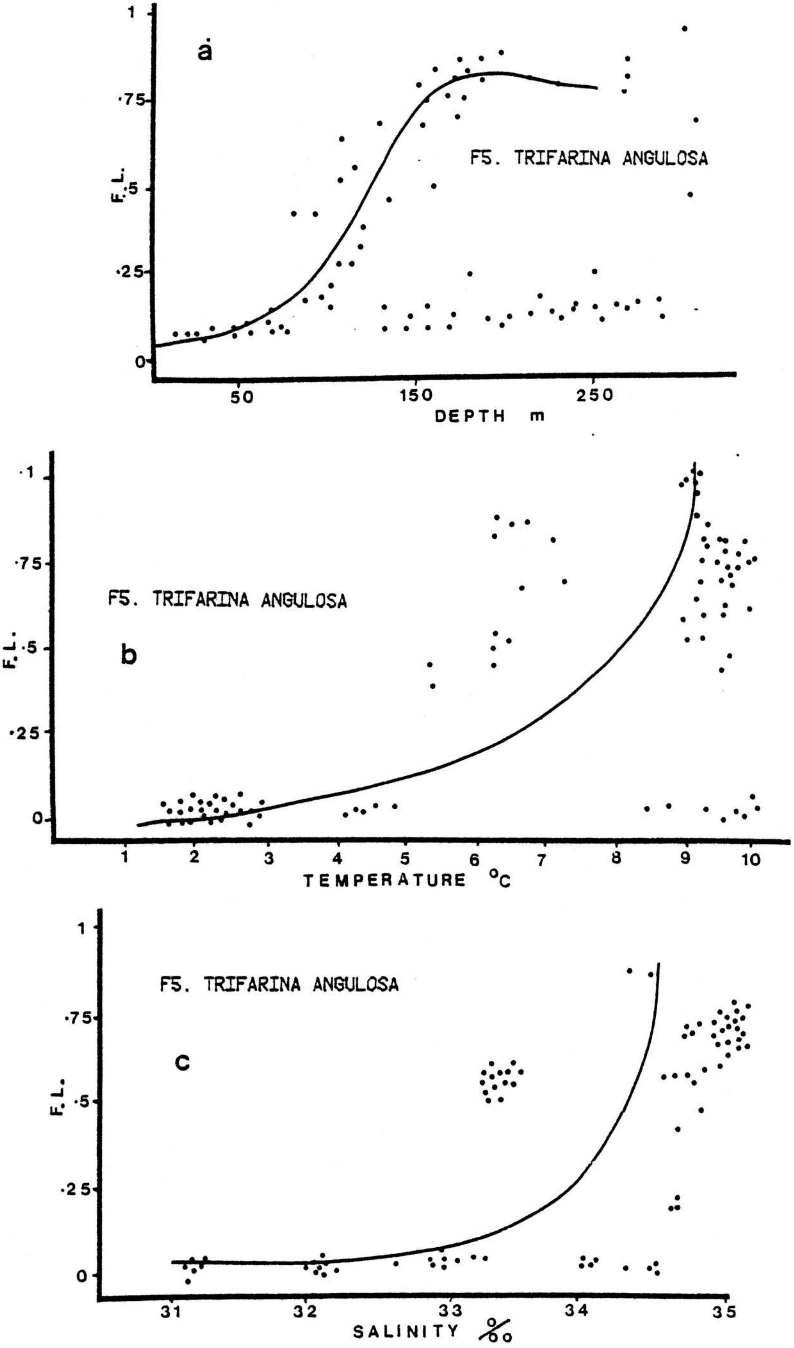
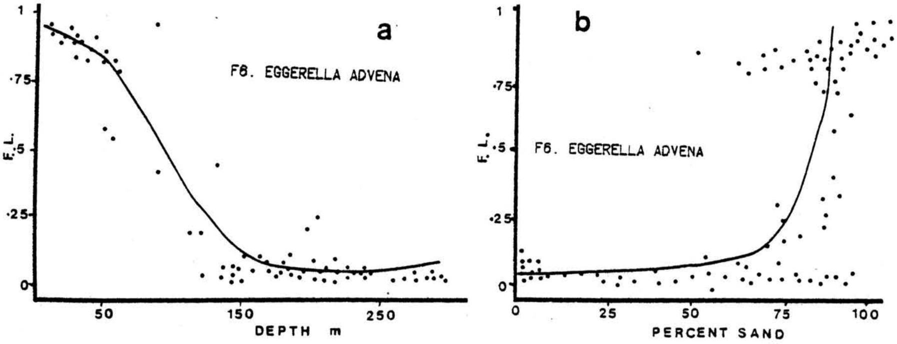

a
F5. TRIFARINA ANGULOSA
F.L.
1
·75
·5
·25
0
50
150
250
DEPTH m
b
F5. TRIFARINA ANGULOSA
F.L.
·1
·75
·5
·25
0
1
2
3
4
5
6
7
8
9
10
TEMPERATURE °C
c
F5. TRIFARINA ANGULOSA
F.L.
1
·75
·5
·25
0
31
32
33
34
35
SALINITY ‰

Figure 6.5



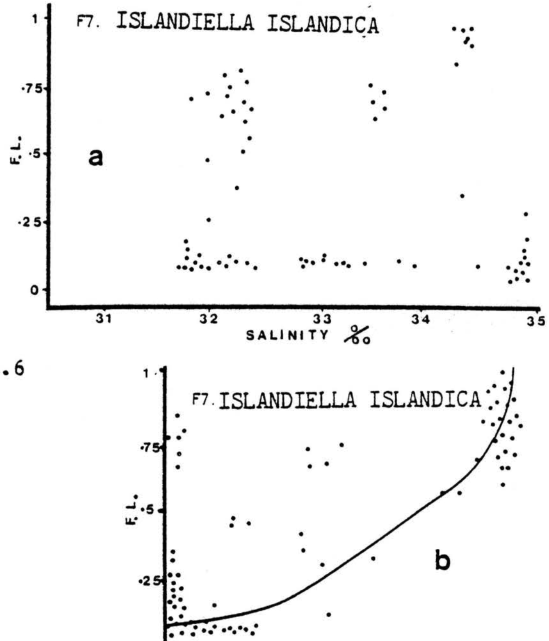


Figure 6.6

Figure 6.7

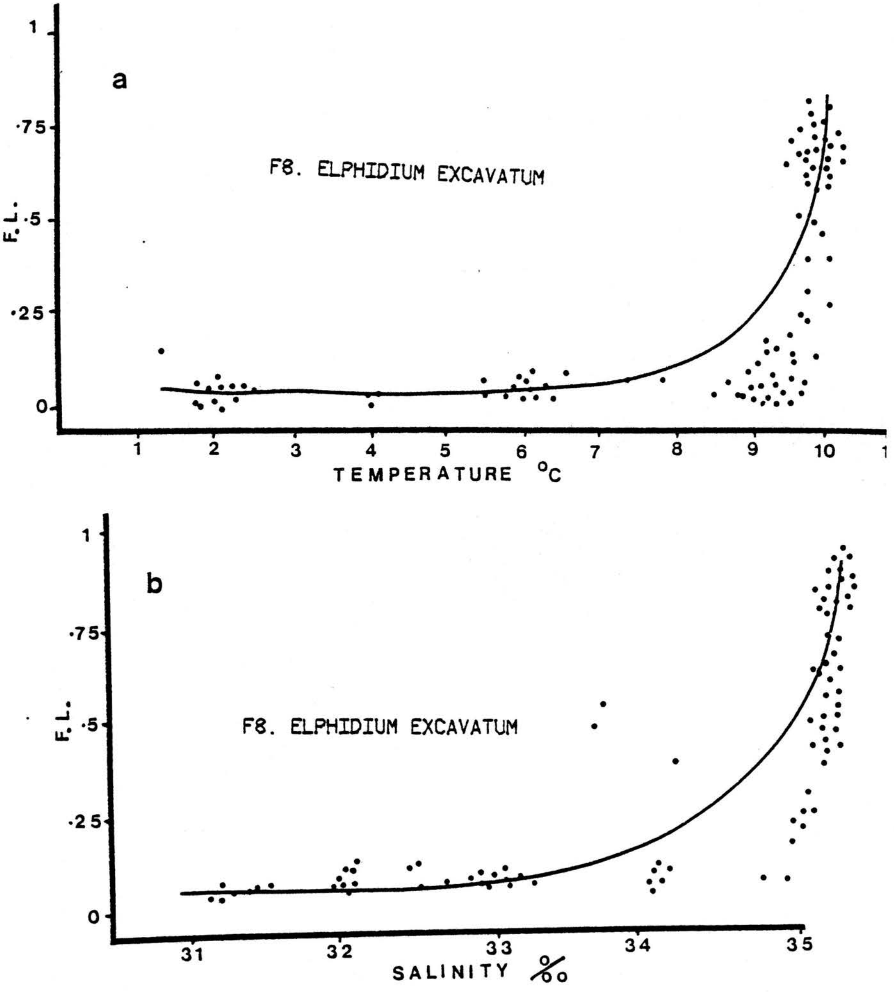
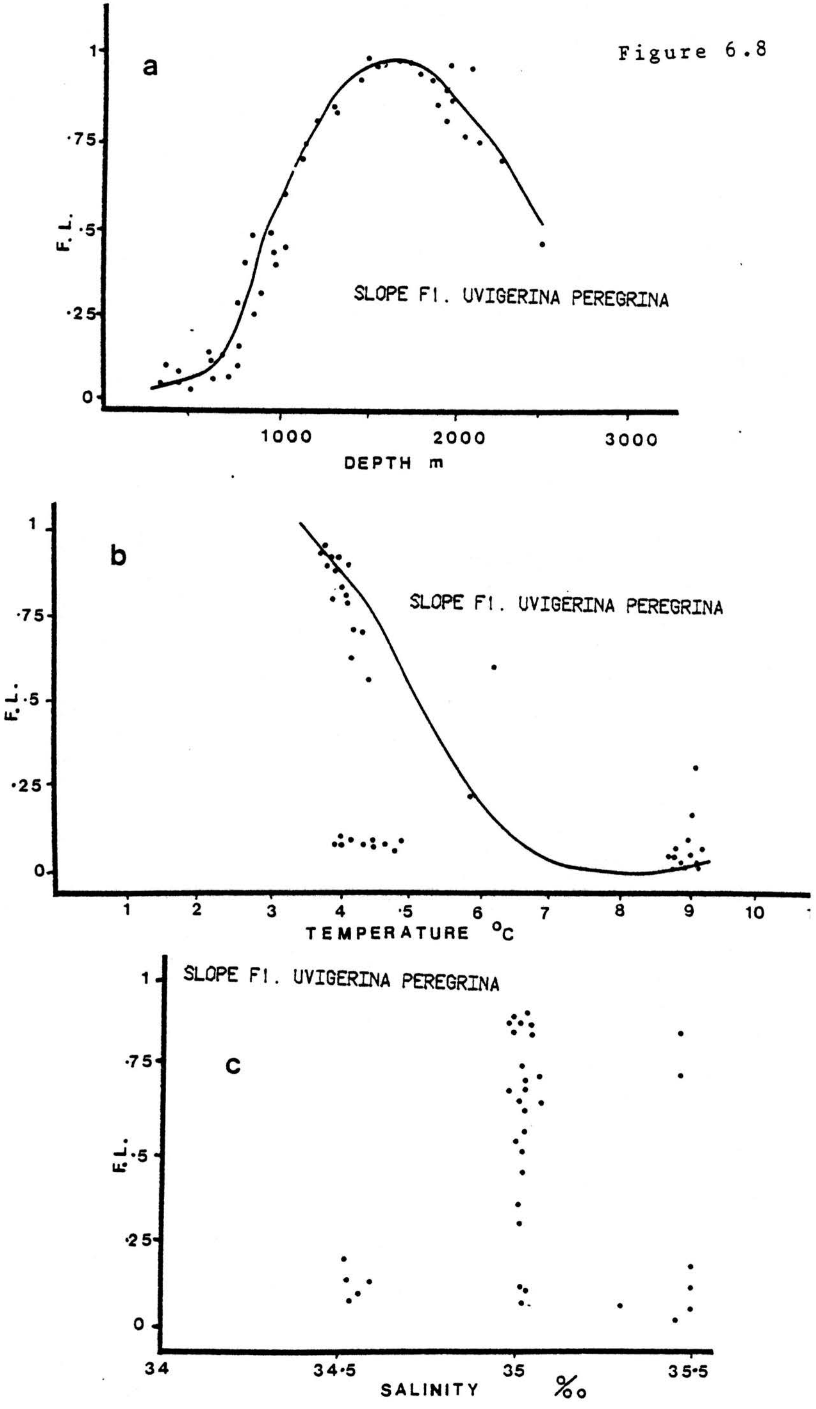

a
F8. ELPHIDIUM EXCAVATUM
F.L.
1
·75
·5
·25
0
1
2
3
4
5
6
7
8
9
10
1
TEMPERATURE °C
b
F8. ELPHIDIUM EXCAVATUM
F.L.
1
·75
·5
·25
0
31
32
33
34
35
SALINITY ‰

Figure 6.8


a
SLOPE F1. UVIGERINA PEREGRINA
F.L.
1
·75
·5
·25
0
1000
2000
3000
DEPTH m
b
SLOPE F1. UVIGERINA PEREGRINA
F.L.
1
·75
·5
·25
0
1
2
3
4
5
6
7
8
9
10
TEMPERATURE °C
SLOPE F1. UVIGERINA PEREGRINA
c
F.L.
1
·75
·5
·25
0
34
34·5
35
35·5
SALINITY ‰

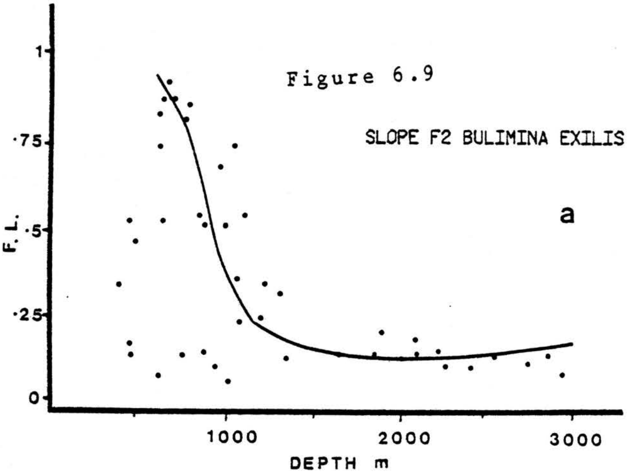


Figure 6.9

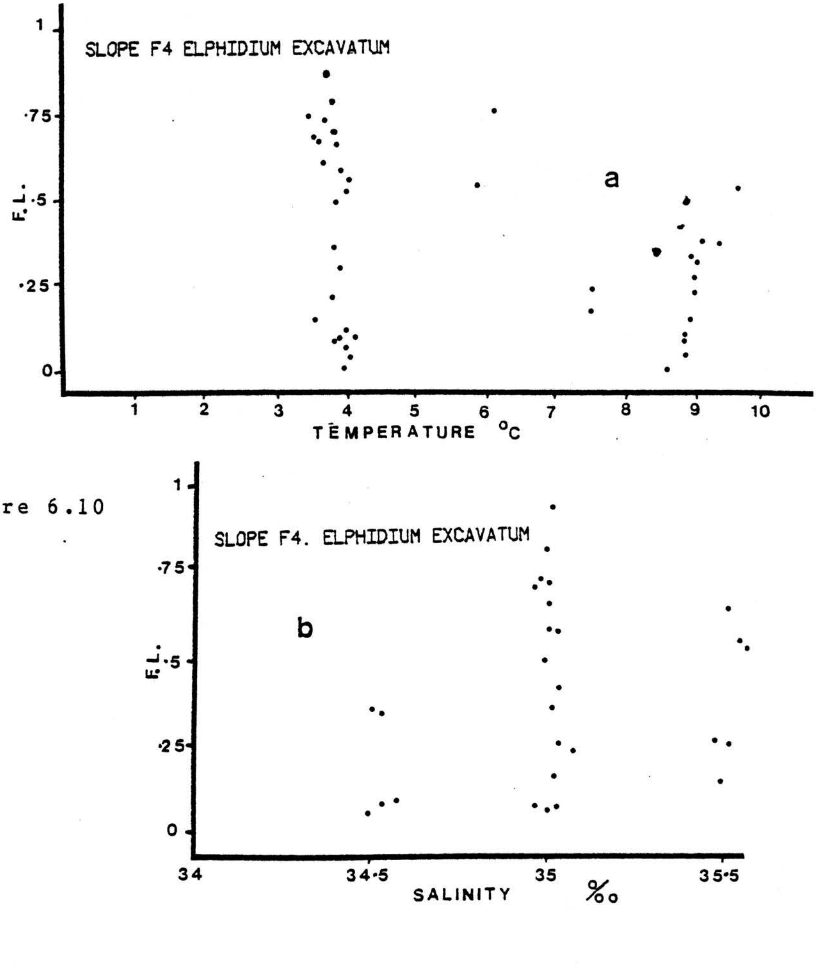


Figure 6.10

of both being associated with high factor loadings. It appears that this assemblage is associated with +70% sand and +70% gravel. This is consistent with previous reports (Gregory, 1971; Phleger, 1952; Poag *et al* 1980) linking the main species of this assemblage with attachment surfaces afforded by coarse substrate. No discernable trends were seen with salinity.

Factor assemblage 3: *Globobulimina auriculata*.

This central shelf basinal assemblage shows a direct relationship (Fig. 6.3a) with depth, maximum factor loadings occurring between 160 and 230 m. depth. A similar relationship is observed (Fig. 6.3b) with % mud: high loadings are associated with +65% mud. The only other discernable trend shows an association with salinity values ranging from 32.5-34o/oo, and an association of high factor loadings with temperatures of 7-10 oC.

Factor assemblage 4: *Saccammina atlantica*

Wide scatter and no discernable trends are observed in the plots concerning this assemblage. The significance of this will be discussed in a later section.

Factor assemblage 5: *Trifarina angulosa*.

This shelf edge assemblage, as would be expected from its distribution features, is associated with 150-250 m. depths (Fig 6.4a). It shows a strong association with temperature and, to a lesser degree, with salinity. No noticeable trends are immediately apparent between this assemblage and substrate characters. For high factor loadings, temperature and salinity ranges are from 6-10oC and 33-35o/oo. The presence of tight clusters of points outside the main trends on Figs. 6.4a and 6.4c suggest reworked populations.

Factor assemblage 6: Eggerella advena.

The only discernable relationships apparent for this assemblage are those between depth and % sand. Figure 6.5 a, shows an inverse association between depth and high factor loadings equating to depths of 15-60 m. A strong association is observed between % sand (60-100%) and high factor loadings. Temperature and salinity show large scatters of points implying lack of association.

Factor assemblage 7: Islandiella islandica.

The only discernable trends of this assemblage appear to be with % gravel and to a lesser extent, with salinity (Fig. 6.6; a,b).

Factor assemblage 8: Elphidium excavatum.

From Figure 6.7 a,b, relationships are observed between temperature and salinity. Temperature and salinity ranges between 8-10oC and 34.5o/oo are associated with high values for the factor loadings, etc. The assemblage shows no other trends when plotted against the remaining environmental variables.

### 6.4.2 Slope Assemblages.

Factor assemblage 1: Uvigerina peregrina.

This lower slope assemblage appears positively associated to depths of 800-2000 m. and negatively related to depths of 2000-3000 m. Maximum values for the factor loadings occur between 1300 and 2000 m. (Fig.

6.8a). A temperature range of 3.5-4.5oC is associated with high factor loadings and there is a strong relationship between factor loadings and higher temperatures. (Fig. 6.8b). Relations to salinity are less clear although it appears that 35o/oo is most favourable to this assemblage (Fig. 6.8c).

Factor assemblage 2: Bulimina exilis.

This assemblage shows an inverse trend with depth, maximum values of loadings occurring between 600 and 900 m (Fig. 6.9a). No discernable trends are determined with respect to temperature or salinity.

Factor assemblage 3: Trifarina occidentalis.

No apparent associations are determined for this assemblage; further discussion will be presented in a later section.

Factor assemblage 4: Elphidium excavatum.

The assemblage shows no apparent depth association over its range between 400 and 2800 m. Similarly, temperature and salinity relationships are not particularly clear (Fig. 6.10; a,b) although there is an association with temperature range of around 4oC, and salinity at 35o/oo.

### 6.4.3 Discussion.

From the above observations, and with reference to Figures 6.1-6.10, it is clear that there are some obvious relationships between the factor assemblages and certain measured oceanographic variables. It is equally clear that some assemblages show no apparent associations with these variables. Temperature for example seems not to exert a great influence on many of the assemblages, in fact only for shelf assemblages 1, 8, and 3, together with slope assemblages 1,4.

Depth seems to be the main influence on shelf factor assemblages 2,3,5,6 and slope assemblages 1 and 2. This, however, is more likely the indirect result of a response to other depth related environmental variables, the significance of which will be discussed below.

Concerning the substrate characters, percent sand appears to be the main influence on shelf factor 6 and, moderately so, on shelf factor 5. Percent mud appears to be the main control of shelf factor 3, although again, as for depth, this may be a response to other mud related variables such as the amount of organic carbon. Percent gravel seems to influence factor assemblages 2 and 7 on the shelf.

Some assemblage/environment associations and their implied relationships appear to be typically parabolic (or partly so) in response to the observed environmental variables. Imbrie and Kipp (1971) pointed to the large amount of field and experimental data from Bradshaw (1957) and Tolerlund (1969) which supports the notion that a species (or assemblage) has an optimum for a particular environmental variable, with a decrease in abundance as the measured variable increases or decreases.

It is the purpose of the regression analysis to investigate the statistical nature and significance of these assemblage/environment associations and to determine, through stepwise procedures, which assemblage provides the best criterion for each measured environmental variable. In this way, the main controlling aspects of the environment that influence an assemblage distribution can be discerned and discussed.

The next section describes the results of the regression analysis and is followed by an ecological discussion.

## 6.5. Regression Results.

The following summarizes the results of the regression analysis. Each environmental variable is described in terms of its relationship to each assemblage (i.e. which assemblage is the best criterion for the particular variable). Regression statistics are presented in several tables (Tables 6.3-6.8) which show the cumulative results of the stepwise multiple regression procedure and significance of each factor in the final linear equation. These tables illustrate the regression results produced after applying a cut off value of 0.01; ie. factor assemblages explaining less than 0.01 of the variance of a particular variable were excluded from the stepwise procedure. This procedure gave better results in terms of lower standard error of estimates and higher significance of equations when compared to the statistics produced after applying a cut off of 0.001. The regression statistics produced in the latter case (cut off of 0.001) are included in Appendix VIII for comparison.

Several diagrams (Figures 6.11-6.19) visually show the predictive ability of each equation through plots of observations against estimates for each variable. The first diagram in each figure (ie. 11a, 12a....) plots the observations and estimates for all the factor assemblages. The quality of the fit for the data points reflects the efficiency of the multiple regression equations. Similarly, Figures

6.11 to 6.19 plot observations against estimates for regional groups of stations (i.e. assemblages as seen in Chapter 3, Fig. 3.9). Clearly, those assemblages which the regression analysis statistically deemed the best criterion for a particular variable will show tighter clusters and less scatter about the line than those deemed of lesser significance.

### 6.5.1. Regression results of shelf and slope assemblages with:

#### a/ Depth.

The coefficients, standard errors and statistics produced through the regression of the 8 shelf assemblages with respect to depth are shown in Table 6.3. This Table and the others concerning the remaining environmental variables are so arranged as to show the order of stepwise selection (as in Imbrie and Kipp, 1971). At the top is the factor assemblage which is the best single criterion of depth, followed by the next best; critical values for *t* in the multiple regression equation are shown for the 0.001 and 0.01 levels. Of the 8 factor assemblages, only those shown to be statistically significant at a certain level are included (mainly at 0.01 level). For depth, an *F* value of 24.2 shows a statistically significant regression at the 99.9 confidence level. Similarly, *t* values show that three of the factor assemblages have significant regression coefficients at the 0.001 level and at the 0.01 level.

Factor assemblages 2 and 6 (*Cibicides lobatulus* and *Eggerella advena*) are therefore the most successful (significantly) at predicting depth estimates, explaining the largest proportion of depth variance. The standard error of estimate for the multiple regression equation is

## Table 6.3

## DEPTH REGRESSION STATISTICS

| SHELF FACTOR ASSEMBLAGE | REGRESSION COEFFICIENTS (RC) | CUMULATIVE VARIANCE (CV) | MULTIPLE CORR. COEFFICIENT (MCC) | STANDARD ERROR REGRESSION COEFF. (SERC) | STANDARD ERROR ESTIMATE (SEE) | t-value |
|---|---|---|---|---|---|---|
| F2 | -88.565 | .149 | .386 | 13.14 | 63.2 | -6.7 |
| F6 | -99.592 | .298 | .546 | 17.51 | 57.7 | -5.6 |
| F5 | 59.089 | .341 | .579 | 16.26 | 56.1 | 3.6 |
| F3 | 46.384 | .380 | .609 | 15.38 | 54.7 | 3.0 |
| F7 | -35.142 | .393 | .618 | 17.55 | 54.3 | -2.0 |
| F8 | -34.336 | .404 | .636 | 17.69 | 54.6 | -1.9 |

Intercept for multiple regression equation = 160.56918

Critical values for t = 2.576 at 0.01
= 3.291 at 0.001 levels

| SLOPE FACTOR ASSEMBLAGE | RC | CV | MCC | SERC | SEE | t-value |
|---|---|---|---|---|---|---|
| F1 | 902.93 | .484 | .696 | 244.1 | 517.0 | 3.6 |
| F2 | -934.16 | .569 | .747 | 333.5 | 478.5 | -2.8 |

Intercept for multiple regression equation = 1584.79816

Critical values for t = 2.704 at 0.01
= 3.551 at 0.001 levels

quite large (54.15) and is 1/6th of the total depth range. Errors seem to increase with depth (Fig. 6.11). The small cumulative variance and large standard errors imply other environmental variables as being of greater influence upon foraminiferal distributions.

Values expressed in Table 6.3 are shown visually in Figs. 6.11 a-i which plot observations for depth against estimates produced by the regression. Fig. 6.11a shows large scatter within and outside the marked confidance bands and reflects the rather poor predictive ability of the depth equation for the combined shelf assemblages listed in Table 6.3. Figure 6.11 b-i show the distribution of this scatter within each factor assemblage, i.e. for the most statistically significant indicators of depth. In this way, the good predictive ability of factor 2 is seen (Fig. 6.11b) and the roughly successively decreasing capabilities of the remaining factors are shown (Fig. 6.11f-i) as tendancies for the data points to fall on a horizontal line (no correlation with depth). Factors 7 and 4 however show some correlation with depth perhaps reflecting their correlation with factor 2 (see table 6.1).

Ecological implications will be discussed in a later section. Suffice it to say the above observations are consistent with those of an earlier section that directly compared the importance of an assemblage and its environmental characters.

Regression of the 4 slope factors with respect to depth explained greater amounts of the depth variance than did shelf factors (Table 6.3). The _F_ and _t_ values show high significance of the regression and regression coefficients at the 0.001 level for factor 1 (_Uvigerina peregrina_). Factor 2 (_Bulimina exilis_) is significant only at the 0.01 level. The overall relative predictive abilities of the slope stations

Figures 6.11--6.19. Environmental parameter observations versus
regression estimates for each assemblage.

Figure 6.11 Regression estimates Vs. observations of depth from shelf stations.

Figure 6.12 Regression estimates Vs. observations of depth from slope stations.

Figure 6.14 Regression estimates Vs. observations of temperature from slope stations.

Figure 6.13 Regression estimates Vs. observations of temperature from shelf stations.

Figure 6.15 Regression estimates Vs. observations of salinity from shelf stations.

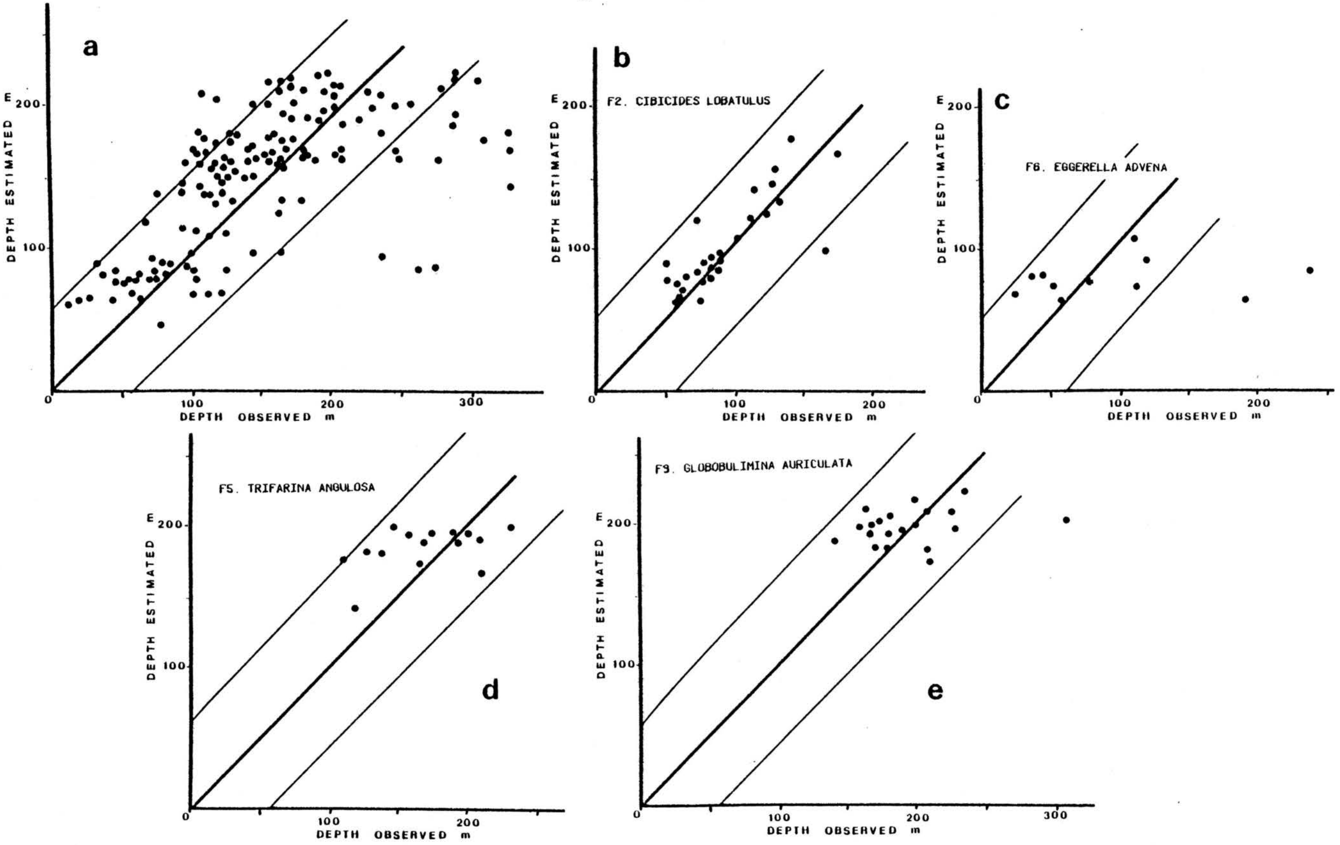
Figure 6.16 Regression estimates Vs. observations of salinity from slope stations.

Figure 6.17 Regression estimates Vs. observations of % gravel from shelf stations.

Figure 6.18 Regression estimates Vs. observations of % sand from shelf stations.

Figure 6.19 Regression estimates Vs. observations of % mud from shelf stations.

Figure 6.11


a
DEPTH ESTIMATED m
DEPTH OBSERVED m
0
100
200
300
b
F2. CIBICIDES LOBATULUS
c
F6. EGGERELLA ADVENA
d
F5. TRIFARINA ANGULOSA
e
F9. GLOBOBULIMINA AURICULATA

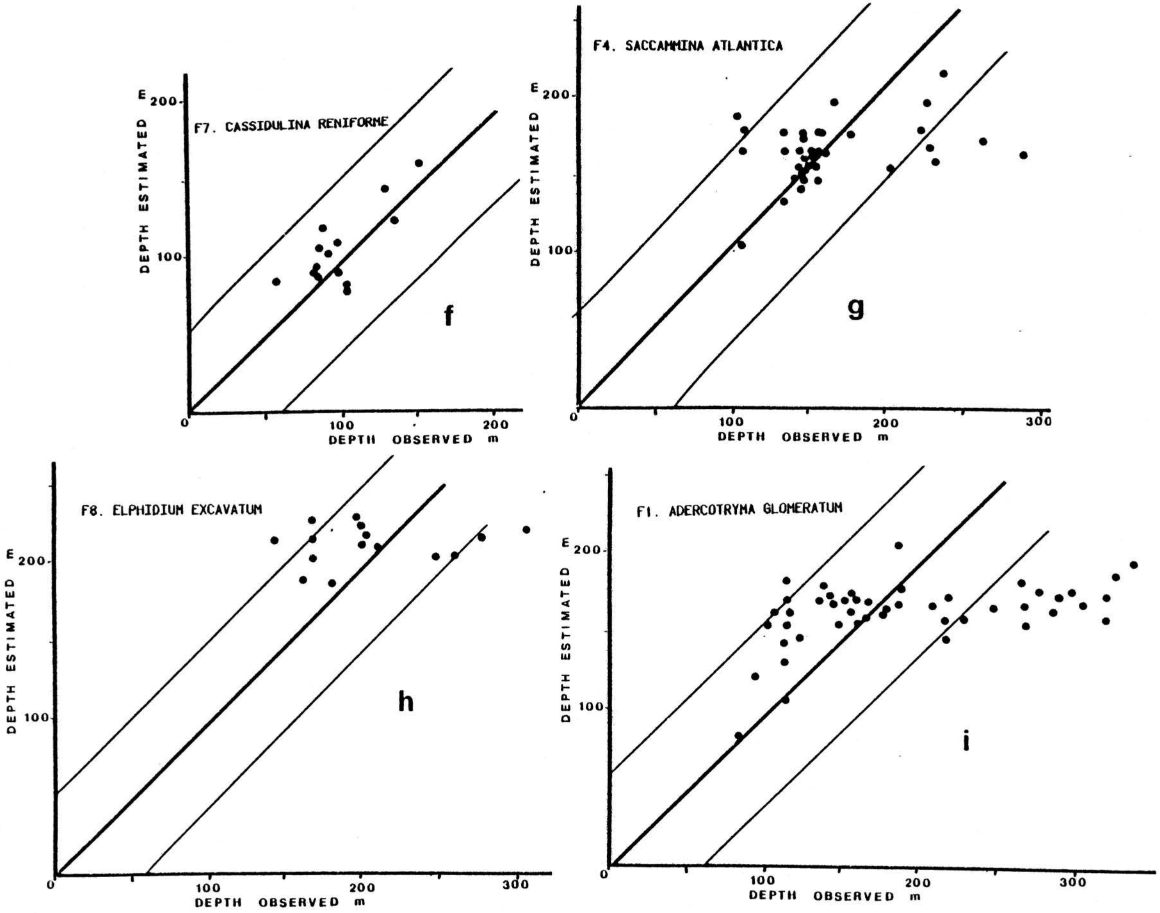
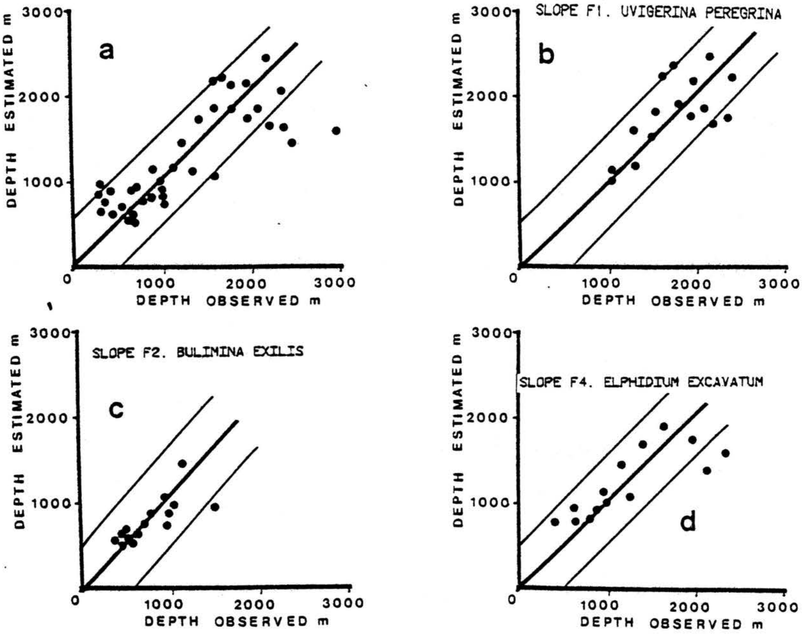

F7. CASSIDULINA RENIFORME
DEPTH ESTIMATED m
DEPTH OBSERVED m
0
100
200
f
F4. SACCAMMINA ATLANTICA
DEPTH ESTIMATED m
DEPTH OBSERVED m
0
100
200
300
g
F8. ELPHIDIUM EXCAVATUM
DEPTH ESTIMATED m
DEPTH OBSERVED m
0
100
200
300
h
F1. ADERCOTRYMA GLOMERATUM
DEPTH ESTIMATED m
DEPTH OBSERVED m
0
100
200
300
i

Figure 6.11

Figure 6.12


a
DEPTH ESTIMATED m
3000
2000
1000
0
1000
2000
3000
DEPTH OBSERVED m
SLOPE F1. UVIGERINA PEREGRINA
b
SLOPE F2. BULIMINA EXILIS
c
SLOPE F4. ELPHIDIUM EXCAVATUM
d

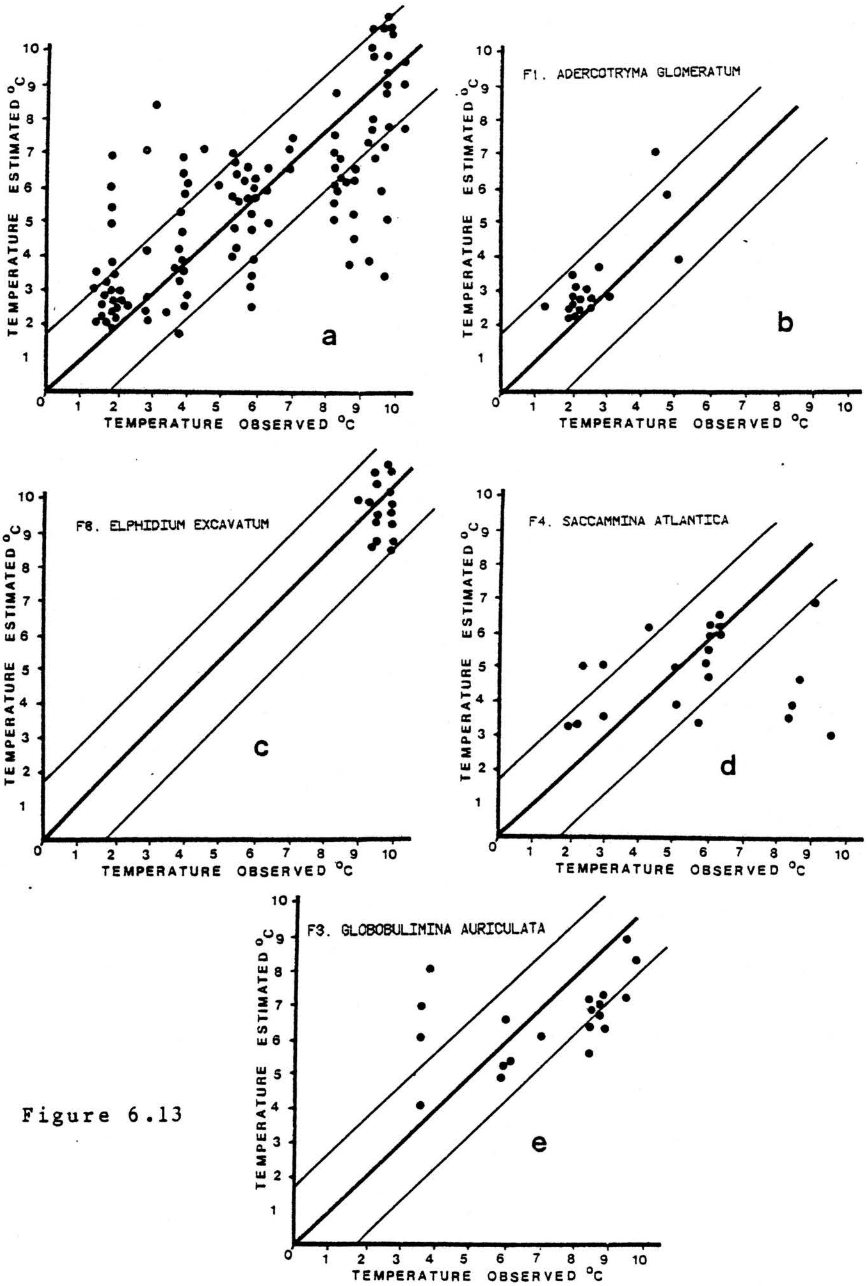

TEMPERATURE ESTIMATED °C
TEMPERATURE OBSERVED °C
0
1
2
3
4
5
6
7
8
9
10
a
F1. ADERCOTRYMA GLOMERATUM
b
F8. ELPHIDIUM EXCAVATUM
c
F4. SACCAMMINA ATLANTICA
d
F3. GLOBOBULIMINA AURICULATA
e

Figure 6.13

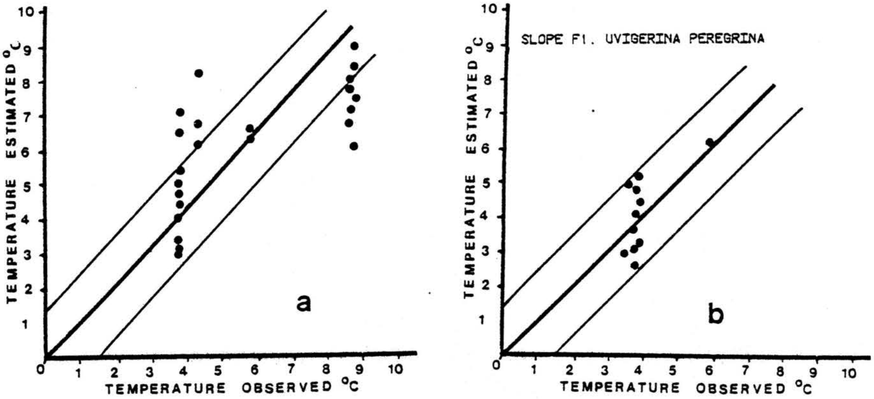

TEMPERATURE ESTIMATED °C
TEMPERATURE OBSERVED °C
0
1
2
3
4
5
6
7
8
9
10
a
SLOPE F1. UVIGERINA PEREGRINA
b

Figure 6.14

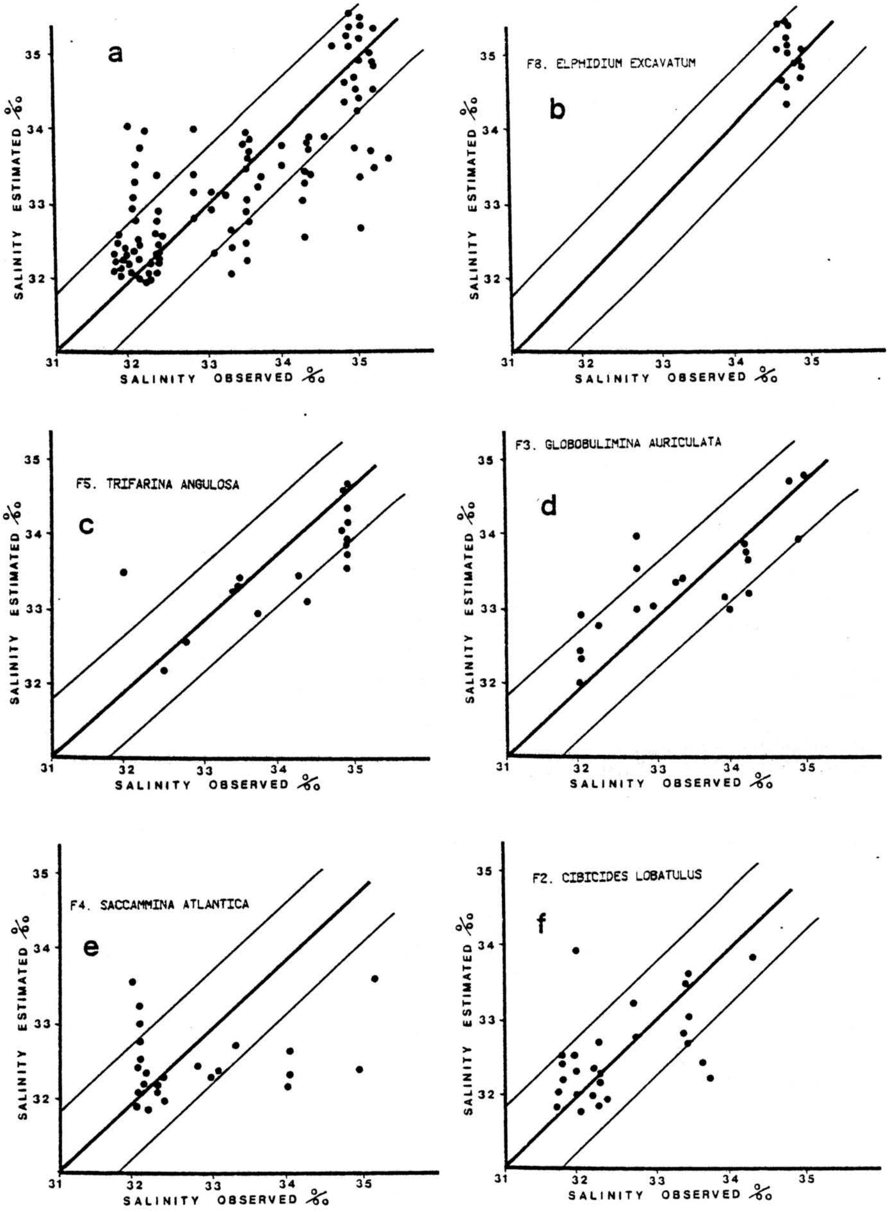
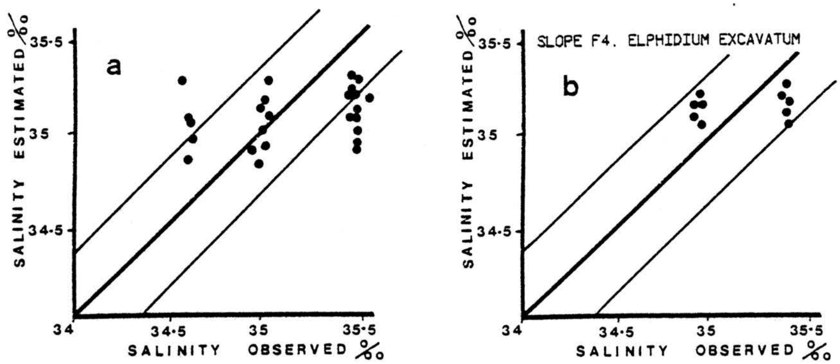

a
b
F8. ELPHIDIUM EXCAVATUM
c
F5. TRIFARINA ANGULOSA
d
F3. GLOBOBULIMINA AURICULATA
e
F4. SACCAMMINA ATLANTICA
f
F2. CIBICIDES LOBATULUS
SALINITY ESTIMATED ‰
SALINITY OBSERVED ‰
31
32
33
34
35

Figure 6.15

Figure 6.16



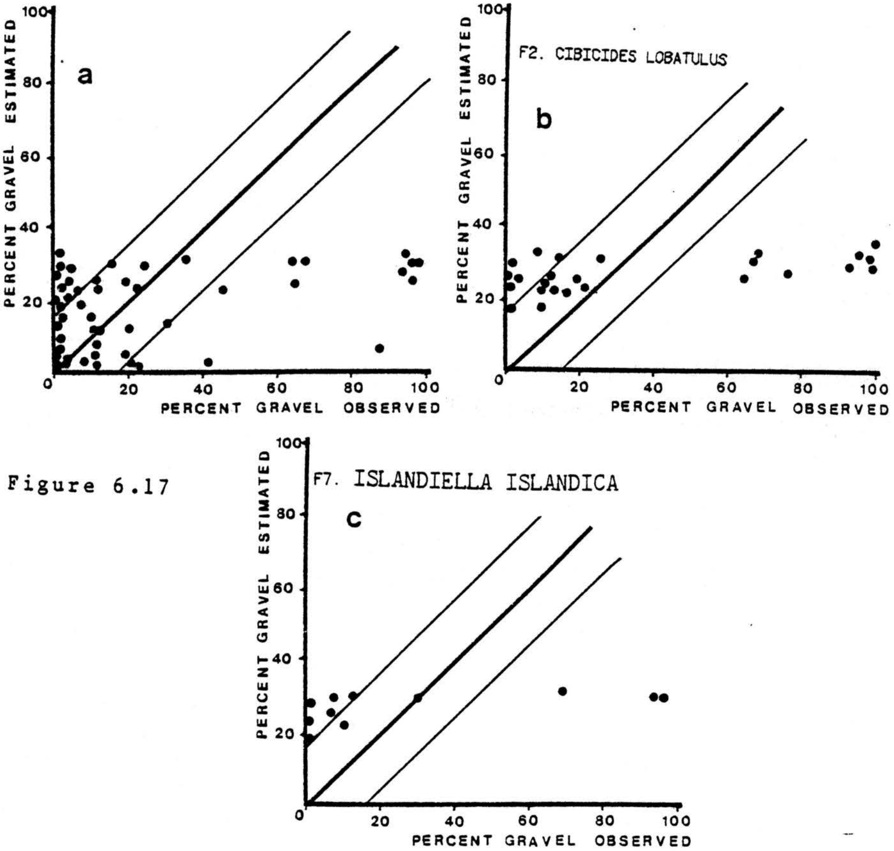


Figure 6.17

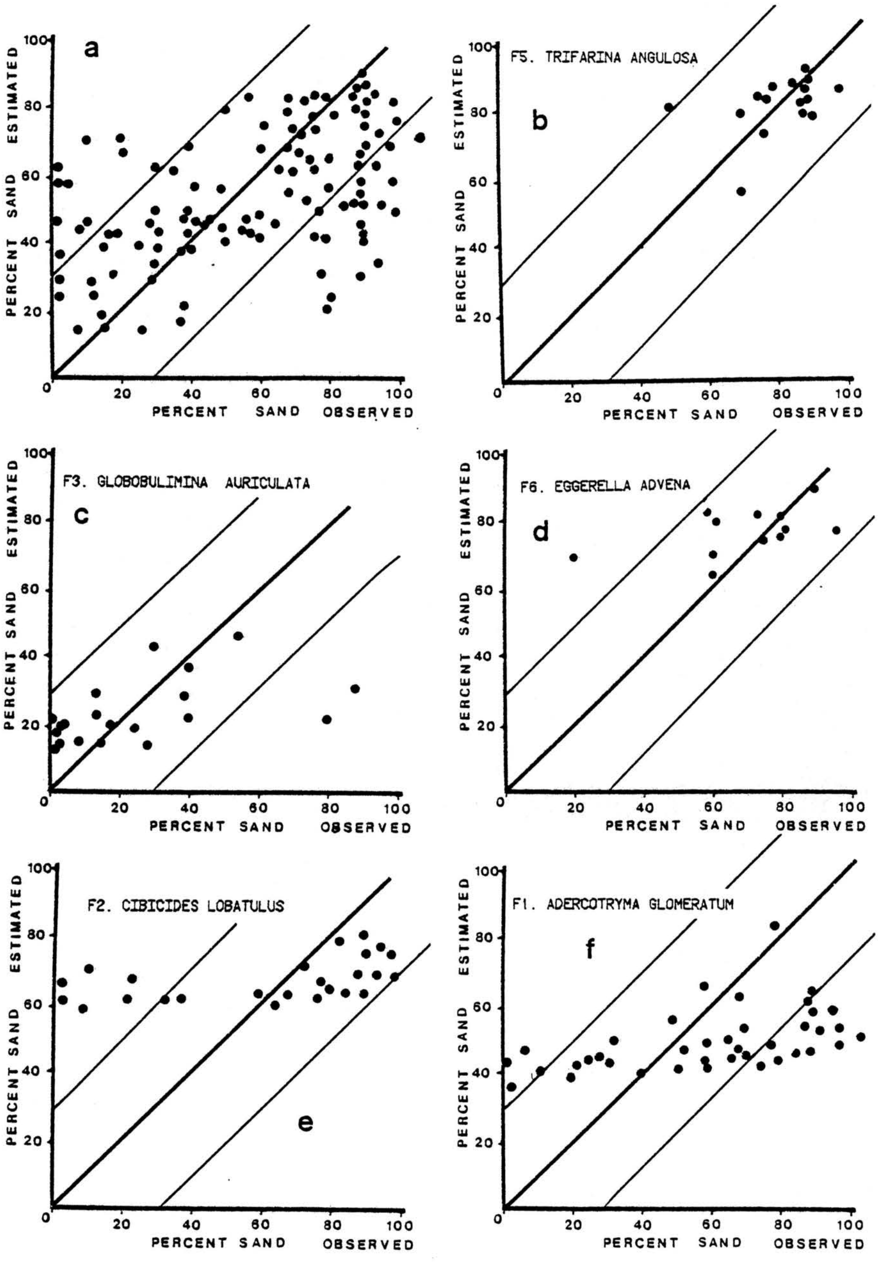

a
F5. TRIFARINA ANGULOSA
b
F3. GLOBOBULIMINA AURICULATA
c
F6. EGGERELLA ADVENA
d
F2. CIBICIDES LOBATULUS
e
F1. ADERCOTRYMA GLOMERATUM
f
PERCENT SAND ESTIMATED
PERCENT SAND OBSERVED
0
20
40
60
80
100

Figure 6.18

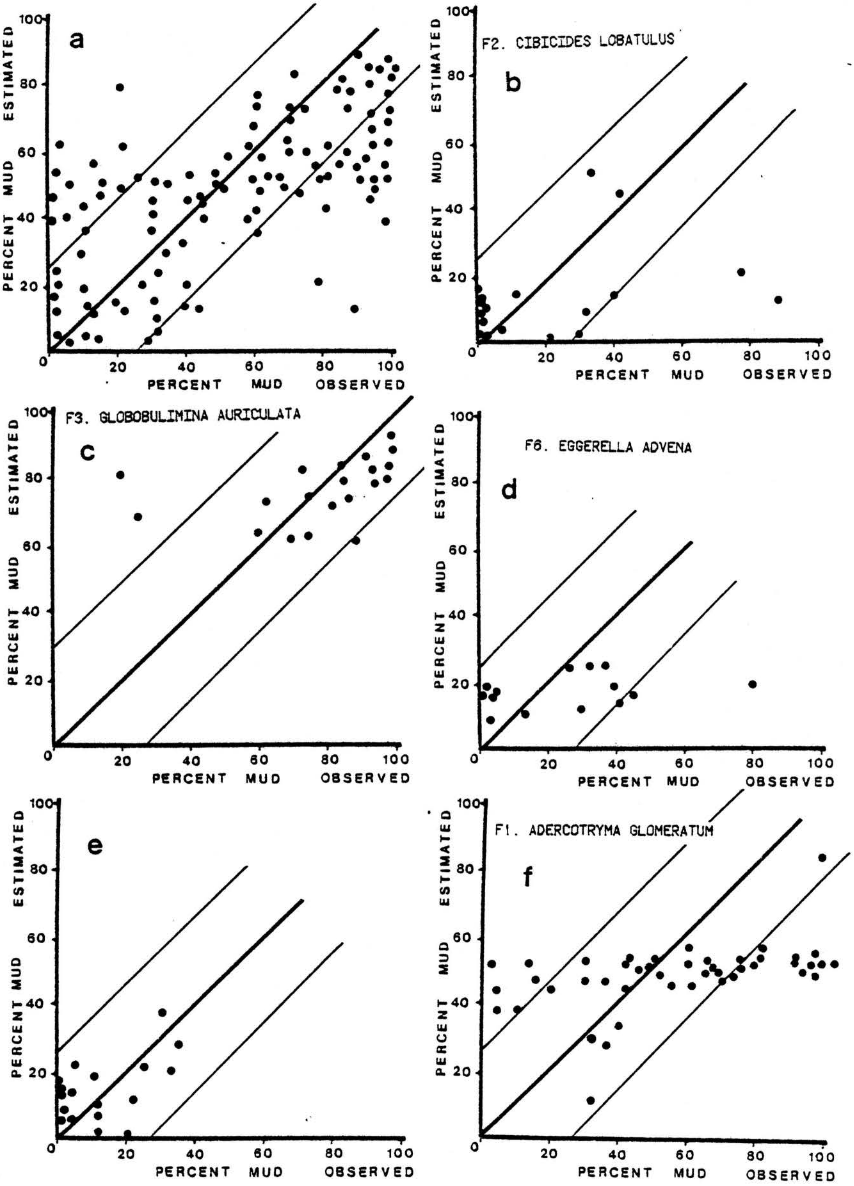

a
PERCENT MUD ESTIMATED
PERCENT MUD OBSERVED
0
20
40
60
80
100
F2. CIBICIDES LOBATULUS
b
F3. GLOBOBULIMINA AURICULATA
c
F6. EGGERELLA ADVENA
d
e
F1. ADERCOTRYMA GLOMERATUM
f

Figure 6.19

are shown in Figs. 6.12a,b,c & d.

b/ Temperature.

Regression of shelf factors against bottom temperatures explains a greater proportion of the variance and has a larger multiple correlation coefficient than the depth regressions (Table 6.4). The SEE for the multiple regression is 1.80C. Several of the regression coefficients are significant at the 0.001 level. Shelf assemblages 1 (Adercotryma glomerata) and 8 (Elphidium excavatum f. clavata) show the most significant relationships to temperature. These relative predictive abilities are illustrated in Figs. 6.13a-e. Again, large amounts of scatter are seen within the confidence bands (6.13a) for the multiple regression equation. Figs. 6.13b,c for factors 1 and 8 display less scatter and better predictive capability whereas Figs. 6.13d,e show the most scatter and a greater tendancy to lie in a horizontal line. (ie. poor or non-existent predictive ability with respect to temperature).

Only slope factor 1 (Uvigerina peregrina) shows significant relationship to temperature (Table 6.4). This is seen in Fig. 6.14b where it exhibits less scatter when compared to 6.14a. Standard errors for shelf and slope estimates are similar at around 1.7oC.

The observations made on regression of shelf and slope assemblages with respect to temperatures are consistent with earlier more subjective considerations.

c/ Salinity.

Regression results for shelf and slope assemblages with respect to

## Table 6.4

## TEMPERATURE REGRESSION STATISTICS

| SHELF FACTOR ASSEMBLAGE | RC | CV | MCC | SERC | SEE | t-value |
|---|---|---|---|---|---|---|
| F8 | -4.9 | .405 | .636 | .656 | | -7.4 |
| F1 | -4.1 | .521 | .720 | .423 | 2.0 | -9.7 |
| F2 | -3.4 | .610 | .779 | .471 | 1.8 | -7.4 |
| F5 | 1.4 | .621 | .785 | .577 | 1.8 | 2.5 |

Intercept for multiple regression equation = 6.40369

Critical values for t = 2.576 at 0.01
= 3.291 at 0.001 levels

| SLOPE FACTOR ASSEMBLAGE | RC | CV | MCC | SERC | SEE | t-value |
|---|---|---|---|---|---|---|
| F1 | -3.8 | .416 | .638 | 0.684 | 1.83 | -5.677 |
| F4 | -3.2 | .519 | .712 | 1.665 | 1.69 | -3.065 |

Intercept for multiple regression equation = 7.085

Critical values for t = 2.704 at 0.01
= 3.551 at 0.001 levels

## Table 6.5

## SALINITY REGRESSION STATISTICS

| SHELF FACTOR ASSEMBLAGE | RC | CV | MCC | SERC | SEE | t-value |
|---|---|---|---|---|---|---|
| F8 | -2.6 | .406 | .637 | .249 | .873 | -10.6 |
| F5 | 1.6 | .483 | .693 | .230 | .818 | 7.1 |
| F3 | .8 | .521 | .719 | .213 | .719 | 3.7 |
| F7 | .9 | .536 | .728 | .249 | .782 | 3.6 |
| F2 | - .6 | .559 | .742 | .182 | .767 | - 3.3 |

Intercept for multiple regression equation = 32.39513

Critical values for t = 2.576 at 0.01
= 3.291 at 0.001 levels

| SLOPE FACTOR ASSEMBLAGE | RC | CV | MCC | SERC | SEE | t-value |
|---|---|---|---|---|---|---|
| F4 | - .61 | .169 | .412 | .211 | .332 | 2.891 |

Intercept for multiple regression equation = 35.02067

Critical values for t = 2.704 at 0.01 level salinity are shown in Table 6.5. Five shelf factors have significant regression coefficients (at 0.001 level). Two of these, factors 8 and 5 (*E. excavatum* and *T. angulosa*) show more significant relationships than the remainder. The multiple correlation coefficients are high. Similarly, approximately 60% of the salinity variance is explained in this regression. The relative predictive abilities of these relationships are seen in Figs. 6.15a-e. Fig. 6.15a shows the shelf assemblage predictive ability as a whole. Large amounts of scatter can be seen, especially when compared with Figs. 6.15b,c, & d, which show the relative increased capability of assemblages 8,3 and 5 (*Elphidium excavatum*, *Globobulimina auriculata* and *Trifarina angulosa*) to predict accurate salinity values ( ie. tighter clusters about the central line). Figs. 6.15e,f show the source of scatter i.e. predictive inability as seen in the tendancy to form in a horizontal line.

Slope assemblage-salinity regression results are shown in Table 6.5. Only slope factor assemblage 4 shows significant relationships (at 0.001 level) but with small correlation coefficients and cumulative variance. General predictive ability and scatters for slope assemblages are shown in Fig. 6.16a & b.

d/ Substrate characters: % sand, gravel and mud.

Table 6.6 summarizes the regression analysis with respect to gravel %. Only 2 assemblages show significant relationships (at 0.001 level). The cumulative variance explained is small and the associated correlation coefficients, lower. Factor assemblage 2 appears most related to % gravel (*Cibicides lobatulus*) with assemblage 7 (*Islandiella*

## Table 6.6

GRAVEL REGRESSION STATISTICS

| SHELF FACTOR ASSEMBLAGE | RC | CV | MCC | SERC | SEE | t-value |
|---|---|---|---|---|---|---|
| F2 | 23.64 | .214 | .463 | 3.85 | 17.385 | 6.1 |
| F7 | 18.47 | .252 | .499 | 5.53 | 17.036 | 3.3 |

Intercept for multiple regression equation = 1.04

Critical values for t = 2.576 at 0.01
= 3.291 at 0.001 levels

## Table 6.7

SAND REGRESSION STATISTICS

| SHELF FACTOR ASSEMBLAGE | RC | CV | MCC | SERC | SEE | t-value |
|---|---|---|---|---|---|---|
| F3 | -32.1 | .149 | .387 | 7.74 | 30.67 | -4.1 |
| F5 | 40.3 | .234 | .480 | 8.12 | 29.2 | -4.9 |
| F6 | 40.7 | .286 | .528 | 9.06 | 28.3 | 4.4 |
| F2 | 16.8 | .307 | .546 | 6.46 | 28.0 | 2.6 |

Intercept for multiple regression equation = 45.08144

Critical values for t = 2.576 at 0.01
= 3.291 at 0.001 levels

## Table 6.8

MUD REGRESSION STATISTICS

| SHELF FACTOR ASSEMBLAGE | RC | CV | MCC | SERC | SEE | t-value |
|---|---|---|---|---|---|---|
| F2 | -39.5 | .246 | .496 | 6.4 | 31.5 | -6.0 |
| F3 | 37.8 | .364 | .601 | 7.3 | 29.0 | 5.1 |
| F6 | -42.3 | .412 | .638 | 8.6 | 28.0 | -4.9 |
| F5 | -32.0 | .454 | .668 | 7.7 | 27.2 | -4.1 |
| F7 | -27.5 | .479 | .685 | 8.6 | 26.7 | -3.1 |

Intercept for multiple regression equation = 52.43668

Critical values for t = 2.576 at 0.01
= 3.291 at 0.001 levels

Table 6.9

A summary of shelf cumulative variance and multiple correlation coeficients for each equation.

| | Cumulative variance | Multiple correlation coefficient |
|---|---|---|
| DEPTH | .404 | .636 |
| TEMPERATURE | .621 | .785 |
| SALINITY | .559 | .742 |
| % GRAVEL | .252 | .499 |
| % SAND | .307 | .546 |
| % MUD | .479 | .685 |

Table 6.10

A summary of slope cumulative variaance and multiple correlation coefficients for each equation.

| | Cumulative variance | Multiple correlation coefficient |
|---|---|---|
| DEPTH | .569 | .747 |
| TEMPERATURE | .519 | .712 |
| SALINITY | .169 | .413 |

islandica) of lesser significance. Fig. 6.17a shows a large amount of horizontal scatter and reflects the inability of the majority of the shelf assemblages to predict accurate values of gravel %. Figs. 6.17b & c show lesser scatter and increased predictive ability.

Relationships to % sand are summarized in Table 6.7. Factors 3,5 and 6 (Globobulimina auricalata, Trifarina angulosa and Eggerella advena assemblages, respectively) are significantly related at the 0.001 level and factor 2 (C. lobatulus) at the 0.01 level. As for the gravel analyses, only low values are seen for the cumulative variance. Fig. 6.18a shows generally large amounts of horizontal scatter and, overall, a poor predictive ability of shelf stations with respect to % sand. Figs. 6.18b,c,d show less scatter and increased predictive capability; Fig. 6.18e,f, on the other hand, display relatively large amounts of scatter and reflect lesser significant relationships.

Four shelf assemblages display significant relationships (0.001 level) with % mud (Table 6.8) with reasonably high cumulative variance and multiple correlation coefficients. Figs. 6.19b & c show relatively good predictive ability compared to 6.19g & h and 6.19a. These reflect the overall regression statistics in Table 6.9.

Factor assemblages 2 and 3 appear to be most significantly related to % mud. Inverse relationship of factor 2 is to be expected considering its occurrence and previously described relationship to more sandy substrates. Factor assemblage 3 (G. auriculata), a central basin assemblage, is positively correlated to % mud and this may be a response to the higher organic carbon content of the muds. This particular aspect will be discussed in a later section.

## 6.6. Discussion of the Regression Results

The previous section determined the relative usefulness of each assemblage in predicting values of a particular environmental variable. The success of each equation in accounting for the observed original information is summarized in Tables 6.9 and 6.10. They show the final cumulative variance and multiple correlation coefficients for each equation. It is clear that around 75% of the original temperature and salinity information was explained by the model: over 60% of the depth and mud as well as approximately 50% of the gravel and sand information. Perfect linear relationships (one to one correspondence) between observed and predicted values would be manifest in 100% explanation. Random errors, both in the environmental observations and the assemblages, account for part of the "non-explanation" i.e. non-linearity, but not for all. Imbrie and Kipp (1971) showed that their estimates were slightly more precise with a curvilinear solution. The fact that this solution did not substantially improve their estimates, together with the nature of the environmental data available and the somewhat obscure ecological meaning of the curvilinear model, as mentioned earlier warranted the use of the more robust linear solution in this study.

The deviations from linearity are best explained with reference to other environmental variables, both measured and unmeasured. Many works (Douglas, 1978; Lohmann, 1978) have shown the subtle nature of intercorrelations between environmental variables and assemblages, i.e. an assemblage generally occurs within a certain environmental variable's limits but may sometimes be found outside of those limits if some other aspect of the environment locally overrides the importance of this particular variable (therefore reducing the linearity of the relationship).

Substrate characters consistently have greater amounts of unexplained information (or non-linearity), substantiating the well documented lack of dominant substrate-assemblage relationships. In fact, in this study, only one assemblage (*Cibicides lobatulus*) is controlled in its occurrence by substrate. Temperature, salinity, depth and to a certain extent percent mud, appear to be more important influences on assemblage distribution (possibly because of increased amounts of organic carbon in mud, implying abundant food and nutrients).

With this in mind, it is possible to discuss each assemblage in terms of the main environmental controls influencing its distribution; and any other feature of the environment that may affect this distribution to a greater or lesser degree. If these relationships are to be valid ecologically and have palaeoecological implications, then some concordancy with previous observations and studies is to be expected. The following chapter will investigate these aspects.

# CHAPTER 7: ASSEMBLAGE DISTRIBUTION CONTROLS : A SYNTHESIS

## 7.1 Introduction

The spatial occurrence and composition of shelf and slope foraminiferal assemblages on the margin off Nova Scotia were described in Chapter 3. It is the purpose of this chapter to discuss these distribution patterns in terms of their limiting controls, the significance of which were investigated in the previous chapter. Reference to figure 3.9 (summary map of shelf distribution) and figs. 3.16-3.23 (slope distribution) will aid in the following discussion.

## 7.2 Shelf Factor assemblages.

### Assemblage 1: Adercotryma glomerata.

The distribution of this widespread assemblage, dominant in the northeast shelf areas of this study, is probably controlled by temperature. It shows no significant relationships with any other of the measured parameters. The temperature dependance of this assemblage is clear also from its distribution on banks, basins and nearshore areas that vary in depth and substrate. Temperature limits for this assemblage are from, 1.8 oC to 3 oC. Salinity varies from 31.3 o/oo to 33 o/oo. The main species from this assemblage have previously been found on the Labrador shelf and in the Canadian Arctic (Vilks, 1969, 1980, 1982), in waters with temperatures of 2-4 oC and salinities of 31-34 o/oo. Leslie (1965) reported their occurrence in the Hudson Bay, in waters of similar temperature but with lower salinities. Similarly, Schafer and Cole (1978) described their occurrence in Chaleur Bay in estuarine conditions of low salinity (28-31o/oo) and temperature (2-4oC). The wide salinity tolerance of species in this assemblage is further shown by their occurrence under normal marine waters (34-35o/oo) of the Newfoundland slope (Schafer and Cole, 1982) and on the Grand Banks; (34o/oo, 3oC; Sen Gupta, 1971). Both Osterman and Kellogg (1979) and Milam and Anderson (1981) have documented Antarctic occurrences in very cold waters (0-1 oC) and variable salinity. Rodrigues and Hooper (1982) recently recorded the dominance of this type of assemblage under waters of similar temperatures and salinities (in fact under the same watermas type) just to the north east of the present study area in the Bay of St. Lawrence.

The occurrence of this assemblage as documented in the literature seems to comply with the data presented in this study and indicates that temperature is the primary control, salinity being relatively unimportant. Palaeoecological implications of its occurrence at depth in piston cores from this area (Scott, 1982; pers. comm.) and the Newfoundland shelf (Mudie and Guilbault, 1982) will be discussed later.

Assemblage 2: <u>Cibicides lobatulus</u>.

This inner shelf (nearshore) and bank assemblage is one of 2 assemblages in this study whose controlling influence appears to be predominantly substrate character. Its most significant, direct relationship is with percent gravel and sand (therefore inversely related to percent mud). Thus it also shows a good relationship to water depth, which controls sediment texture; it occurs on sandy gravel banks where the water is shallow as opposed to deep mud filled basins which offer no attachment surfaces. Some relation to temperature is observed in this study (ranges from 4-8.5oC) and is presumably due to a high tolerance of temperature range. The salinity relationships seen may be a response to the fact that substrate (preferred) availability is essentially restricted to nearshore waters and corresponding low salinities.

Cibicides lobatulus has a world wide distribution and its occurrence has previously been related to substrate (Phleger, 1952; Parker, 1952; Sen Gupta, 1971). It has been described on the eastern U.S. shelf and off Maine (Cushman, 1931); the Georgia continental shelf (Sen Gupta and Kilbourne, 1976); and from the North Carolina continental shelf (Schnitker, 1971). On the eastern Atlantic continental shelf, Murray (1973) has recorded it in the Celtic Sea; Haman (1966) from Tremadoc Bay, North Wales, and Serjup (1981) from the Norwegian continental shelf. Other occurrences include Halifax Harbour (Gregory, 1971); Long Island (Akpati, 1975); St. Margarets and Mahone Bays,(Bartlett, 1968) and in the Ross Sea, Antarctica (Osterman and Kellogg, 1979). In the Bay of St. Lawrence to the north of this area this assemblage is similarly associated with substrate type and large annual range in temperature and salinity (Rodrigues and Hooper, 1982)

Its occurrence in the North Atlantic from the Georgia shelf to Arctic waters implies, as observed in this study, that there is no significant relationship between its distribution and temperature. In the references mentioned above it is reported for salinities ranging from normal marine to estuarine which also indicates that salinity is not a major controlling influence.

This assemblage then, exhibits strong relationships to the nature of the substrate, occurring upon gravel or coarse sandy bottoms. This appears to pertain to its distribution on a global scale.

Assemblage 3: Globobulimina auriculata.

This central shelf basinal assemblage occurs throughout most of Emerald, LaHave and Roseway basins. It is more diverse when compared to the other assemblages described above. Its most significant relationships are with salinity, percent mud and depth. No direct association with temperature is seen in the study area. The assemblage is usually found in sediments of 70-100% mud composition, under waters of 5-12 oC and 34.5 o/oo.

The main species in this assemblage (Globobulimina auriculata, Bolivina subaenariensis and Nonionellina labradorica) have been reported widely in the literature. They occur in the Bay of St-Lawrence (Hooper, 1975), on the Grand Banks of Newfoundland (Sen Gupta, 1971), in Long Island Sound (Parker,1952; Murray, 1969), on the shelf off Massachussets (Kaefelesciou, 1975), on the North Carolina continental shelf (Schnitker 1971), on the Florida-Hatteras slope (Sen Gupta and Strickart,1982), and on the Norwegian shelf (Sejrup, 1981). These occurrences, together with those documented by Culver and Buzas (1981) cover a wide latitudinal range and therefore imply a general independence of temperature control. Similarly, all these works document occurrences in essentially normal marine waters (34-35o/oo). Both these tendencies are apparent on the Scotian shelf. It appears that this central basin assemblage requires normal marine salinities (34-35o/oo) which may partly explain why it does not occur in the basins to the northeast of the study area which have salinities of about 31-33o/oo). The higher salinities in the central basin area of the shelf are directly due to the influence of the slope water (Warner, 1970) and in this way, shelf assemblage 3 reflects the areal extent of this slope water incursion on to the continental shelf. The significant relationship between this assemblage and mud content implies other controlling influences acting in conjunction with salinity. This is probably a function of increased amounts of organic carbon in these sediments (Vilks, 1976) and other nutrients (Fournier *et al*, 1978) which are advected, mixed and moved onto the shelf in this area. Sen Gupta and Strickart (1982) and Sen Gupta *et al* (1981) have previously documented large amounts of *Bolivina subaenariensis* co-occurring with high mud and organic carbon content samples in nutrient enriched waters which result from Gulf Stream upwelling. Similarly, Miller and Lohmann (1982) and Mullineaux and Lohmann (1981) find *Globobulimina spp.* associated with sapropelic sediments. The high species diversity in the present study area would also be explained by the higher productivity in the surface waters. Previous work then, support the present contention of a salinity/nutrient control of shelf assemblage 3.

Assemblage 4: *Saccammina atlantica*.

This assemblage, which is composed entirely of agglutinating forms is found peripheral to the northern boundary of assemblage 3 in the central basins. It is remarkable for its apparent lack of significant controlling influences in the study area (or at least of those investigated in this study). Consistent with these observations is the fact that the main species: *Saccammina atlantica*, *Reophax scorpiurus* and *Cribrostomoides jeffreysi* have been reported from a wide range of salinities, temperatures, depths and substrates including the Georgia shelf (Sen Gupta and Kilbourne, 1976); Rhode Island Sound (Belanger, 1976); Buzzards Bay, Vineyards Sound (Murray, 1968,1969); Chaleur Bay (Schafer and Cole, 1978); Florida Bay (Bock, 1971);the mid- atlantic bight (Ellison, 1977);Labrador slope (Schafer and Cole, 1982); Lake

Melville and Labrador shelf (Vilks et al, 1982). Clearly, these occurrences ranging from sub-tropical to arctic or brackish waters to fully marine, require other environmental explanations than the ones investigated hitherto.

Assemblage 4 lies peripheral to assemblage 3 and from the factor score matrix (appendix II), it appears that if the dominant components of assemblage 3 are removed (i.e. G. auriculata, N. labradorica, B. aculeata, B. marginata and I. teretis), the dominant species as observed in assemblage 4 would now be dominant. Thus the selective removal of these components (of assemblage 3) either by transportation or dissolution could produce the observed assemblage 4. Dissolution on the shelf will be discussed in a later section. Transportation is a stronger option with complete removal of the calcareous species from these peripheral areas and redeposition in deeper parts of the basin being possible. This kind of effect is well documented by Murray (1969) and Haynes and Whatley (pers. comm. 1981) as occurring on a large scale in the Celtic and Irish Seas. The idea is supported by the fact that the remaining assemblage has an underlying presence (ie. a background presence in the surface samples) in the deep basinal assemblage 3.

If transportation did produce the observed patterns however, one would expect at least some of the calcareous species to remain in the depleted assemblage. In particular, those species which, to be removed, would require different traction velocities (i.e. transportability in assemblage 3 differs from species to species; compare, for example, the species G. auriculata or N. labradorica to B. subaenariensis and I. teretis; these two groups are clearly different in terms of their operational sphericity which, according to Kontrovitz 1977, defines their susceptibility to transportation). Similarly, one would expect some presence of shallower nearshore species (e.g. C. lobatulus) in both assemblage 3 an 4, if transportation was responsible. This is not observed.

The most probable explanation for the distribution of this assemblage is that it occurs in an area of intense temperature and salinity gradients. Shown by MCLellen (1957), these gradients are present to a greater or lesser degree year round (Warner, 1970). They are a result of the slope derived central basin waters being in juxtaposition with the Labrador surface and St. Lawrence waters. This results in temperature gradients ranging from 10°C in the basins to 1.8°C in the northern periphery, with salinity varying from 35°/oo to 32°/oo. These gradients presumably preclude the basin assemblage 3 on the basis of adverse salinity conditions (see previous pages) and assemblage 1, because of adverse elevated temperatures.

The ecological niches made available by the non-occurrence of these assemblage 1 and 3 are filled by assemblage 4, the components of which are, judging by the cited literature, rather opportunistic in nature. Further work is needed to determine whether this assemblage can be used in palaeoecological studies to trace the occurrence and spatial fluctuation of this watermass boundary in Pleistocene to Recent deposits.

### Assemblage 5: Trifarina angulosa.

This assemblage is persistently present in the shelf break region. Temperature ranges from 8.5-10°C, with salinity constant at 35°/oo. Significant relationships are evident between occurrence, salinity and depth; there is a lesser correlation with % sand and inverse relationships with % mud. No apparent dependence on temperature is seen in this study. Again, these observations are consistent with previous documentation. The main components of this assemblage have been described from the warmer waters off the southern United States (Schnitker, 1971; Ellison, 1977) to cold arctic waters (Vilks *et al*, 1982), antarctic waters (Osterman and Kellogg, 1979; Milam and Anderson, 1982) and intermediate areas (Murray, 1969; Schafer and Cole, 1978). Consequently, no temperature dependence is implied or has been observed in the present study. All these previous occurrences, however, are associated with normal open marine conditions of salinity. Similarly, many are associated with shelf edge locations or areas of upwelling. The main controls influencing the distribution of this assemblage appear to be salinity in concert with high nutrient content and productivity (produced through upwelling along the shelf edge).

### Assemblage 6: *Eggerella advena*.

Restricted to Chedabucto, Gaberous, Mahone and St. Margarets bays and to shallow banks off Sable Island, this assemblage shows no significant correlations with temperature or salinity. Its main correlations are with depth, percent sand and, inversely, with percent mud. The observations made in this study are consistent with those reported in the literature. Schafer and Cole (1978) have described similar assemblages from estuarine deposits noting optimum substrate conditions as being well sorted fine sands (i.e. as in this study). Similarly, Bartlett (1964) noticed a depth dependency in St. Margarets and Mahone Bay, and a similar association is seen in the present study. Several works have described the presence of the main species of this assemblage in warmer, more southern waters (Schnitker 1971, North Carolina shelf; Ellison 1977, Mid-Atlantic Bight; Parker 1952, Long

Island Sound; Murray 1969, Cape Hatteras; Sen Gupta and Kilbourne 1976, Georgia shelf). The main species have been recorded from fully marine to brackish waters (Vilks 1982). The temperature and salinity independence recorded in the literature is thus consistent with present observations.

Assemblage 7: *Islandiella islandica*.

This assemblage is completely dominated by *Islandiella islandica* and is prevalent on isolated outer banks and shallow depressions on the shelf. It appears to replace factor 2 *Cibicides lobatulus* in these areas and is not an important faunal component on the shelf. Its most significant relationship (0.001) is to percent gravel and in this respect, is similar to *C. lobatulus*. The live data in this study imply an "in situ" assemblage on a coarse sand/gravel substrate, and is further implied by the lack of occurrence of elements of this assemblage in the central shelf basins of this area. This assemblage has been described on the sandy banks to the north of this area and under similar temperature and salinity conditions (Sen Gupta, 1969).
One question concerning its distribution remains. Why is it that this assemblage is not associated in some parts with *C. lobatulus*? (Raw data or factor score matrix). It is predominantly monospecific in its occurrence. One would expect some amount of *C. lobatulus* in light of their similar substrate requirements. Competition edge seems unlikely as this species does not have a widespread occurrence on the shelf. On the other hand, *Islandiella islandica* does form a small portion of the factor 2 *Cibicides lobatulus* assemblage. The most likely explanation for this is local transportation of the tests within the bank environment, concentrating large amounts of *I. islandica* in small areas. This local transportation effect would explain the observation of live

I. islandica in parts of the assemblage. That the transportation is local is indicated by the non-occurrence of the species in the basins. The available data thus implies that factor assemblage 7 is a local variation of the Cibicides lobatulus assemblage produced through local transportation.

Assemblage 8: Elphidium excavatum f. clavata.

In view of the fact that this assemblage was earlier described as relict and transported, the regression results, showing a relationship to temperature and salinity, appear anomalous. The ragged, worn and size sorted nature of the tests is a testament to their relictness as is the complete lack of live representatives. Previous reports of its occurrence show that it is predominantly a cold water, restricted salinity species (Vilks 1979, 1982). More recent work, however, documents a broader range of salinity (Miller et al 1982, Mudie et al in press). Further discussion on the distribution of the relict components of this assemblage on the shelf and slope will follow later. It remains to explain here the apparent correlation to temperature and salinity values.

The observed response may be to the sub-dominant but "in situ" live occurrence of Fursenkoina fusiformis, a form previously described from waters of similar temperatures and salinities, 6-8 °C, 34 °/oo (Schnitker 1971; Ellison 1977). The restricted occurrence of the whole assemblage to a small area on the shelf overlain by waters of consistent temperature and salinity values may also explain in part the observed relationships. It is most likely a combination of these two effects that is responsible for the observed correlation.

## 7.3 Slope Factor assemblages.

### Assemblage 1: Uvigerina peregrina.

This slope assemblage consistently peaks at 1600 m. within the study area. Its total depth range is 800 m. to 2500 m. Regression analysis reveal significant relationships to temperature, depth but not with salinity. The temperature optimum for this assemblage is 4oC. This is consistent with optimum values of 3-4oC for the occurrence of this species throughout the North Atlantic (Streeter 1973). Uvigerina peregrina has been reported from many depths and is marked by its apparent inconsistency in this respect. Miller and Lohmann (1982) for example, observe its occurrence off the U.S. continental margin at 1000-2000 m.; Cushman (1913-31) observes its presence at 200-4000 m.; Phleger (1942) and Phleger and Parker(1951, off the Gulf of Mexico) at 300-4000 m.; Pflum and Frerichs (1976) at 300-1500 m. and Lohmann (1978) in the South Atlantic at 2000-4000 m.

This depth inconsistency and the fact that the species has been associated with colder (less than 3oC) deoxygenated waters (Streeter and Shackleton, 1979) led Miller and Lohmann (1982) to conclude that temperature was not the most important limiting control on the species distribution. This assumption is, at the outset, unwarranted. The fact is that Uvigerina peregrina has rarely been associated with waters warmer than 4oC. Thus, it appears that the species has an upper temperature limit below which it may grow and reproduce. That the species is related to, and to some extent, controlled by organic carbon content (Miller and Lohmann, 1982) and low oxygen values (Streeter and Lavery, 1982) is not in dispute here; this association being described many times. Although the present study has no organic carbon/oxygen content data available, previous work has shown that below 1300 m. there is an oxygen minima (Gatien, 1970) and below 600 m., the proportion of silt and clay in the sediments increases (Hill, 1981). This implies, in a qualititative way, some correlation with low oxygen, and high carbon content. However, if these were the primary limiting controls of the distribution of this species, one would expect to find its occurrence in large numbers in the organic carbon-rich (Vilks and Rashid, 1976), low oxygen sediments and waters prevalent in Emerald and LaHave Basins. That this is not observed may be due to a primary temperature control i.e. basin waters at 7-10°C are too warm for U. peregrina.

Further work documenting the occurrence of this species and its covarying environmental parameters is required before significant conclusions can be reached concerning its palaeoenvironment.

Implications to palaeoceanographic studies will be discussed in the next chapter.

### Assemblage 2: Bulimina exilis.

This diverse calcareous assemblage is restricted to upper slope depths (400-800 m.). Regression analysis revealed significant relationships only to depth. It occurs under normal marine salinities in warm slope waters (35°/oo; 6-9°C). The main components of this assemblage have been previously documented from areas to the South: N-E continental shelf of the U.S. (Phleger,1942); the Massachussetts shelf (Parker, 1948); Gulf of Maine (Faas, 1971); and from the areas North of the present study area: the St. Lawrence (Vilks, 1968); the Tail of the Grand Banks (Sen Gupta, 1971); and in Chaleur Bay (Schafer and Cole, 1978); i.e. in waters colder and warmer than the present waters. All of its previously reported occurrences are from normal marine waters.

Bartlett (1964) described occurrences of the main species (Bulimina exilis) from the nearshore area within the present study limits. Therefore, neither temperature or depth appear to be limiting parameters. In the present study, B. exilis is found also at shallow shelf depths as a subdominant component of the Central basinal assemblages.

Further data is required to evaluate the significance of this assemblage on the slope. However, its occurrence on the shelf in the warm nutrient-rich basins and along the Eastern shore (Bartlett, 1964) in an area of upwelling, together with its main occurrence on the upper slope under some highly productive surface waters, implies that nutrient availability in some part controls this assemblages occurrence. This would also explain the high values for diversity in this area.

### Assemblage 3: Trifarina occidentalis.

A very restricted occurrence (about 3 samples) in several upper slope regions renders this assemblage difficult to interpret. It shows no relationship to any of the measured parameters. It seems to be similar to the B. exilis assemblage in composition but is less diverse. Until further slope data is available, no valid conclusions can be made concerning its role in the slope environment.

### Assemblage 4: Elphidium excavatum f. clavata.

This assemblage has a large depth range on the slope and occurs in transects A and C. It appears to be the slope equivalent of shelf assemblage 8 and shows a significant relationship to salinity only. The shelf occurrence of the main species of this assemblage has been shown to be relict and in some areas, transported. This was based upon the ragged and worn nature of the test and the lack of live representatives. Diameter size data revealed the possibility of transportation from a source area in the Scotian Gulf to the southwest approches of Emerald Basin. It is necessary now to discuss its overall distribution in terms of the causal factors.

It is unlikely that the slope assemblage *E. excavatum* is in place, in equilibrium with its present environment. Streeter and Lavery (1982) however, decided their *E. excavatum* fauna was in place on the basis of a recorded instance (Matoba, 1976) of slope living *Elphidium batialis*. Similarly, Schafer *et al* (1981) reported the presence of live *E. excavatum* off the Newfoundland slope but concluded that they were displaced into the slope environment where they continued to live as adults.

The main problem is to adequately explain its presently observed distribution. On the shelf, reworking and transportation have been invoked to explain its occurrence, the mechanism for this probably being the effect of several storm events. It is possible that these same storms put *E. excavatum* into suspension in the surface layers, with subsequent transportation seaward and slopeward by the net southward surface current. Settling through the water column would allow deposition on the slope adjacent to the source area in the Scotian Gulf. The fact that this assemblage is dominantly present in transect A, i.e. adjacent to the Scotian Gulf, would tend to support this, but does not explain its presence, although subdued, in transect C which is not adjacent to a shelf source. One would also expect significant amounts of the shelf edge fauna to be displaced, and this is not observed to such a degree.

A more likely possibility is the reworking and subsequent transportation and deposition of relict Emerald silt-type deposits on the upper parts of the slope. The occurrence of such deposits has been documented by Stanley et al (1972) and has previously been described as a source for relict E. excavatum (Vilks, 1976). This process, together with cross-shelf transportation in the Scotian Gulf area, could explain the observed distribution. More data is clearly needed to evaluate the degree and extent of this reworking. This will be discussed in a later section.

Each assemblage, then, has been summarized in terms of its environmental controls as indicated through the regression analysis. The next chapter will discuss the relative importance of other aspects of the environment not considered quantitatively in the work so far, and then present a unified assemblage/environment model.

# CHAPTER 8: ASSEMBLAGE DISTRIBUTION CONTROLS: A DISCUSSION

## 8.1. Introduction

The work so far has determined the spatial occurrence of foraminiferal assemblages and related them statistically to various measured aspects of their environment. There are however, several other potentially important aspects of the marine environment which have not been measured in this study and have only been qualitatively described in previous sections. It is the purpose of this section to define and discuss the relative importance of these environmental parameters and arrive at a unifying model concerning assemblage-environment relationships within this study area. Subsequent to this, chapter 9 will consider implications of these results for Pleistocene to Recent studies on the Eastern Canadian continental margin.

## 8.2. Qualitative factors

An earlier section made reference to the community approach in palaeoecology and listed several features of an environment that control the taxonomic composition of an assemblage. Features not directly considered in this study include: space, light, trace elements, pressure, dissolved gases, nutrients, calcium carbonate availability and predation. There is thus a possibility that some or all of these may be more directly responsible for foraminiferal distribution within the study area than the measured depth, temperature, salinity and substrate characters. At the least, it is probable that the nutrient and other factors have a minor effect. Some of them have been considered indirectly.

Light and pressure are a function of depth, so the effect of light is probably not that great in this area because of the occurrence of several assemblages in this study area in waters deeper than the photic zone. However some assemblages may in an indirect way be related partly to light, the Cibicides lobatulus assemblage for instance is significantly related to depth and substrate. It was observed earlier that the depth relationship was probably a response to the occurrence of suitable substrate at shallow depth only. However, part of this relationship may be due to the availability of light. Similarly, occurrences of certain types of algae and seaweeds are light-related and these also provide attachment surfaces for Cibicides lobatulus.

Hydrostatic pressure is not often considered as a directly limiting influence on foraminifera. It is known that at depth, pressure restricts the availability of $CaCO_3$ with resulting increase of agglutinating fauna. Belanger and Streeter (1979) considered the difficulties in evaluating the distribution effects of pressure on foraminiferal assemblages. They believed that temperature and pressure together regulate the occurrence of Planulina wuellersdorfi in the Atlantic. That these pressure-related effects should be studied more is indicated in Wirsen and Jannasch (1975) who record the effects of increased pressure on the metabolism of most micro-organisms. No pressure relationships are envisaged in the present study due to the observed independence of most assemblages to depth, etc.

Another aspect of the environment omitted in the regression analysis was dissolved gases, in particular the $O_2$ content of the overlying waters. Lohmann (1979) and Streeter and Shackleton (1978) pointed to the importance of $O_2$ (and temperature) as a control in deep sea distribution; Belanger and Streeter (1980) however, believe that the relationship may be only indirectly linked. They refer to Hessler and Sanders (1969) observation that $O_2$ has not been previously recorded as a limiting parameter in other deep sea biological studies. Douglas (1977) recorded a restriction of macro-benthos and removal of predatory pressure with low $O_2$ values (anoxic conditions) and consequent benefits for foraminiferal abundances.

Much speculation exists on the position of foraminifera within the trophic structure of the marine benthos. Unfortunately however the speculation is for the most part not corroberated by scientific documentation of the extent and selectivity that foraminifera are preyed upon. Buzas (1979) alluded to the scant nature of predation studies concerning foraminifera and documented some of the more recent works (Lipps and Valentine, 1970; Mageau and Walker, 1976; Buzas, 1978). Controlled experimentation on the effects of predation in the Indian River Florida, (Buzas, 1979) determined that deposit feeders at least, do not selectively feed on foraminifera and that foraminifera are ingested because of their occurrence in the meiofaunal size range. The present study has no data pertinant to predation effects. Macro-benthic activity on the margin off Nova Scotia does not seem abnormal even in the two areas of oxygen minima (lower slope and central basins) Mills and Fournier, 1979 (ie. restriction of macro benthos and removal of predatory pressure as described in Douglas, 1978). The lack of foraminifera however on large parts of Emerald and Sable Island Banks, previously explained with reference to the nature and mobility of the substrate may in part at least be an effect of predation by the large stocks of fish associated with these spawning and feeding grounds. Daniels and Lipps (1978) however concluded that foraminifera are not a significant food source for most fish in the Antarctic; that they might be important for smaller or juvenile fish is suggested in Buzas, 1979.

Nutrient availability has been subjectively discussed as probably influencing the composition and diversity of the shelf edge, upper slope and central basin faunae. That it is not a dominant factor is reflected by the high nutrient occurrences along the Eastern shore near Yarmouth, due to centrifugal upwelling (Garrett and Loucks, 1976) and circulation-induced upwelling along the Cape Breton shore, which are not characterised by major changes in the assemblages.

It is clear that most of the environmental parameters not considered in the regression analysis are unlikely to be the main causes for the observed foraminiferal distributions ($CaCO_3$ availability will be discussed later). It is also known however that complex interaction exists between environmental parameters and biological populations therefore no one to one relationships are likely to exist or indeed should be sought. This statistical study has shown, however, the environmental parameters that show a strong correlation with species distributions and are therefore probably important controlling aspects of these distributions. It is the sensitivity of the assemblages to these that provide insight to palaeoenvironmental studies.

## 8.3. Shelf and Slope Assemblages: Their controlling environment

In the context of the correlations mentioned above, the regression analysis allows a summary of the margin assemblages in terms of their limiting environments:

The temperature and salinity values of the impinging watermasses appear to be the main influence on the shelf. In particular, a distinct faunal and hydrographic boundary can be seen between the northeast of study area including Misaine, Middle and Canso Banks and Basins, and the Central shelf basinal areas of LaHave, Roseway and Emerald. The hydrographic boundary is between cold, less saline bottom waters from the St. Lawrence and Cabot Strait; and the warmer, more saline waters of slope origin. The associated faunal changes are from the *Adercotryma glomerata*, *Recurvoides turbinatus* and *Cribrostomoides crassimargo* assemblage (factor 1) to the *Globobulimina auriculata*, *Nonionellina labradorica* and *Bolivina subaenariensis*(factor 3). The former assemblage is restricted by a low temperature optimum and the latter, by a high salinity optimum. Both these statistically defined associations are consistent with the literature describing the species in other areas.

A shelf transition zone is recognized both in terms of the hydrography and fauna. To the northern periphery of the central basin area, observed temperature and salinity gradients for the bottom waters are high (i.e. 35-32 o/oo salinity and 9-1.9 oC). These gradients are present to a greater or lesser degree throughout the year (McLellen, 1957). The variable temperature and salinities in this area appear to preclude the occurrence of the *A. glomeratum* assemblage on the basis of adverse temperature and the *G. auriculata* assemblage on the basis of adverse salinity. The niches available appear to be taken up by the opportunistic *S. atlantica* and *R. scorpiurus* assemblage. The relationship to percent mud, observed for the central basins assemblage, is believed to be a function of increased amounts of organic carbon. This contention is further implied by the absence of this assemblage on the shelf edge where temperatures and salinities are similar but sediments are coarser with less organic carbon. Imprinted on this hydrographic (temperature and salinity) control of distribution is the occurrence of a temperature and salinity independent assemblage, Cibicides lobatulus, whose presence is dictated by substrate suitability.

Assemblages of the slope and shelf edge also appear hydrographically controlled but seemingly to a lesser degree than on the shelf, being influenced also by nutrients, productivity of surface waters, organic carbon and oxygen content.

## 8.4. Foraminiferal response to oceanographic variability

In most studies of benthic foraminiferal distributions it has been thought sufficient to determine, the relationship of assemblage and environment with little attention being paid to those aspects of foraminiferal physiology and metabolism that actually respond to these environments. This in part reflects the aims of the studies involved and the greater emphasis put on palaeoenvironmental rather than ecological or biological studies. In fact, knowledge concerning the life cycles, physiological needs etc. is minimal for all but a few well studied foraminiferal species.

Similarly, this study reveals dominant temperature, salinity and substrate controls of assemblage occurrences but did not investigate which aspects of foraminiferal biology is actually controlled. The most common explanation is that the assemblage occurs in that environment which provides optimum conditions for growth and reproduction. These optimum conditions give an assemblage an edge in competing for the limiting resources. This appears to be the case in the central basin complex where the presence of elements of the A. glomerata assemblage are extremely supressed by the more successful G. auriculata fauna. There is, however, an overall lack of elements of this central basin fauna in the northeast of the area. It has been suggested in this study that low salinity precludes the occurrence of the central basin fauna. Even so, its absence in total from all the Misaine Basins and its nearly complete absence elsewhere in the northeast is rather difficult to explain. Less nutrient flux compared to the central basins area and an more restricted bottom circulation in the Misaine basin areas may partly explain this aspect. Another reason that should be considered, especially in the light of the virtual absence of calcareous foraminifera in this area is that of calcium carbonate availability.

The literature suggests that active dissolution of calcareous tests in this area is not a possibility, the calcium carbonate compensation depth being present only at around 4000 m in this part of the Atlantic (Li et al, 1969; Broecker, 1974).

Many physico-chemical factors affect the solubility of $CaCO_3$ in sea water. Revelle (1934) used the mass law equation

$$[Ca^{++}] \times [CO_3^{--}] = k\ CaCO_3$$

in his discussion on the controlling influences of $CaCO_3$ solubility. These influences include: the Ca and $CO_3$ ion concentration; the value of a temperature dependant constant k. Both of these are in turn a function of salinity, temperature, hydrostatic pressure, amount of $CO_2$ and the concentration of hydrogen and hydroxyl ions (i.e. pH). From this it was suggested (Revelle, 1934) that $CO_2$ content in the water affected most the $CaCO_3$ solubility when dealing with near normal marine salinity. Sverdrup et al(1942) and Revelle and Fairbridge (1957) added to the discussion and concluded that a temperature increase would lower the solubility product of $CaCO_3$ and increases the $CO_3$ ions; similarly evaporation would increase the concentration of Ca ions and thus the carbonate alkalinity: Both these processes facilitate $CaCO_3$ precipitation. The converse, low temperature, lower salinity, no evaporation, increased amounts of dissolved $CO_2$ will surpress precipitation, which results in a lower availability of $CaCO_3$ for foraminifera.

Working in the Antarctic, Anderson (1975), Osterman and Kellogg (1979) and Milam and Anderson (1981) have suggested that ice cover restricts the normal uptake of $CO_2$ by photosynthesis, leaving greater amounts in the water and thus (from the above) decreasing $CaCO_3$ availability. In the Antarctic, high concentrations of $CO_2$ because of pack ice apparently lead to dissolution of hyaline tests.

Although it is clear from the above that the inter-relationships between $CaCO_3$ chemistry and temperature, salinity, pressure, dissolved $CO_2$ are complex (and thus difficult to evaluate in a study such as this), Greiner (1971) derived a simple model relating benthic foraminiferal distribution patterns to availability of $CaCO_3$. It is useful to discuss the distribution patterns observed in this study in terms of the above model and the above discussion on carbonate chemistry.

Chapters 6 and 7 have shown the association of the completely agglutinated assemblage A. glomerata with low temperatures and salinities ie. two factors that lower $CaCO_3$ availability. A lock at the winter ice cover in the present study area (Forward 1954; Cok 1970) shows a spatial occurrence similar to the limits of this agglutinating A. glomerata assemblage. Little is known concerning the chemical oceanographic results of this ice cover on waters off Nova Scotia. What is apparent is that the circulation within the Misaine Basin complex is restricted and would tend to accumulate any dissolved $CO_2$ that had not been taken up through photosynthesis. There is thus strong evidence that the absence of calcareous tests and the dominance of an agglutinating assemblage is a direct result of corrosive arctic derived waters, which at the least would give competitive advantage to these agglutinating forms. Further evidence is seenin the presence of planktonic foraminifera in the surface waters of this area (Aksu, pers. comm. 1983) and not in the bottom sediments. To the south west in the central basins calcareous forms dominate under warmer more saline ice free waters. A convenient test for this tentative hypothesis is seen in areas to the north of the present study, in particular in the Arctic. One would expect similar patterns in the more northern, heavily iced arctic waters. Carsola (1952) indicated a combination of low salinity, high $CO_2$ and low temperature as increasing the solubility of $CaCO_3$, and thus the prevention of calcareous tests. Arctic Bay foraminifera (Marlowe and Vilks 1963) show a dominance of agglutinate types in areas of low $CaCO_3$. Calcareous foraminifera however are present in the Arctic and form dominant populations under heavily iced areas (Lagoe 1979; Green 1960; Vilks 1969). All of these areas however are of normal salinity and, more importantly, lie in deeper well-circulating waters which would tend to remove excess $CO_2$ from an area; thus two factors that reduce $CaCO_3$ availability are lessened in their influence.

If this calcium carbonate dependence can be quantitatively evaluated, i.e. threshold levels of $CaCO_3$ availability above which hyaline tests can form without undue stress, etc., then it would add evidence to Greiners (1970) model concerning foraminiferal distribution. The latter work postulates that the progressive restriction of hyaline types is primarily governed by $CaCO_3$ availability, explaining their correlation to temperature and salinity. Bartlett (1966) studied the test composition of arctic, cool temperate and warm saline environments and noted a predominance of agglutinates in the Arctic, hyaline in the cool temperate and miliolids in the warmer saline. The cool temperate (hyaline) bay environments were from Tracadia Bay in the Northumberland Straits within the Bay of St. Lawrence, and therefore represented the same climate as in the present study area. The presence of hyaline types, and of the Cibicides lobatulus assemblage that occurs in the coastal zones to the north east can perhaps be explained as the result of its distribution in the seasonal, turbulent layer where greater amounts of $O_2$, less $CO_2$ and warmer summer temperatures predominate making $CaCO_3$ more available.

The lack of scientific study concerning the effects of increased $CO_2$ on $CaCO_3$ availability in this area renders conclusions regarding its control on foraminiferal distribution unwarranted. One can say, however, that this control is related to temperature and salinity characters and that the evidence suggests that certain oceanographic conditions to the north east (e.g. sluggish circulaton, heavy ice cover, less than normal salinity, etc) to prevail together, within this area, to determine the presence or absence (or supressed presence) of calcareous foraminiferal tests.

## 8.5 Diversity response to oceanographic variability.

In an earlier chapter, the observed trends in species diversity were described, illustrated and briefly discussed in terms of environmental influences. The results of this and the previous two chapters now allow further insight into these trends. Briefly, what has to be explained are the apparent associations of:

a/ low diversity (H(S)) and high equitability (E) with cold Labrador derived waters of less than normal salinity;

b/ low H(S) and low E with inner shelf areas;

c/ high H(S) and high E with warm slope derived waters in the central basin and shelf edge areas;

d/ low H(S) and low E with deeper slope, cool water environments.

In particular, it is hoped to discuss these in terms of their concordance with various ecological hypotheses of diversity, stability.

In order to explain lowered diversity levels on the shelf and slope of Georgia, Arnold and Sen Gupta (1981) examined three processes:

a/ reworking
b/ biotope overlap
c/ environmental control

Reworking has been shown to be a problem only in certain areas of shelf and slope off Nova Scotia and has been invoked previously (Chapter 5) to explain locally depress H(S) and E values. It does not, however, explain the general trends.

Similarly, biotope overlap could not explain these observed general trends. Each defined assemblage is statistically independent in terms of its distribution with the main assemblages involved having very few co-occurring species.

The observed diversity trends then, appear in some way related to environmental factors. With the community approach in mind, this is not surprising. It has already been assumed that certain environmental factors determine the number of species potentially able to live in a particular region; for the purpose of this study these are mainly temperature and salinity characters. Whether or not species become dominant within an assemblage depends upon their competitive ability with respect to the limiting resources. Clearly, the higher number of species (diversity) present in the central shelf basin and shelf edge areas is a function of the warmer, more optimum hydrographic conditions allowing the reproduction and growth of calcareous as well as agglutinating foraminifera. This also results in high E values. Similarly, the low H(S) values to the northeast, which are associated with colder arctic derived waters, are low because less species find optimum conditions. This latter aspect has been shown to be related to lower $CaCO_3$ availability and therefore greater physiological stress and the exclusion of $CaCO_3$-secreting foraminifera. High E values in this area would also imply a certain level of environmental stability for the well adapted species.

To a large extent, these observed patterns reflect Sanders (1968) and Slobodkin and Sanders (1969) hypothesis on environmental predictability and species diversity. They contend that predictable environments with "non-extreme physical properties" will be inhabited by a diverse, somewhat specialized population. Any change in the "predictability" of an environment could result in local extinction of specialized forms. To all intents and purposes, if both the central basin area (warm, saline) and the area to the northeast (cold, relatively fresh) are predictable environments, why then is one a high diversity area whereas the other is a low diversity area? Quite simply, and this is noted in Slobodkin and Sanders (1969), the predictability of an environment is not purely an environmental phenomenon, it is also dependent in part on the organism itself. In effect then, the physiological needs of calcareous foraminifera, i.e. the need to secrete $CaCO_3$, means that the northern area (cold, relatively fresh) is for this group an "unpredictable" environment. This exclusion of calcareous forms has lowered diversity in this area, whilst the agglutinates present have proceeded to become "biologically accomodated" (Sanders 1969) as seen in the high E values.

Further evidence of environment stability and its influence on species diversity is seen in the central basin area and its periphery. The peripheral assemblage (Factor assemblage 4, Saccammina atlantica) has been shown to occupy an environmentally unpredictable area of relatively intense temperature and salinity gradients (of locally fluctuating areal extent). This region is a buffer between the two dominant shelf waters and, as such, is prone to fluctuations in areal extent and intensity seasonally and otherwise (i.e. after storms, McLellen 1957; Warner 1970). This unpredictability then precludes to a large extent calcareous forms present in the basin which are presumably rather specialized and unable to compete with the opportunistic species (S. atlantica). This situation is also supportive of Connell and Slaters (1977) view which allows for an optimum amount of environmental variability, which enables opportunistic species to compete with specialized species (i.e. as in central basin assemblage Factor 3, Globobulimina auriculata where S. atlantica also occurs). At higher levels of disturbance (i.e. in the peripheral, high salinity, temperature gradients zone) opportunistic species (S. atlantica assemblage) dominate at the expense of more specialized species.

The low H(s) and E values of the inner shelf coastal stations are coincident with coarse substrates, turbulent high oxygen waters and are thought here to be a result of the inability of many species of foraminifera to cope with this kind of stress; the subsequent niche gap is occupied almost monospecifically by the *Cibicides lobatulus* assemblage which, through its attached mode of life is able to survive and reproduce very well in this environment. On the other hand the low H(s) and E seen in lower slope stations is probably a result of flooding of the assemblage through transportation of *Elphidium excavatum* again producing an almost monospecific assemblage. It is an important distinction to make then between areas which have a low diversity in response to physiological constraints and those areas which are low because of physical action of the environment.

In summary, the general diversity trends observed in this study are a function of imposed physiological stress related to overall hydrographic characters. These relatioships however, as seen in the above discussion are far from·simple, and any patterns observed are a result of the inter action of the factors discussed. The patterns seen in this study do seem to follow several hypothesis relating species diversity to environmental stability.

# CHAPTER 9: IMPLICATIONS AND APPLICATIONS OF THIS STUDY

This chapter considers the main ramifications of the present work for:

9.1. Ongoing investigation of Pleistocene to Recent deposits off Canada's eastern continental margin.

9.2. Future foraminiferal study in this area and elsewhere.

9.3. Interpretation of geologically older foraminiferal assemblages.

## 9.1. Implications for Pleistocene to recent studies off Eastern Canada.

One of the stated aims at the beginning of this study was to objectively synthesize present day assemblage-environment relationships and thus provide data for palaeoceanographic studies off the Eastern Canadian continental margin. The multivariate methods that have been used to attain this are the same as those employed by CLIMAP (1976) studies (Imbrie and Kipp 1971) which are concerned with the wider aspects of reconstructing the palaeoceanography of the Atlantic. Most of these studies (e.g. Imbrie and Kipp 1971; Molfino et al 1982) concentrate on information obrained from planktonic foraminifera. More recently, however, studies with similar aims and methods have been undertaken on deep water benthic foraminifera (Miller and Lohmann 1982; Lohmann 1978; Streeter and Lavery 1982; Belanger and Streeter 1981). These are for the most part restricted to deep sea investigations, with little attempt at examining (with similar methods) the continental shelf or neritic foraminiferal distributions. This is all the more surprising in light of the fact that the watermass and circulation changes that have taken place since the last glaciation will have had more effect on the nearshore sediments and fauna than the deep sea. Only Osterman and Kellogg (1979) in the Antarctic and more recently Mudie et al(1983) off eastern Canada have attempted palaeoceanographic studies of the neritic zone using CLIMAP methods.

The implications of this present study for palaeoceanographic investigation of the Pleistocene to Recent off Canada's eastern continental margin can only be considered in the light of current knowledge concerning this period of time.

Several workers have investigated the palaeoclimatic and palaeoceanographic history as represented in the sediments of the Eastern Canadian margin (Fillon 1976; Alam Piper and Cooke 1983, Mudie 1980). Using palynomorph data from Emerald Basin cores, Mudie (1980) has tentatively recognized several climatic phases from the last glacial event up until the present day. A glacial phase at 15-13 Ka. B.P. was followed by a later glacial phase of warmer waters (13-10 Ka B.P.). At 10-7 Ka B.P. occurred an early Holocene phase of rapid climatic warming with the closer proximity of tropical airmasses resulting in a stronger influx of warm saline waters over the Scotian shelf. The Holocene Hypsithermal phase followed (7-3 Ka. B.P.) and was a period of maximum climatic warmth. During this time period, other workers have shown an oceanographic cooling trend in the Labrador current (Fillon 1976; Alam 1979; Hill 1979). This cooling event is thought by Fillon (1976) and Alam (1979) to represent the increased influence of the shallow shelf component of the Labrador current. Finally, from 3 Ka to the present day, is a climatic deterioration phase due to cooler surface waters and possibly a further increase of the Labrador current influence (Mudie 1980).

At the present time, the margin off Nova Scotia lies at the limits of direct influence of the shallow shelf component of the Labrador current. An earlier chapter (chapter 1) described how its effect is presently squeezed shoreward on the shelf both by bathymetry and more importantly, by the slope waters intrusion. The results of this present work have shown how the broad hydrography is statistically reflected in the spatial distribution of benthic foraminifera on the shelf and thus provides the potential for further quantitative appraisal of piston cores and subsequent interpretation in terms of the most recent geological history off Nova Scotia.

The most convenient method to do this, considering the nature of the present data, would be to apply paleoecological transfer functions (Imbrie and Kipp 1971; Mudie et al 1983) to down core assemblages and from these to make quantitive estimates concerning depth, temperature and salinity. It is beyond the scope of this thesis to do this; however, some discussion is warranted on the nature of these core successions and what they may imply.

Core 80-004-33 provides foraminiferal data (Scott, D.B., unpub. data) from sediments within Canso Basin (fig. 9.1). A tentative interpretation of the foraminiferal successions observed is offered. The basis for these are the results of the present work, in particular the observed present day assemblage-environment relationships.

At the base of the core is an Elphidium excavatum f. clavata assemblage (assemblge I in fig. 9.1) almost monospecific and previously associated with adjacent ice margins (Vilks 1976). It is an assemblage such as this that has been recognized in an earlier chapter as being relict and reworked. Dates from nearby Emerald Basin cores put the time interval dominated by this assemblage at 15000 + 280 years B.P. (Vilks,

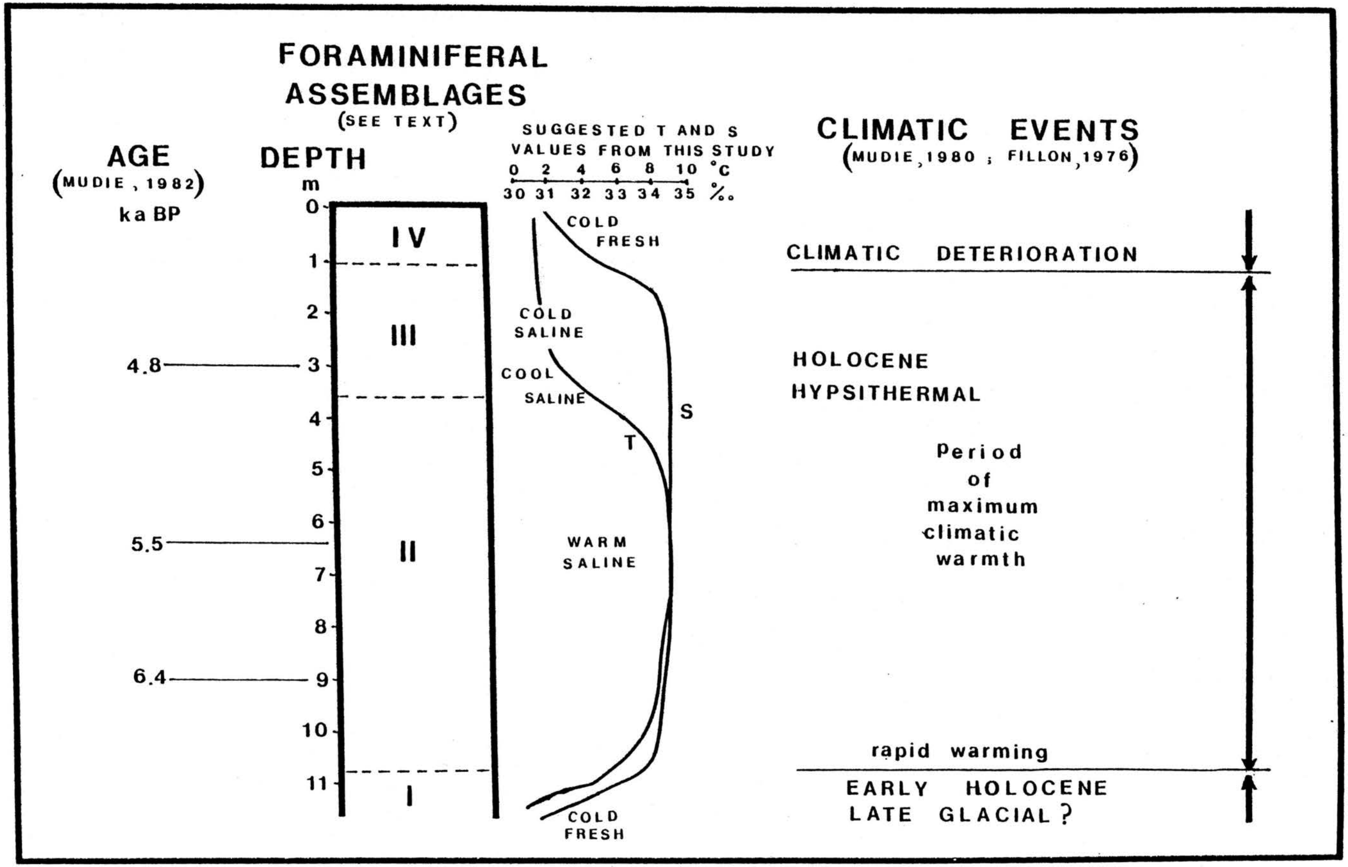


Figure 9.1 Summary diagram for core 80-004-33

1976) which, according to Milliman and Emery (1968) is when sea level was at its lowest stand. This fauna is replace above by a *Globobulimina auriculata*, *Nonionellina labradorica* assemblage (II in fig. 9.1) with some amounts of *Bolivina subaenariensis*. This assemblage presently occurs at the surface over a large part of the central Basin (Emerald and LaHave) and has in this study been statistically related to the normal marine (34-35°/oo) salinities and warmer waters (8-12°C) of slope origin that gain access through the Scotian Gulf. This assemblage is replaced up the core by an assemblage dominated by *Islandella teretis*, *Cassidulina reniforme* and *N. labradorica* (III in fig. 9.1). *B. subaenariensis* disappears and *G. auriculata* is severely restricted. A similar assemblage to this has been related to normal marine salinity (34-35°/oo) but rather cooler waters (3-4°C) by Mudie *et al* (1983) on the Labrador shelf to the North. At the top of the core (30-0 cm) this assemblage (III in fig. 9.1) is replaced by a modern day assemblage, (IV in Fig. 9.1) *Adercotryma glomerata* which is associated statistically to cold (1-2°C) and relatively fresh (31-33°/oo) waters of Labrador current origin.

The hydrographic changes then, as represented by the foraminiferal successions in this core, appear to be from cold (1-2°C) relatively fresh (29-31°/oo) waters; to warmer (6-9°C) more saline (34-35°/oo) waters; to colder (3-4°C) saline (34°/oo) waters and finally to colder (1-2°C) less saline waters (31-33°/oo).

The extent to which these oceanographic events fit into the framework described by Mudie (1980) from Emerald Basin cores can be illustrated with reference to the Canso core pollen data (Mudie 1982, pers. comm). This data, calibrated with the dates of Livingstone (1968), provide a working chronology (Fig. 9.1). It is clear, both from the age and pollon zonation that glacial and late glacial deposits have not been penetrated. The early Holocene, rapid warming phase (10-7 Ka.) is perhaps represented in this core by the warm saline assemblage (*G. auriculata*, *N. labradorica*). The Holocene hypsithermal phase (7-3 Ka), or period of maximum warming, is represented in the oceanographic record initially by a warmer saline assemblage (including *B. subaenariensis*) and progressively by a cold saline assemblage (*N. labradorica*, *C. reneforme*, *I. teretis*). This period of maximum climatic warmth at 5-6 Ka is coincident with Fillon's (1976) and Alam's (1979) oceanographic cooling events and is due to the increased influence of the shelf component of the Labrador current. The trigger for this increased cooling influence is presumably the dissipation of the northern ice volumes by the maximum atmospheric warming associated with the hypsithermal. Following this period is the climatic deterioration phase and is (3 Ka. - present) represented by the cold, relatively fresh assemblage *A. glomeratum*. The significance of this last phase still has to be thoroughly investigated. From this study, it is apparent that the assemblage IV in fig. 9.1 replaces the other (III in 9.1) cooler more saline assemblage (with *I. teretis*, *N. labradorica* and *C. reneforme*) because of decreased salinity. The impetus for this may be the overall climatic cooling trend that could have increased the temperature and salinity gradients between the Labrador influence and the slope water influence. Mixing of these two waters may, in the past, have been responsible for the elevated salinities in the northeast region and therefore for the *N. labradorica*, *I. teretis* fauna at depth in the core.

The synthesis above is rather simplistic and is meant only to describe in qualitative terms what is represented oceanographically by the observed piston core foraminiferal assemblages. What is required further is corroborative evidence from other cores at key sites on the shelf and slope off Nova Scotia. Application of biological transfer functions in the manner of Imbrie and Kipp (1971) and Mudie *et al* (1983) using the quantitative results of this study would provide quantitative estimates of palaeodepth, temperature and salinity values down these cores. Together with an accurate chronological framework, such an approach will provide valuable insight into the nature of the paleoceanographic changes marking the Pleistocene to recent interval off Eastern Canada.

## 9.2. Implications for future foraminiferal study.

Several interesting lines of investigation are available for further foraminiferal study within this area. Research could be well employed in a more detailed and systematic analysis of the three main shelf assemblages. The central basin assemblage (*Globobulimina auriculata*), its peripheral assemblage (*Saccammina atlantica*) and the northeast shelf assemblage (*Adercotryma glomerata*) are presently in equilibrium with the oceanographic conditions; a more rigorous definition of these limits and oceanographic controls using the same methods employed in this study would be invaluable for a more accurate palaeoceanographic study. Further study should involve several sample transects across these faunal boundaries together with the collection of alkalinity and $CO_2$ data which would determine if $CaCO_3$ availability really is a primary limiting control of these aforementioned shelf assemblages.

The number of statistically independent assemblages defined on the shelf (8) reveals the importance of an adequate sample control. Any lesser amount of samples would probably have failed to distinguish some of the smaller, but important assemblages such as the peripheral assemblage (S. atlantica), etc. Similarly, it was important to use multivariate methods in this study as consideration only of indicator species from this amount of samples would have proved rather inaccurate.

The recognition of transported and relict components of assemblages is important in any study. Their recognition in this study was made easier through a consideration of live foraminifera and a sieve size that retained juvenile components. The present work located and defined to some extent the degree of relictness and transportation on the shelf. Further work could consider this problem closer, paying particular attention to source areas of relict deposits. Effects of transportation of foraminiferal tests could be more systematically studied. An approach similar to that of Murray (1982) who found benthic foraminifera in the whole water column (following storms) in the southwestern approaches to the British Isles, is envisaged. Of particular interest would be the area known as the Scotian Gulf, southward down the slope and northward into Emerald Basin. Current meter measurements in this area (Hill 1982) have recorded several peaks of water movement throughout the year. These are storm related and are of sufficient velocity to put sand grains (and foraminifera) into suspension. An investigation designed to measure the degree and extent of any cross-shelf movement of foraminiferal tests in this area would be important for a more thorough understanding of the recent sedimentological and foraminiferal history of this area.

Finally, more slope transects would add to the comprehensive understanding of slope foraminiferal assemblages, their variability and limiting parameters.

## 9.3. Interpretation of geologicaly older foraminiferal assemblages.

Any palaeoecological study is essentially concerned with the reconstruction of the watermass, climatic and bathymetric history of the deposits. The direct application of the present day quantitative models to fossil populations is not theoretically valid for rocks older than Miocene (Douglas 1979); the stratigraphic base of many present day species. At the generic and familial levels, one would be able to go back to the late Cretaceous, and early Cretaceous respectively (Sliter 1972; Douglas 1979) these being the limits of direct taxonomic approaches.

Palaeoecological study based upon analogous or homeomorphic species assumes that neither the physiological needs nor the bathymetric habits have changed substantially with time. In view of the changing nature of the character of the worlds oceans (i.e. development of the psychrosphere in early Tertiary) and theories of speciation and evolution, these assumptions may be misleading. Blake and Douglas (1979) have shown that the depth limits of Melonis pompilioides have shifted during the Pleistocene to Recent, as a response to changes in the watermass depth limits. Similarly, Douglas (1979) summarized the results of Streeter (1973) and Schnitker (1974) who show the changing bathymetric distributions of Atlantic assemblages over several thousand years. These emphasize the caution required for palaeodepth interpretation.

The absence, presence and relative abundance of agglutinated foraminifera is perhaps a more useful tool for interpretation. Their usefulness in this respect lies in the inability of calcareous foraminifera to exist or compete successfully in chemical opposition to the environment (Greiner 1970). The recent distribution of agglutinated foraminifera dominated assemblages has been shown to have distinct depths, diversity and morphological characters (Scott _et al_ 1981) that have remained consistent through a long period of geological time. Gradstein and Berggren (1981) and Miller _et al_ (1982) have developed some useful palaeoecological models with this in mind. The use of calcareous assemblages is more difficult and prone to misinterpretation. Bandy (1960) realized the potential of convergent adaptation in palaeoecological interpretation, contending that morphological similarity is related to environmental affinity. Such a correlation of form and environment is seen in Pflum and Frerichs (1966) and Haq and Boersma (1977). The usefulness of buliminids and uvigerinids in this respect has been pointed out by Douglas (1979). Certainly, in this study, the size, shape and ornementation of buliminids varies with bathymetry. In shallow shelf depths (0-200 m.) the distinctive _Bulimina marginata_ and _Bulimina aculeata_ are the main forms. They are replaced at upper slope depths (250-800 m.) by _Bulimina exilis_ and finally, by _Bulimina striata_ at lower slope depths (1000 m. +).

In conclusion, consideration of all aspects of fossil foraminiferal populations, their diversity and equitability characters, the presence, absence or dominance of agglutinated types, including their morphology, etc, should be rigorously pursued in order to gain the most meaningful palaeoecological results.

# CHAPTER 10: CONCLUDING STATEMENTS

1. Examination of bottom grab samples taken from the continental margin off Nova Scotia revealed some 120 foraminiferal species. Seventy five of these occurred in abundances greater than 3% at any one sample.

2. Q-Mode factor analysis methods of Imbrie and Kipp (1971) delimited eight shelf and four slope statistically independent foraminiferal assemblages on the continental margin off Nova Scotia. The distributions of these assemblages are seen in figure 3.9. The raw data input comprised relative abundance values for the 75 main species (i.e. species making up more than 3% of the total in any sample) at 250 sample sites.

3. Comparison of the factor assemblages with the living foraminiferal abundance data shows that most of the assemblages are presently in equilibrium with the prevailing marine environment. Others were found to be reworked and or relict.

3. Multiple regression analysis shows that the principal shelf assemblages are significantly related to some aspects of the prevailing hydrography. The central shelf basin assemblage ( factor 3; _Globobulimina auriculata_ and other predominantly calcareous species) is controlled in its distribution by its apparent requirement of normal marine salinities, and to a lesser extent, to the higher temperatures associated with the impinging slope derived waters. The north east shelf assemblage (factor 1, _Adercotryma glomerata_ and completely

agglutinated) is significantly related to the cold, less than normal marine salinities of the inner margin Labrador current. This arctic derived water reaches its limit of continental shelf influence over the Misaine and Canso Bank-Basin area.

4. A transition assemblage (factor 4, Saccammina atlantica) is delimited by the factor analysis and occurs between the central shelf basin and the north east shelf assemblages. This assemblage occupies an area of steep temperature and salinity gradients associated with the boundary between the cold arctic derived waters and the warmer slope derived waters.

5. The observed response of the main shelf assemblages to the hydrography may in part be a function of decreased $CaCO_3$ availability in the arctic waters and the subsequent inability of hyaline foraminifera to secrete calcareous tests.

6. Imprinted on these main shelf distribution patterns are two substrate controlled assemblages (factor 2, Cibicides lobatulus; factor 7, Islandiella islandica). The nature of the substrate (coarse and gravelly sands) appears to locally override any importance of the hydrographic constraints.

7. Four measures of species diversity (H(s), S, E, $\alpha$) show essentially similar trends. Highest values are found along the shelf edge, upper slope and in the central basins. All these areas are overlain by warm, saline waters with high nutrient capacity. Low values of diversity are seen in the north east shelf and along the inner shelf

zone. These values appear related to low temperature, low salinity conditions. The low values along the inner shelf may be a result of the coarse substrate upon which only a few species can survive (eg. C. lobatulus). The lower slope area also has depressed diversity values which is probably due to dilution with a monospecific reworked assemblage (E. excavatum).

8. Several slope assemblages are recognised. An upper slope assemblage shows an association with depth and high water productivity (slope factor 2, Bulimina exilis). A lower slope assemblage (U. peregrina) appears to be associated with a narrow range of temperature and salinity conditions (2-4$^{C}$, 34-35$^{0}$/00).

9. The foraminiferal response to hydrographic conditions on the shelf off Nova Scotia has been shown to be statistically significant and has potential for further quantitative studies of the palaeoceanographic evolution of this area.

10. Using the results of this objective study, qualitative estimates of past temperature and salinity conditions have been made through an interpretation of the foraminiferal assemblages present in a core from Canso Basin. From the base of the core upwards oceanographic conditions change from cold fresh, to warm saline water, followed by cool saline, to cold saline and finally to cold fresh, water over a time period of 15 Ka to present (fresh being less than normal marine salinity, about 30-33.5 o/oo).

11. The indicated oceanographic sequences recognised above fit in

with previous palaeoceanographic interpretations and palaeoclimatic daata. It appears that the oceanographic history is a result of the interchanging influences of Labrador current and the Gulf Stream waters.

12. The data, observations and discussions reported in this thesis provides a suitable base for quantitative palaeoceanographic studies of the continental margin off Nova Scotia, and for future, more precise investigation of the present foraminiferal distributions.

# CHAPTER 11 SYSTEMATIC TAXONOMY

Many of the species present off Nova Scotia have been previously well described and documented. For this reason, it was thought unnecessary to include species descriptions in this study. Taxonomic problems are presently the subject of separate studies (Miller 1983). Classifications adopted in this study follow that of Loeblich and Tappan (1964).

The following chapter includes essential systematic data for the seventy-five species used in the statistical analyses. Reference is made to initial descriptions, subsequent nomenclatural changes, more recent documentation and illustration and to several plates which figure the main species found in this study. The photographs were taken with a scanning electron microscope. Reference is also made to forty-two other unfigured rarer species not used in the analysis. Reference slides are housed in the Department of Geology, Dalhousie Univesity, Halifax, Nova Scotia.

| | | |
|---|---|---|
| Superfamily | AMMODISCACEA | Reuss 1862 |
| Family | ASTRORHIZIDAE | Brady 1881 |
| Subfamily | HIPPROCREPININAE | Rhumbler 1895 |
| Genus | HYPERAMMINA | Brady 1878 |

Hyperammina elongata Brady

Plate 1 Fig. 1

Hyperammina elongata Brady, 1878, p. 433, pl. 20, figs. 2a, b; Parker, 1952, p. 395, pl. 1, fig. 10; Vilks, 1969, p. 42, pl. 1, fig. 4;

Gregory, 1971, p. 161, pl. 1, figs. 2, 3.

Distribution: Rarely living and often found broken this species is restricted to central shelf basin areas and middle slope regions.

### SACCAMMINIDAE Brady 1884

### SACCAMMININAE Brady 1884

### SACCAMMINA Sars in Carpenter 1869

### Saccammina atlantica (Cushman)

Plate 1 Fig. 2

Proteoina atlantica Cushman, 1944, p5, pl. 1, fig. 4; Phleger, 1952, p. 85, pl. 13, figs. 1, 2.

Saccammina atlantica (Cushman) Vilks, 1962, p. 43, pl. 1, fig. 13; Barbieri and Medioli, 1969, p. 853, pl. 1, fig. 4; Cole, 1981, p. 13, pl. 1, fig. 14.

Distribution: Dominant on the inner shelf, in assemblages 5 and 6. It occurs also in association with other agglutinated assemblages.

### Saccammina difflugiformis (Brady)

Plate 1 Fig. 3

Reophax difflugiformis Brady, 1879, p. 51, pl. 4, fig. 3a, b.

Proteoina difflugiformis (Brady) Phleger and Parker, 1955 p. 2, pl. 1 fig. 4, 5.

Saccammina difflugiformis (Brady) Todd and Bronniman, 1957, p. 52, pl. 1, fig. 15.

Distribution: Restricted to inner shelf assemblages 3 and 4.

Saccammina sphaerica Brady

Plate 1 Fig. 4

Saccammina sphaerica Brady, 1871, v. 7, p. 187; Barker, 1960, p. 36, pl. 123, fig. 11-15.

Distribution: Rare, not observed live and restricted to the inner shelf.

AMMODISCIDAE Reuss 1862

AMMODISCINAE Reuss 1862

AMMODISCUS Reuss 1862

Ammodiscus catinus Hoglund

Plate 1 Fig. 5

Ammodiscus catinus Hoglund, 1947, p. 122, pl. 8, fig. 1, 7; Gregory, 1971, p. 166, pl. 1, fig. 7.

Distribution: Not an important component in any assemblage, occurs mainly on sandy substrates.

LITUOLACEA de Blainville 1825

HORMOSINIDAE Haeckel 1894

HORMOSININAE Haeckel 1894

REOPHAX Montfort 1808

Reophax arctica (Brady)

Plate 1 Fig. 8

Reophax arctica Brady, p. 405, pl. 21, fig. 2a-b; Parker, 1952, p. 85, pl. 13, fig. 3; Gregory, 1971, p. 168, pl. 2, fig. 3; Cole, 1981, p. 22, pl. 16, fig. 22.

Distribution: Occurs mainly in assemblage 1. Restricted mainly to inner shelf areas on sandy and silty substrates.

### Reophax scotti Chaster

Plate 1 Fig. 11

Reophax arctica Chaster, 1890, p. 57, pl. 1, fig. 1; Gregory, 1971, p. 172, pl. 11, fig. 7; Cole, 1981, p. 26, pl. 2, fig. 17.

Distribution: Similar in occurrence to R. arctica although less abundant and more fragile.

### Reophax nodulosa Brady

Plate 1. Fig. 14

Reophax nodulosa Brady, 1879, v. 19, p. 52, pl. 4, fig. 7, 8; Cole, 1981, p. 25, pl. 4, fig. 7,8.

Distribution: Found mainly in central basin assemblage 3. Distinctive but easily broken.

### Reophax guttifera (Brady)

Plate 1 Fig. 10.

Lituola guttifera Brady, 1881, v. 21, p. 49.

Reophax guttifera (Brady) Brady, 1884, p. 295, pl. 31, fig. 10-15; Cole, 1981, p. 25, pl. 2, fig. 11.

Distribution: Mainly associated with central shelf basin assemblages.

### Reophax scorpiurus(Montfort)

Plate 1 Fig. 9

Reophax scorpiurus Montfort, 1808, p. 330; Loeblich and Tappan, 1953, p. 24, pl. 2, fig. 7-10; Leslie, 1965, p. 169, pl. 1, fig. 6, 7.

Distribution: Occurs on the periphery of the basin assemblage as a sub-dominant component of assemblage 4.

### LITUOLIDAE de Blainville 1825

### HAPLOPHRAGMOIDINAE Maync 1925

### HAPLOPHRAGMOIDES Cushman

#### Haplophragmoides canariensis (d'Orbigny)

Plate 1 Fig. 13

Nonionina canariensis d'Orbigny, 1839, p. 128, pl. 2, fig. 33.

Haplophragmoides canariensis (d'Orbigny) Cushman, 1910, v. 1, p. 101.

Distribution: Found mainly in central basin assemblage 3; apertural characters enable its distinction from C. jeffreysi.

### ADERCOTRYMA Loeblich and Tappan 1952

#### Adercotryma glomerata (Brady)

Plate 1 Fig. 16

Lituola glomerata Brady, 1878, v. 1, p. 433, pl. 20, fig. 1a-c.

Adercotryma glomerata (Brady) Loeblich and Tappan, 1953, v. 121, p. 26, pl. 8, fig. 1-4; Vilks, 1969, p. 44, pl. 1, fig. 15; Gregory, 1971, p. 173, pl. 11, fig. 9-11; Cole, 1981, p. 29, pl. 4, fig. 5-6.

Distribution: Most abundant in the north east of the study area. Dominant component of shelf assemblage 1, and occurs in basins and on banks.

### RECURVOIDES Earland 1934

### Recurvoides turbinatus (Brady)

Plate 1 Fig. 17

Haplophragmium turbinatus Brady, 1881, p. 50.

Recurvoides turbinatus (Brady) Parker, 1952, p. 402, pl. 2, fig. 23, 24; Vilks, 1969, p. 45, pl. 1, fig. 19; Gregory, 1971, p. 176, pl. 3, fig. 3, 4; Cole, 1981, p. 32, pl. 6, fig. 7,8.

Distribution: Essentially the same as A. glomerata.

## CRIBROSTOMOIDES Cushman 1910

### Cribrostomoides crassimargo (Norman)

Plate 1 Fig. 6, 7.

Haplophragmium crassimargo Norman, 1892, p. 17.

Labrospira crassimargo (Norman)Hoglund, 1947, p. 11, fig. 1, text-fig. 121-125.

Cribrostomoides crassimargo (Norman)Leslie, 1965, p. 158, pl. 2, fig. 2a, b; Barbieri and Medioli, 1969, p. 855, fig. 4; Gregory, 1971, p. 176, pl. 3, fig. 1, 2.

Distribution: Occurs mainly with A. glomerata in assemblage 1.

### Cribrostomoides jeffreysi (Williamson)

Plate 1 Fig. 12

Nonionina jeffreysi Williamson, 1858, p. 34, pl. 3, fig. 72, 73

Cribrostomoides jeffreysi (Williamson)Barbieri and Medioli, 1969, p. 855, fig. 4; Vilks, 1969, p. 45, pl. 1, fig. 17a, b; Cole, 1981, p. 30, pl. 6, fig. 6.

Distribution: Associated mainly with assemblages 3 and 4, and sandy/silty substrate.

*Cribrostomoides subglobosum* (Sars)

Plate 1 Fig. 15

*Lituola subglobosum* Sars, 1871, p. 253.

*Cribrostomoides subglobosum* (Sars)Cole, 1981, p. 31, pl. 4, fig. 13.

Distribution: Rare and confined to assemblage 1 and 4.

### CYCLAMMINAE Marie 1941

### ALVEOPHRAGMIUM Tschendrina 1936

*Alveophragmium scitulum* (Brady)

Plate 2 Fig. 6

*Alveophragmium scitulum* (Brady)Parker, 1952, p. 487; Barker, 1960, p. 70, pl. 34, fig. 11-13.

Distribution: Maximum occurrences in basin assemblages 3 and 4. Never a dominant component.

### CYCLAMMINA Brady 1879

*Cyclammina cancellata* Brady

Plate 2 Fig. 10

*Cyclammina cancellata* Brady, 1879, v. 19, p. 62; Cole, 1981, p. 12, pl. 5, fig2.

Distribution:Very rare, restricted to slope regions.

### LITUOLINAE de Blainville 1825

### AMMOBACULITES Cushman 1910

### Ammobaculites dilatatus Cushman

Plate 2 Fig. 1

Ammobaculites dilatatus Cushman. Cushman and Bronniman, 1948, p. 39, pl. 7, fig. 10-11; Schnitker, 1971, p. 193, pl. 1, fig. 7

Distribution: Restricted to basins and slope. Not very abundant.

## AMMOTIUM Loeblich and Tappan

### Ammotium cassis (Parker)

Plate 2 Fig. 2

Lituola cassis Parker in Dawson, 1870, p. 177, fig. 3.

Ammobaculites cassis (Parker)Cushman, 1920, p. 63, pl. 12, fig. 5.

Ammotium cassis (Parker)Loeblich and Tappan, 1953, p. 33, pl. 2, fig. 12-18; Gregory, 1970, p. 176, pl. 3, fig. 5.

Distribution: Restricted to inner shelf near-shore areas of silts and fine sands. Common in assemblage 6.

## TEXTULARIDAE Ehrenberg, 1838

## SPIROPLECTAMMINAE Cushman, 1927

## SPIROPLECTAMMINA Cushman, 1927

### Spiroplectammina biformis (Parker and Jones)

Plate 2 Fig. 5

Textularia agglutinans d'Orbigny var. biformis Parker and Jones, 1865, p. 370, pl. 15, fig, 23, 24.

Spiroplectammina biformis(Parker and Jones)Cushman, 1927, p. 23, pl. 5, fig. 1; Vilks, 1969, p. 45, pl. 1, fig. 20a, b; Gregory, 1970, p. 178, pl. 3, fig. 6; Cole, 1981, p. 34, pl. 6, fig. 3-4.

Distribution:Abundant in shelf assemblages 1 and 6. Present on both banks and basins, sands and silts.

### TEXTULARINAE Ehrenberg 1838

### TEXTULARIA Defrance in de Blainville 1824

### _Textularia torquata_ Parker

Plate 2 Fig. 4.

_Textularia torquata_ Parker, 1952, p. 403, pl. 3, fig. 9-11; Vilks, 1968, p. 18, pl. 1, fig. 10, 11; Gregory, 1971, p. 179, pl. 4, fig. 1, 2.

Distribution:Extremely small specimens, low in abundance. Restricted to arenaceous assemblages.

### TROCHAMMINIDAE Schwager 1877

### TROCHAMMININAE Schwager 1877

### TROCHAMMINA Parker and Jones 1859

### _Trochammina inflata_ (Montagu)

Plate 2. Fig. 12, 13.

_Nautilus inflata_ Montagu, 1808, p. 81, pl. 18, fig. 3.

_Trochammina inflata_ (Montagu)Parker and Jones, 1859, p. 347; Schafer and Cole, 1978, p. 29, fig. 1; Scott and Medioli, 1980, p. 44, pl. 3, fig. 12, 14.

Distribution: Restricted to northern periphery of central basins, not dominant.

The form of _T. inflata_ as seen in this study differs from the marsh forms described in Scott and Medioli (1980); the shelf forms lack an inner organic lining.

### Trochammina lobata Cushman

Plate 2. Fig. 15

Trochammina lobata Cushman, 1944, p. 18, pl. 2, fig. 10; Parker, 1952, p. 408, pl. 4, fig. 8a,b; Schnitker, 1971, p. 212, pl. 1, fig. 18; Cole and Furgerson, 1975, p. 14, pl. 4, fig. 5,6.

Distribution: Not an important component in any assemblage.

### Trochammina squamata Parker and Jones

Plate 2. Fig. 8, 9.

Trochammina squamata Parker and Jones, p. 407, pl. 15, fig. 30-31 a-c; Schafer and Cole, 1978, p. 29, pl. 5, fig.1; Scott and Medioli, 1980, p. 45, pl. 4, fig. 6,7.

Distribution: Restricted to shallow banks and in-shore areas.

### Trochammina globigeriniformis (Parker and Jones)

Plate 2. Fig. 14.

Lituola nautiloidea globigeriniformis Parker and Jones, 1865,p. 407, pl. 15, fig. 46,47.

Trochammina globigeriniformis Cushman, 1910, pl. 24, text-fig. 193-195; Cole, 1981, p.37, pl. 7, fig. 2-3;

Distribution: Same as T. squamataalthough in lesser abundance.

## TRITAXIS Schubert,1921

### Tritaxis conica Parker and Jones

Plate 2. Fig. 11

Valvulina triangularis conica Parker and Jones, p. 406, pl. 15, fig. 27.

Tritaxis conica (Parker and Jones) Barker, 1960, p. 100, pl. 49, fig. 15,16; Cole, 1981, p. 41, pl. 17, fig. 19,20.

Distribution: Restricted to assemblage 4.

### ATAXOPHRAGMIIDAE Schwager 1877

### GLOBOTEXTULARINAE Cushman 1927

### EGGERELLA Cushman 1933

Eggerella advena (Cushman)

Plate 2. Fig. 3.

Verneuilina advena Cushman, 1922, p. 141.

Eggerella advena (Cushman) Cushman, 1937, p.51, pl. 5, fig. 12-15; Schnitker, 1971, pl.1, fig. 19; Cole, 1981, p. 42, pl. 6, fig. 2.

Distribution: Predominant component of assemblage 6, rare outside these limits.

### KARRERIELLA Cushman 1933

Karreriella bradyi (Cushman)

Plate 2. Fig. 7.

Gaudryina bradyi Cushman, 1911, p. 67, fig. 107.

Karreriella bradyi (Cushman) Cushman, 1937, p. 135; Cole, 1981, p. 44, pl. 6, fig. 5.

Distribution: Occurs in many assemblages, never more than 5%.

### MILIOACEA Ehrenberg 1839

### MILIOIDAE Ehrenberg 1839

### QUINQUELOCULININAE Cushman 1917

### QUINQUELOCULINA d'Orbigny 1826

Quinqueloculina seminulum (Linne)

Plate 3. Fig. 1

Serpula seminulum Linne, 1758, p. 786.

Miliolina seminulum (Linne) Brady, 1884, p. 157, pl. 5, fig. 6.

Quinqueloculina seminulum (Linne) Cushman, 1917, p. 44, pl. 11, fig. 2; Todd and Bronniman, 1957, p. 27, pl.3, fig. 9-10; Barbieri and Medioli, 1969, p. 855, pl. 62, fig. 1a, b; Gregory, 1971, p. 187, pl. 6, fig. 1.

Distribution: Restricted to near-shore open marine areas. Not an important component in any assemblage.

## PATEORIS Loeblich and Tappan 1953

Pateoris hauerinoides (Rhumbler)

Plate 3. Fig. 2

Quinqueloculina subrotunda (Montagu) forma hauerinoides Rhumbler, 1936, p. 206, 217, 226, fig. 208-212.

Pateoris hauerinoides (Rhumbler) Loeblich and Tappan, 1953, p. 42, pl. 6, fig. 8-12; Gregory, 1971, p. 188, pl. 6, fig. 3-4.

Distribution: Very rare occurrence, only once seen greater than 3 %. Found attached to sea-weed.

## SIGMOILOPSIS Findley 1947

Sigmoilopsis schlumbergeri (Silvestri)

Plate 3. Fig. 4

Sigmoilina schlumbergeri Silvestri, 1904, v. 22, p. 267.

Sigmoilopsis schlumbergeri (Silvestri) Findley, 1947, v. 28, p. 270;

Barker, 1960, p. 16; pl. 8, fig. 1-4.

Distribution: Not an important componant. Found only in deep slope waters.

### TRILOCULINA d'Orbigny 1826

#### Triloculina trihedra Loeblich and Tappan

Plate 3. Fig. 3

Triloculina trihedra Loeblich and Tappan, 1953, p. 45, pl. 4, fig. 10; Schnitker, p. 212, pl. 3, fig. 10.

Distribution: Rare. Similar to Q. seminulum.

### NODOSARIACEA

### NODOSARIDAE Ehrenberg 1838

### NODOSARININAE Ehrenberg 1838

### ASTACOLUS de Montfort 1808

#### Astacolus hyalacrulus Loeblich and Tappan

Plate 3. Fig. 5

Astacolus hyalacrulus Loeblich and Tappan, 1953, p. 52, pl. 9, fig. 1-4; Cole, p. 58, pl. 17, fig. 48.

Distribution: Probably relict, restricted to the upper slope.

### LAGENA Walker and Jacob

#### Lagena mollis (Cushman)

Plate 3. Fig. 6

Lagena gracillima (Seguenza) var. mollis Cushman, 1944, p. 21., pl. 3, fig. 3.

Lagena mollis (Cushman) Vilks, 1969, p. 47, pl. 2, fig. 20; Gregory, 1971, p. 195, pl. 7, fig. 4;Cole, 1981, p. 64, pl. 18, fig. 20.

Distribution: Rare occurrences on the upper slope.

### GLANDULINIDAE Reuss 1860

### GLANDULININAE

### GLANDULINA d'Orbigny

### Glandulina laevigata (d'Orbigny)

Plate 3. Fig. 7

Nodosaria laevigata d'Orbigny, 1826, p. 252, pl. 10, fig. 1-3.

Glandulina laevigata (d'Orbigny) d'Orbigny, 1846, p.29, pl. 1, fig. 45; Loeblich and Tappan, 1953, p. 18, pl. 16, fig. 2-5; Gregory, 1971, p. 198, pl. 9, fig. 4; Cole, 1981, p. 73, pl. 19, fig. 2.

Distribution: Restricted to upper slope or central basins.

### OOLINIDAE Loeblich and Tappan 1961

### FISSURINA Reuss 1850

### Fissurina marginata (Montagu)

Plate 3. Fig. 8

Vermiculum marginata Montagu, 1803, p. 524.

Fissurina marginata (Montagu) Loeblich and Tappan, 1953, p. 77, pl. 14, fig. 6-9; Vilks, 1969, p. 48, pl. 2, fig. 2a,b; Gregory, 1971, p. 207, pl. 10, fig. 1; Cole,1981, p. 81, pl. 19, fig. 25.

Distribution: Rare on shelf and slope.

## BULIMINACEA Jones 1875

## BOLIVINITIDAE Cushman 1927

## BOLIVINA d'Orbigny 1839

### Bolivina subspinescens Cushman

Plate 3. Fig. 10

Bolivina subspinescens Cushman, 1922, p. 48, pl. 17, fig. 5; Barker, 1960, p. 108, pl. 52, fig. 24; Cole, 1981, p. 88, pl. 10, fig. 4.

Distribution: A rare species, found mainly in the central basins and upper slope.

### Bolivina spathulata (Williamson)

Plate 3 . Fig. 9

Textularia variabilis Williamson var. spathuleata, Williamson, 1858, p. 76, pl. 6, fig. 164-165.

Bolivina spathulata (Williamson) Barker, 1960, p. 106, pl. 52, fig. 20-21;Schnitker, 1971, p. 194, pl. 4, fig. 24.

Distribution: In association with T. angulosa this species forms one of the main components of the upper slope / shelf edge assemblages

### Bolivina subaenariensis Cushman

Plate 3. Fig. 11

Bolivina subaenariensis Cushman, 1922, p. 46, pl. 7, fig. 6; Phleger and Parker, 1951, p. 15, pl. 7, fig. 8-10; Cole and Fergerson, 1975, p. 33.

Distribution: A dominant component of the central basin areas. Not so common on the slope. Associated with G. auriculata.

## ISLANDIELLIDAE Loeblich and Tappan 1964

### ISLANDIELLA Norvang 1958

### Islandiella teretis (Tappan)

Plate 3. Fig. 19

Cassidulina laevigata d'Orbigny. Brady, 1884, p. 428, pl. 54, fig. 1-3.

Cassidulina teretis Tappan, 1951, p. 7, pl. 1, fig. 30a-c.

Islandiella teretis (Tappan) Vilks, 1969, p. 49, pl. 3, fig. 5.

Distribution: Restricted occurrence, found mainly in central basin and shelf edge assemblages. This species may in fact have been confused with I. norcrossi(Cushman) as figured in Rodrigues et al 1980.

### Islandiella islandica (Norvang)

Plate 5. Fig. 18

Cassidulina islandica Norvang, 1945, p. 41, fig. 7, 8.; Leslie, 1965, p. 57, pl. 10, fig. 4a-c.

Islandiella islandica Norvang. Vilks; 1969, p. 49, pl. 3, fig. 3; Barbieri and Medioli, 1969, p. 857, pl. 62, fig. 3a-c; Gregory, 1971, p. 213, pl. 11, fig. 1.

Distribution: Restricted to outer sandy banks where it is predominent in the absence of C. lobatulus. Occurs also but in less abundence in nearshore samples.

### BULIMINIDAE Jones 1875

### BULIMININAE Jones 1875

### BULIMINA d'Orbigny 1826

### Bulimina marginata d'Orbigny

Plate 3. Fig. 13

Bulimina marginata d'Orbigny, 1826, p. 269, pl. 12, fig. 10-12; Phleger and Parker, 1951, p. 16, pl. 7, fig. 27-28; Feyling-Hansen, 1964, p. 303, pl. 14, fig. 2-3; Schnitker, 1971, p. 194, pl. 5, fig. 5.

Distribution: Not present in large numbers, restricted to central basin assemblages.

### Bulimina aculeata d'Orbigny 1826

Plate 3. Fig. 12

Bulimina aculeata d'Orbigny, 1826, v. 7, p. 269; Cushman, 1944, p. 27, pl. 3, fig. 47; Phleger and Parker, 1951, p. 15, pl. 7, fig. 23; Schnitker, 1971, p. 194, pl. 5, fig. 4.

Distribution: Occurs mainly in the central basins and their sothern approaches. Although often occuring in large numbers it is never found living.

### Bulimina exilis Brady 1884

Plate 3. Fig. 15

Bulimina elegans var. exilis Brady, 1884, p. 399, pl. 50, fig. 5-6.

Bulimina exilis Brady. Cushman and Parker, 1940, p. 11, pl. 2, fig. 18-21; Cole, 1981, p. 89, pl. 19, fig. 43.

Distribution: Dominant componant of the upper slope assemblage (400--1000m). Also found in the central basins, but of lesser importance.

### Bulimina striata d'Orbigny

Plate 3. Fig. 14

Bulimina striata d'Orbigny; Barker, 1960, p. 104, pl. 51, fig. 10-12; Cushman and Parker, 1947, p.119.

Distribution: Not an important componant in any assemblage. Restricted to lower slope areas and as such is a good depth indicator.

## GLOBOBULIMINA Cushman 1927

### *Globobulimina auriculata* (Bailey) 1851

Plate 3. Fig. 17

*Bulimina auriculata* Bailey, 1851, p. 12, pl. 1, fig. 25-27.

*Globobulimina auriculata* (Bailey) var. *arctica*, Hoglund, 1947, p. 254, text-fig. 266, 267, 270, 271.

*Glbobulimina auriculata arctica* (Hoglund) Leslie, 1965, p. 161, pl. 9, fig. 6a-c.

*Globobulimina auriculata* Cole, 1981, p. 90.

Distribution: One of the most pre-dominant species in the central basins; occurs less frequently in the upper slope areas.

### *Globobulimina pacifica* Cushman

Plate 3. FIg. 16

*Globobulimina pacifica* Cushman. Galloway and Wissler, 1927, p. 74; Loeblich and Tappan, 1964, p. 560, fig. 442, no. 4.

Distribution: Rare, occurs mainly on the upper slope.

## STAINFORTHIA Hofker 1956

### *Stainforthia concava* (Hoglund)

Plate 3. Fig. 18

*Virgulina concava* Hoglund, 1947, p.257, pl. 23, fig. 3, 4.

*Stainforthia concava* (Hoglund) Loeblich and Tappan, 1964, c561; Cole, 1981, p. 91, pl. 9, fig. 5.

Distribution: Rare, mainly slope occurrence.

## UVIGERINIDAE Haeckel 1894

### UVIGERINA d'Orbigny 1826

#### _Uvigerina peregrina_ Cushman 1923

Plate 4. Fig. 3

_Uvigerina peregrina_ Cushman, 1923, p. 166, pl. 42, fig. 7-10; Schnitker, 1971, p. 212, pl. 5, fig. 11; Cole, 1981, p. 92, pl. 10, fig. 9.

Distribution: Restricted to depths greater than 800 m. A dominant component at these depths.

### TRIFARINA Cushman 1923

#### _Trifarina angulosa_ (Williamson)

PLate 4. Fig. 1

_Uvigerina angulosa_ Williamson, 1858, p. 67, pl. 5, fig. 140.

_Angulogerina angulosa_ (Williamson) Leslie, 1965, p. 155, pl. 18, fig. 13a-c.

_Trifarina angulosa_ (Williamson) Barbieri and Medioli, 1969, p. 857, pl. 65, fig. 1-5; Cole, 1981, p. 92, pl. 19, fig. 46.

Distribution: Dominant shelf edge component.

#### _Trifarina cf. occidentalis_ Cushman

Plate 4. Fig. 2

_Trifarina cf. occidentalis_ (Cushman) Todd, 1948, p.291, pl. 36, fig. 4; Todd and Bronniman, 1957, p.36, pl. 9, fig. 5-6.

Distribution: Found in only a few upper slope samples

Most probably a megalospheric form of T. angulosa.

## DISCORBACEA

## DISCORBIDAE Ehrenberg 1838

## DISCORBINAE Ehrenberg 1838

## BUCELLA Anderson 1952

### Buccella frigida (Cushman)

Plate 4. Fig. 4, 5

Pulvinulina frigida Cushman, 1922, p. 12.

Eponides frigidus (Cushman), Cushman, 1941, p. 37, pl. 9, fig. 16-17; Phleger, 1952, p. 419, pl. 6, fig. 12a-b.

Buccella frigida (Cushman) Anderson, 1952, p. 144, fig. 4, 5, 6; Vilks, 1969, p. 49, pl. 3, fig. 7; Gregory, 1971, p. 220, pl. 12, fig. 1-3.

Distribution: Found only on the shelf but is common in several assemblages. Often found associated with C. lobatulus.

## BAGGININAE Cushman 1927

## VALVULINERIA Cushman 1927

### Valvulineria laevigata Phleger and Parker

Plate 4. Fig. 6, 7

Valvulineria laevigata Phleger and Parker, 1951, p. 25, pl. 13, fig. 11-12; Schnitker, 1971, p. 212, pl. 6, fig. 6; Cole, 1981, p. 98, pl. 11, fig. 1.

Distribution: Rare occurrence, restricted to the shelf.

## ROTALIACEA Ehrenberg 1839

## ELPHIDIIDAE Galloway 1933

## ELPHIDIUM de Montfort 1808

### Elphidium excavatum (Terquem) forma clavata Cushman 1930

Plate 5. Fig. 9

Elphidium incertum (Williamson) var. clavatum Cushman, 1930, p. 20, pl. 7, fig. 10.

Elphidium clavatum Cushman. Buzas, 1965, p. 23, pl. 3, fig. 3-4; SenGupta, 1971, p. 89, pl. 2, fig. 28,29.

Elphidium excavatum forma clavata Cushman. Miller, 1979, p. 27, pl. 1, fig. 3-8,pl. 3, fig. 2-8.

Distribution: Forms a dominant component of the possibly relict assemblage on the shelf and slope. For a complete discussion of this variable form see Miller et al. 1982.

### Elphidium bartletti (Cushman)

Plate 5. Fig. 10

Elphidium bartletti Cushman, 1933, p. 4, pl. 1, fig. 9; Leslie, 1965, p. 160, pl. 8, fig. 10a-b; Vilks, 1969, p. 50, pl. 3, fig. 12; Cole, 1981, p. 100, pl. 20, fig. 1.

Distribution: Common on the shelf edge and in the central basin area.

### Elphidium subarcticum Cushman

Plate . Fig.

Elphidium subarcticum Cushman 1944, p. 27, pl. 3, fig. 34,35; Schnitker, 1971, p. 198, pl. 7, fig. 3; Cole 1981, p. 101, pl. 20, fig. 4.

Distribution: Rare, occurs mainly on the shelf.

### ELPHIDIELLA Cushman 1936

### Elphidiella arctica(Parker and Jones)

Plate 5. Fig. 7

Polystomella arctica Parker and Jones, p. 471, pl. 48, fig. 18

Elphidiella arctica (Parker and Jones) Cushman, 1939, p. 65, pl. 18, fig. 11-14; Phleger, 1952, p. 83, pl. 14, fig. 14; Leslie, 1965, p. 159, pl. 8, fig. 12a-b.

Distribution: Commonly occurs associated with C. lobatulus on shallow banks and nearshore.

## ORBITOIDACEA

### CIBICIDIDAE Cushman 1927

### PLANULININAE Bermudez 1952

### PLANULINA d'Orbigny 1826

### Planulina wuellerstorfi (Schwager)

Plate 4. Fig. 8, 9

Anomalina wuellerstorfi Schwager, 1886, p. 258, pl. 7, fig. 107, 105.

Planulina wuellerstorfi (Schwager) Cushman, 1929, p. 104, pl. 15, fig. 1-2; Barker, 1960, pl. 93, fig. 9; Cole, p. 103, pl. 12, fig. 9

Distribution: Not a dominant species. Only found at deep (+ 2000m )slope depths.

## CIBICIDINAE Cushman 1927

### CIBICIDES de Montfort 1808

### Cibicides lobatulus (Walker and Jacob)

Plate 4. Fig. 10, 11

*Nautilus lobatulus* Walker and Jacob, 1798, p. 642, pl. 14, fig. 36

*Cibicides lobatulus* (Walker and Jacob) Parker, 1952, p. 427, pl.6, fig. 26; Feyling-Hansen, 1964, p. 339, pl. 19, fig. 1-3; Vilks, 1969, p. 50, pl. 3, fig. 17; Cole, 1981, p. 104, pl. 12, fig. 4.

Distribution: Predominant componant of near-shore assemblages and shallow banks. Its variable morphology is a result of its attached nature.

### Cibicides pseudoungerianus (Cushman)

Plate 4. Fig. 17, 18

*Truncatulina pseudoungerianus* Cushman, 1922, p. 97, pl. 20, fig. 9.

*Cibicides pseudoungerianus* (Cushman) Feyling-Hansen, 1964, p. 340, pl. 19, fig. 4-6; Schafer and Cole, 1978, p. 22; Schnitker 1971, p. 196, pl. 9, fig. 7.

Distribution: Not a dominant species, main occurrence is in the central basin area and upper slope.

## CASSIDULINACEA

## CAUCAUSINIDAE Bykova 1959

## FURSENKOININAE Loeblich and Tappan 1961

### FURSENKOINA Loeblich and Tappan 1961

### Fursenkoina fusiformis (Williamson)

Plate 5. Fig. 1

*Bulimina pupoides* d'Orbigny var. *fusiformis* Williamson, 1858, p. 63, pl. 5, fig. 129, 130.

*Virgulina fusiformis* (Williamson) Feyling-Hanssen, 1964, p. 307, pl. 14, fig. 15-18.

*Fursenkoina fusiformis* (Williamson) Schnitker, 1971, p. 200, pl. 10, fig. 1; Cole, 1981, p. 106, pl. 14, fig. 1.

Distribution: Found mainly on the upper slope and central basin area.

## NONIONIDAE Schultz 1854

## NONIONINAE Schultz 1854

## ASTRONONION Cushman and Edwards 1937

### *Astrononion gallowayi* Loeblich and Tappan

Plate 4. Fig. 12

*Astrononion gallowayi* Loeblich and Tappan, 1953, p. 90, pl. 17, fig. 4-7; Vilks, 1969, p. 51, pl. 3, fig. 19; Cole, 1981, p. 109, pl. 13, fig. 6.

Distribution: Not a common species, it is usually found in shelf edge or upper slope environments.

## NONIONELLINA Voloshinova 1958

### *Nonionellina labradorica* (Dawson)

Plate 4. Fig. 14, 15

*Nonionina labradorica* Dawson, 1860, p. 191, fig. 4.

*Nonion labradorica* (Dawson) Cushman, 1927, p. 148, pl. 2, fig. 7-8.

*Nonionellina labradorica* (Dawson) Schafer and Cole, 1978, p. 28, pl. 9, fig. 4; Cole, 1981, p. 110, pl. 13, fig. 20.

Distribution: A dominant component of the central basin area.

### NONIONELLA Cushman 1926

### Nonionella turgida (Williamson)

Plate 4. Fig. 13

Rotalina turgida Williamson, 1858, p. 50, pl. 4, fig. 95-97.

Nonionella turgida (Williamson) Cushman, 1930, p. 15, pl. 6, fig. 1-4; Cole, 1981, p. 110, pl. 13, fig. 3.

Distribution: Occurs mainly on the upper slope areas.

### PULLENIA Parker and Jones 1862

### Pullenia quinqueloba (Reuss)

Plate 4. Fig. 16

Nonionina quinqueloba Reuss, 1851, p. 71, pl. 5, fig. 31.

Pullenia quinqueloba (Reuss) Schnitker, 1971, p. 206, pl. 10, fig. 11; Cole, 1981, p. 111, pl. 14, fig. 6.

Distribution: Occurs mainly in the central basins but is also found in slope samples.

### ALABAMINIDAE Hofker 1951

### GYROIDINA d'Orbigny 1826

### Gyroidina soldani d'Orbigny

Plate 5. Fig. 5, 6

Rotalia soldani d'Orbigny, p. 278, fig. 36.

Gyroidina soldani d'Orbigny var. altiformis Stewart. Phleger and Parker, 1952, p. 22, pl. 11, fig. 15-16.

Gyroidina soldani d'Orbigny. Cole, 1981, p. 112, pl. 14, fig. 7.

Distribution: Shelf edge and upper slope environments.

## ORIDORSALIS Andersen 1961

### Oridorsalis umbonatus (Reuss)

Plate 5. Fig. 3, 4

Rosalina umbonata Reuss, 1857, p. 75, pl. 5, fig. 35.

Eponides umbonatus (Reuss) Parker, 1952, p. 419, pl. 6, fig. 13.

Eponides tener (Brady) Cushman. Todd and Postma, 1954, p. 359.

Oridorsalis umbonatus (Reuss) Todd, 1965, p. 23, pl. 6, fig. 2; Cole, 1981, p. 113, pl. 14,fig. 8.

Distribution: Relatively rare occurrence in central basin and deeper slope areas.

## OSANGULARIIDAE Loeblich and Tappan 1964

## OSANGULARIA Brotzen 1940

### Osangularia rugosa (Phleger and Parker)

Plate 5. Fig. 13, 14

Pseudoparrella rugosa Phleger and Parker, 1951, p. 28, pl. 15, fig. 8-9.

Osangularia rugosa (Phleger and Parker) Pflum and Frerichs, 1976, pl. 7, fig. 2-4; Cole, 1981, p. 114, pl. 20, fig. 12, 13.

Distribution: Restricted to rare deep water occurrences.

## ANOMALINIDAE Cushman 1927

### DISCANOMALINA Asano 1951

Discanomalina semipunctata (Bailey)

Plate 5. Fig. 15

Rotalina semipunctata Bailey, 1851, p.1-15, pl. 11, fig. 17-19.

Anomalina semipunctata (Bailey) Cushman, 1931, p. 106, pl. 18, fig. 1-2.

Discanomalina coronata (Parker and Jones) Asano, 1951, p. 13, fig. 1-2.

Discanomalina semipunctata (Bailey) Medioli and Scott, 1979, p. 298, pl. 1,2.

Distribution: Restricted to s.w. areas of the shelf, may be locally very abundant.

### MELONIS de Montfort 1808

Melonis pompilioides (Fichel and Moll)

Plate 5. Fig. 8

Nautilus pompilioides Fichel and Moll, 1798, p. 31, pl. 2, fig. a-c.

Nonionina pompilioides (Fichel and Moll) Parker, Jones and Brady, 1865, p. 18, pl. 3, fig. 98.

Melonis pompilioides (Fichel and Moll) Voloshinova, 1958, p. 117-119; Cole 1981, p. 114, pl. 14, fig. 9.

Distribution: Restricted to deep waters, rare.

### CASSIDULINA d'Orbigny 1826

Cassidulina neocarinata Thalmann

Plate 5. Fig. 17.

*Cassidulina laevigata* d'Orbigny.var. *carinata* Cushman, 1922, p. 124, pl. 25, fig. 6,7.

*Cassidulina neocarinata* Thalmann, 1950, p. 44, nom. nov. for *C. laevigata* d'Orbigny var. *carinata* Cushman, 1922. Rodrigues *et al* 1980, p. 58, pl. 5, fig. 2, 5, 8, pl. 6, fig. 3,4.

Distribution: Rare, found mainly in the central basins.

### ROBERTINACEA Reuss 1850

### CERATOBULIMINIDAE Cushman 1927

### EPISTOMININAE Wedekind 1937

### HOEGLUNDINA Brotzen 1948

### *Hoeglundina elegans* (d'Orbigny)

Plate 5. Fig. 11, 12

*Rotalia elegans* d'Orbigny, 1826, p. 276, no. 54.

*Epistomina elegans* (d'Orbigny) Cushman, 1931, p. 65, pl. 13, fig. 6.

*Hoeglundina elegans* (d'Orbigny) Cole, 1981, p. 116, pl. 14, fig. 10.

Distribution: Not a common species, found in deep slope environments (+2000m) and contrary to the literature at shelf depths in the central basins.

Listing of rare species.

Ammobaculites foliaceus (Brady) Cushman, 1920, v. 104, p. 64.

Astrorhiza arenaria Carpenter. Cole, 1981, p. 3, pl. 2, fig. 6.

Astrononion stellatum Cushman and Edwards, 1937, p. 32, pl. 3, fig. 9-11.

Botellina labyrinthica Brady. Cole, 1981, p. 11, pl. 3, fig. 7.

Cibicides refulgens Montfort. Barker, 1960, p. 190, pl. 92, figs. 7-9.

Cystammina pauciloculata (Brady) Barker, 1960, p. 84, pl. 41, fig. 1-2.

Cassidella complanata (Egger) Parker, 1952, p. 417, pl. 6, fig. 1-2

Dentalina frobisherensis Loeblich and Tappan, 1953, p. 55, pl. 10, fig. 1-9.

Dentalina ittai Loeblich and Tappan, 1953, p. 56, pl. 10, fig. 10-12.

Fissurina serrata (Schlumberger) Cole, 1981, p. 83, pl. 19, fig. 31.

Fissurina submarginata (Broomgaart) Barker, 1960, p. 122, pl. 59, fig. 21-22.

Glomospira charoides (Jones and Parker) Barker, 1960, p. 78, pl. 38, fig. 10-16.

Islandiella norcrossi (Cushman) Loeblich and Tappan, 1953, p. 20, pl. 24, fig.2.

Lagena gracillima (Seguenza) Loeblich and Tappan, 1953, p. 60, pl. 11, fig. 1-4.

Lagena apliopleura Loeblich and Tappan, 1953, p. 59, pl. 10, fig. 14, 15.

Lagena distoma Parker and Jones. Barker 1960, p. 119, pl. 58, fig. 11-15.

Lagena elongata (Ehrenberg) Barker, 1960, p. 116, pl. 56, fig. 27-29.

Lagena laevis Loeblich and Tappan, 1953, p. 61, pl. 11, fig. 5-8.

Liebusella soldani (Jones and Parker) Barker, 1960, p. 66, pl. 32, fig.

14-18.

Lenticulina peregrina (Schwager) Barker, 1960, p. 144, pl. 68, fig. 11-16.

Miliammina fusca (Brady) Scott and Medioli, 1980, p. 40, pl. 2, fig. 1-3.

Marsipella cylindrica Brady. Barker, 1960, p. 48, pl. 24, fig. 20-22.

Nodosaria pyrula d'Orbigny. Chapman and Parr, p. 60.

Oolina melo d'Orbigny. Loeblich and Tappan, 1953, p. 73, pl. 13, fig. 9-10.

Oolina borealis Loeblich and Tappan, 1953, p. 68, pl. 13, fig. 4-6

Marginulina obesa Cushman. Barker, 1960, p. 136, pl. 65, fig. 5-6.

Pyrgo murrhyna (Schwager) Barker, 1960, p. 4, pl. 2, fig. 10, 11, 15.

Patellina corrugata Williamson. Barker, 1960, p. 178, pl. 86, fig. 1-7.

Quinqueloculina agglutinata Cushman. Loeblich and Tappan, 1953, p. 39, pl. 15, fig. 1-4.

Rhabdammina abyssorum Carpenter. Cole, 1981, pl. 16, fig. 3.

Rhizammina indivisa (Brady) Cole, 1981, pl. 2, fig. 16.

Robulus thalmanni Hessland. Barker, 1960, p. 144, pl. 69, fig. 13.

Rosalina coumbiensis (Cushman) Uchio, 1960, p. 66, pl. 8, fig. 1-2.

Robertinoides charlottensis (Cushman) Parker, 1952, p. 416, pl. 5, fig. 3a-c.

Saccorhiza ramosa (Brady) Cole, 1981, p. 11, pl. 2, fig. 7.

Saracenaria italica Defrance. Barker, 1960, p. 142, pl. 67, fig. 9.

Technitella legumen Norman. Barker, 1960, p. 50, pl. 25, fig. 8-12.

Trochammina nana (Brady) Barker, 1960, p. 72, pl. 35, fig. 6-8.

Trochammina nitida Brady. Barker, p. 84, pl. 41, fig. 5-6.

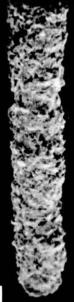
Tolypammina schandini Rhumbler. Barker, 1960, p. 48, pl. 24, fig. 6-9.

Vaginulina spinigera Brady. Barker, 1960, p. 42, pl. 65, fig. 13,14.

## PLATE 1.

| | |
|---|---|
| Figure 1 | *Hyperammina elongata* Brady. x 21 |
| Figure 2 | *Saccammina atlantica* (Cushman) x 74 |
| Figure 3 | *Saccammina difflugiformis* (Brady) x53 |
| Figure 4 | *Saccammina sphaerica* Brady. x113 |
| Figure 5 | *Ammodiscus catinus* Hoglund. x43.5 |
| Figure 6 | *Cribrostomoides crassimargo* (Norman) x36 |
| Figure 7 | *Cribrostomoides crassimargo* (Norman) x50 |
| Figure 8 | *Reophax arctica* (Brady) x145 |
| Figure 9 | *Reophax scorpiurus* (Montfort) x47 |
| Figure 10 | *Reophax guttifer* (Brady) x69.5 |
| Figure 11 | *Reophax scotti* Chaster. x180.5 |
| Figure 12 | *Cribrostomoides jeffreysi* (Williamson) x103 |
| Figure 13 | *Haplophragmoides canariensis* (d'Orbigny) x75 |
| Figure 14 | *Reophax nodulosa* Brady. x41.2 |
| Figure 15 | *Cribrostomoides subglobosum* (Sars) x 57 |
| Figure 16 | *Adercotryma glomerata* (Brady) x146 |
| Figure 17 | *Recurvoides turbinatus* (Brady) x146 |

# PLATE I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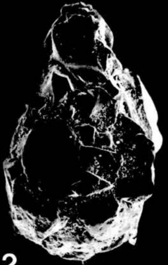
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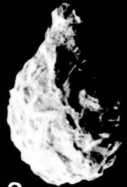
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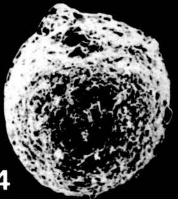
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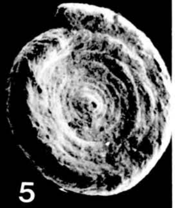
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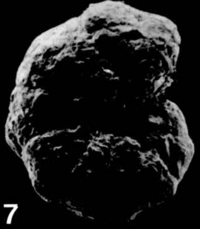
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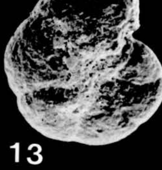
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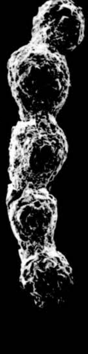
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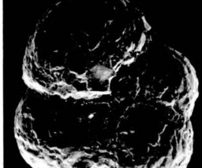
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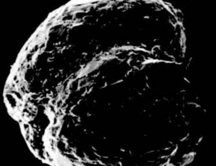
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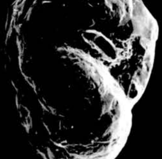
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# PLATE 2.

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|---|---|
| Figure 1 | *Ammobaculites dilatatus* Cushman. x 36.5 |
| Figure 2 | *Ammotium cassis* (Parker) x 25 |
| Figure 3 | *Eggerella advena* (Cushman) x138 |
| Figure 4 | *Textularia torquata* Parker. x 136 |
| Figure 5 | *Spiroplectammina biformis* (Parker and Jones) x 133 |
| Figure 6 | *Alveophragmium scitulum* (Brady) x 135 |
| Figure 7 | *Kareriella bradyi* (Cushman) x 73.5 |
| Figure 8 | *Trochammina squamata* Parker and Jones. x 171 |
| Figure 9 | *Trochammina squamata* Parker and Jones. x 120 |
| Figure 10 | *Cyclammina cancellata* Brady. x 20 |
| Figure 11 | *Tritaxis conica* Parker and Jones. x 46.5 |
| Figure 12 | *Trochammina inflata* (Montagu) x 52 |
| Figure 13 | *Trochammina inflata* (Montagu) x 146 |
| Figure 14 | *Trochammina globigeriniformis* (Parker and Jones) x 96 |
| Figure 15 | *Trochammina lobata* Cushman. x 102 |
| Figure 16 | *Trochammina lobata* Cushman. x 93 |

# PLATE 2


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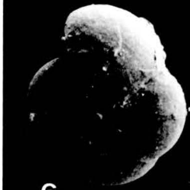
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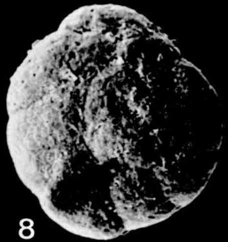
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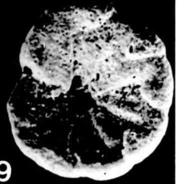
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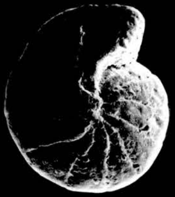
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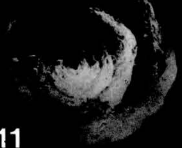
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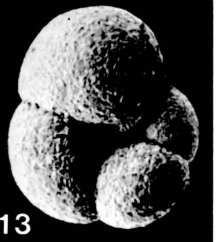
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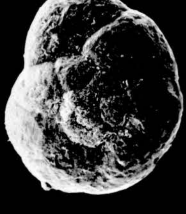
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# PLATE 3.

| | |
|---|---|
| Figure 1 | *Quinqueloculina seminulum* (Linne) x 50.5 |
| Figure 2 | *Pateroris hauerinoides* (Rhumbler) x 67.5 |
| Figure 3 | *Triloculina trihedra* Loeblich and Tappan. x 89 |
| Figure 4 | *Sigmoilopsis schlumbergeri* (Silvestri) x 42.5 |
| Figure 5 | *Astracolus hyalancrulus* Loeblich and Tappan. x 36 |
| Figure 6 | *Lagena mollis* (Cushman) x 24.5 |
| Figure 7 | *Glandulina laevigata* (d'Orbigny) x 60 |
| Figure 8 | *Fissurina marginata* (Montagu) x 170 |
| Figure 9 | *Bolivina spathulata* (Williamson) x 133 |
| Figure 10 | *Bolivina subspinescens* Cushman. x 163 |
| Figure 11 | *Bolivina subaenariensis* Cushman. x 43 |
| Figure 12 | *Bulimina aculeata* d'Orbigny. x 74 |
| Figure 13 | *Bulimina marginata* d'Orbigny. x 102.5 |
| Figure 14 | *Bulimina striata* d'Orbigny. x 105.5 |
| Figure 15 | *Bulimina exilis* Brady. x 44.5 |
| Figure 16 | *Globobulimina pacifica* Cushman. x 53 |
| Figure 17 | *Globobulimina auriculata* (Bailey) x 121.5 |
| Figure 18 | *Stainforthia concava* (Hoglund) x 110.5 |
| Figure 19 | *Islandiella teretis* (Tappan) x 70 |

# PLATE 3


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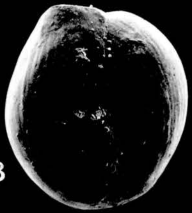
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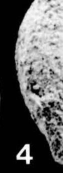
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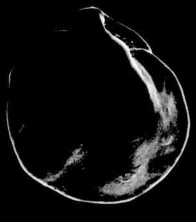
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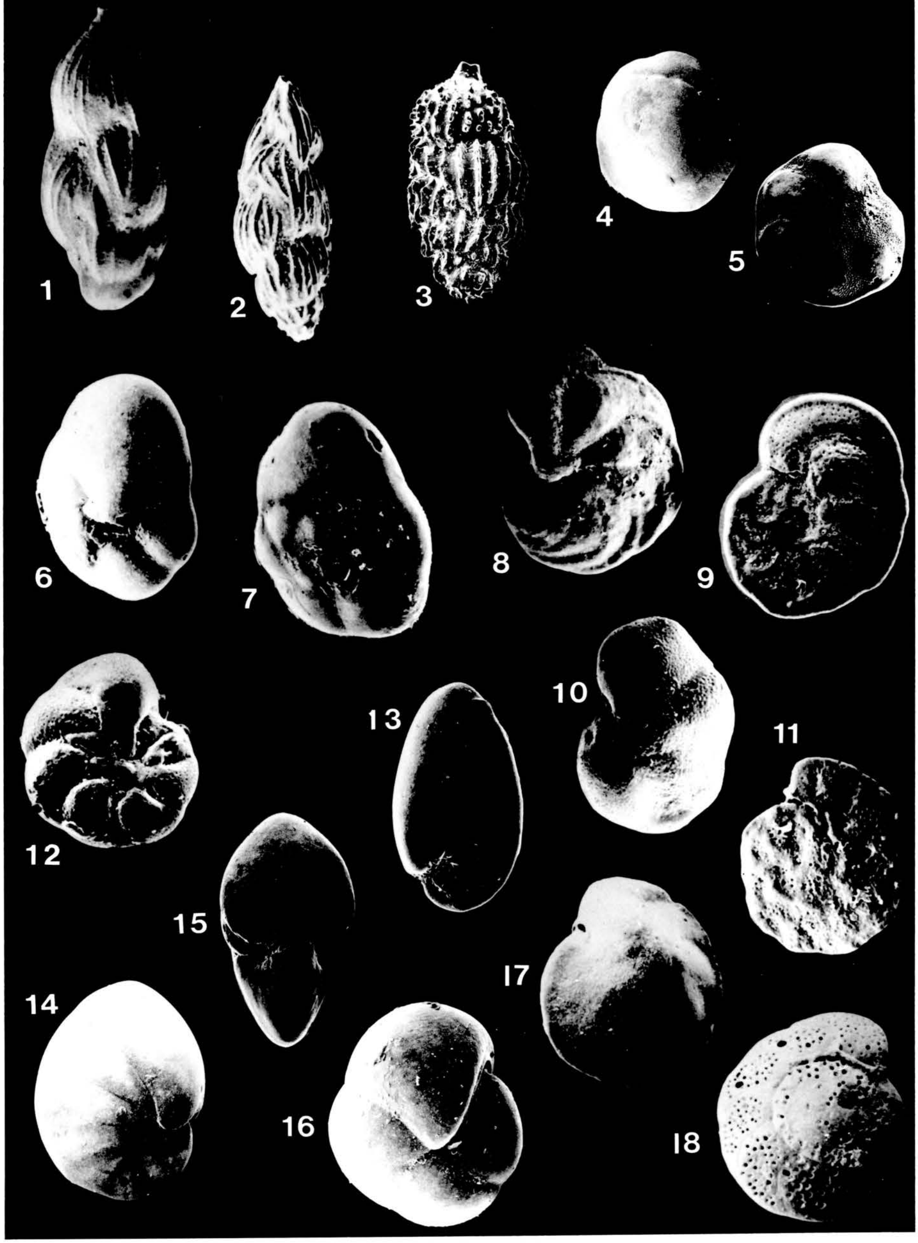
## PLATE 4.

| | |
|---|---|
| Figure 1 | *Trifarina angulosa* (Williamson) x 91 |
| Figure 2 | *Trifarina occidentalis* Cushman. x 106 |
| Figure 3 | *Uvigerina peregrina* Cushman. x 58 |
| Figure 4 | *Buccella frigida* (Cushman) x 60 |
| Figure 5 | *Buccella frigida* (Cushman) x 60 |
| Figure 6 | *Valvulineria laevigata* Phleger and Parker. x 135 |
| Figure 7 | *Valvulineria laevigata* Phleger and Parker. x 136 |
| Figure 8 | *Planulina wuellerstorfi* (Schwager) x 63 |
| Figure 9 | *Planulina wuellerstorfi* (Schwager) x 57.5 |
| Figure 10 | *Cibicides lobatulus* (Walker and Jacob) x 58 |
| Figure 11 | *Cibicides lobatulus* (Walker and Jacob) x 121.5 |
| Figure 12 | *Astrononion gallowayi* Loeblich and Tappan. x 109 |
| Figure 13 | *Nonionella turgida* (Williamson) x 128.5 |
| Figure 14 | *Nonionellina labradorica* (Dawson) x 54.5 |
| Figure 15 | *Nonionellina labradorica* (Dawson) x 60.5 |
| Figure 16 | *Pullenia quinqueloba* (Reuss) x 82.5 |
| Figure 17 | *Cibicides pseudoungerianus* (Cushman) x 56.5 |
| Figure 18 | *Cibicides pseudoungerianus* (Cushman) x 81 |

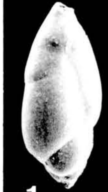
# PLATE 4



## PLATE 5

| | |
|---|---|
| Figure 1 | *Fursenkoina fusiformis* (Williamson) x 115.5 |
| Figure 2 | *Fursenkoina loeblichi* (Williamson) x 170 |
| Figure 3 | *Oridorsalis umbonatus* (Reuss) x96 |
| Figure 4 | *Oridorsalis umbonatus* (Reuss) x 114 |
| Figure 5 | *Gyroidina soldani* d'Orbigny. x 117.5 |
| Figure 6 | *Gyroidina soldani* d'Orbigny. x 157 |
| Figure 7 | *Elphidiella arctica* (Parker and Jones) x 31 |
| Figure 8 | *Melonis pompiliodes* (Fichel and Moll) x 71 |
| Figure 9 | *Elphidium excavatum f. clavatum* Cushman. x 65 |
| Figure 10 | *Elphidium bartletti* (Cushman) x 77.5 |
| Figure 11 | *Hoeglundina elegans* (d'Orbigny) x 60 |
| Figure 12 | *Hoeglundina elegans* (d'Orbigny) x 47.5 |
| Figure 13 | *Osangularia rugosa* (Phleger and Parker) x 156 |
| Figure 14 | *Osangularia rugosa* (Phleger and Parker) x 109 |
| Figure 15 | *Discanomalina semipunctata* (Bailey) x 36 |
| Figure 16 | *Eponides spp.* x 130.5 |
| Figure 17 | *Cassidulina laevigata* d'Orbigny. x 118.5 |
| Figure 18 | *Islandiella islandica* (Norvang) x 62.5 |

# PLATE 5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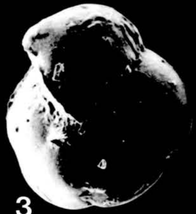
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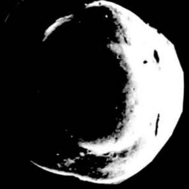
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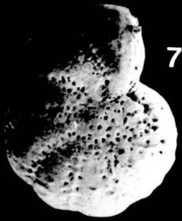
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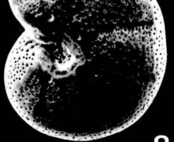
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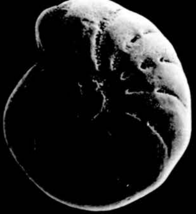
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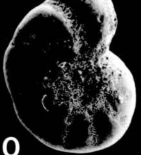
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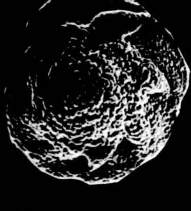
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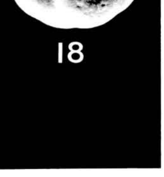
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# REFERENCES

AKPATI, B.N., 1975, Foraminiferal distribution and environmental variables in eastern Long Island Sound, New York. Jour. Foramin. Res., v. 5, p. 127-142.

AKSU, A.E., 1980, Late Quaternary stratigraphy, palaeoenvironmentology and sedimentation history of Baffin Bay and Davis Strait. Unpubl. PhD thesis, Department of Geology, Dalhousie University, Halifax Nova Scotia.

ALAM, M., 1979, The effect of Pleistocene climatic changes on the sediments around the Grand Banks. Unpubl. Phd. thesis, Dept. of Geology, Dalhousie University, Halifax Nova Scotia.

ALAM, M., PIPER, D.J.W. and COOKE, H.B.S., 1983, Late Quaternary stratigraphy and palaeo-oceanography on the Grand Banks continental margin, eastern Canada. Boreas, in press.

AllEN, R. and RODA, R.S., 1977, Benthonic foraminifera from LaHave estuary. Maritime Sediments, v. 13, no.2, p. 67-72.

ANDERSEN, H.V., 1952, Buccella, a new genus of Rotalid foraminifera. Jour. Wash. Acad. Sci. v. 42, p. 143-151.

ANDERSON, J.B., 1975, Factors controlling calcium carbonate dissolution in the Weddell Sea from foraminiferal distribution patterns. Mar. Geol. v. 19, p. 315-332.

ARNOLD, A.J. and SEN GUPTA, B.K., 1981, Diversity changes in the foraminiferal thanatocoenoses of the Georgia-South Carolina continental slope. Jour. Foramin. Res., v. 11, no. 4, p. 268-276.

ASANO, J. 1951, Illustrated catalogue of Japanese Tertiary smaller Foraminifera. Petrol. Branch Nat. Res. Sec., General H.Q. Supreme Commander for allied powers (Tokyo), pt. 13, p. 12-19.

ATKINSON, K. 1969, The association of living Foraminifera with algae from the littoral zone, South Cardigan Bay, Wales. Jour. Nat. Hist., v. 3, p. 517-542.

BAILEY, J.W., 1851, Microscopical examination of soundings made by the U.S. coast survey of the Atlantic coast of the U.S. Smithson. contrib. to Knowl., v. 2, p. 1-15.

BANDY, O., 1960, General correlation of foraminiferal structure with environment. Rept. Internat. Geol. Congr., 21st. session, Copenhagen, pt. 22, p. 7-19.

BARBIERI, F. and MEDIOLI, F., 1969, Distribution of Foraminifera on the Scotian shelf (Canada). Rev. Italiani di paleontologica, v. 75, p. 849-878.

BARKER, R.W., 1960, Taxonomic notes on species figured by H.B. Brady in his report on the Foraminifera dredged by H.M.S. Challanger. Soc. Econ. Pal. and Min., special public., no. 9, p. 1-240.

BARTLETT, G.A., 1964, Benthonic foraminiferal ecology in St. Margarets Bay and Mahone Bay, S.E. Nova Scotia. Bedford Inst. Oceanog. Rept. 64-8 (unpubl) p. 1-159.

---------------, 1965, Preliminary investigations of benthonic foraminiferal ecology in Tracadie Bay, Prince Edward Island. Bedford Inst. Oceanog. Rept. 65-3.

---------------, 1966, Foraminiferal distribution in Tracadie Bay, Prince Edward Island. Geol. Surv. Canada, paper 66-20.

BEERBOWER, J.R. and JORDEN, D., 1969, Application of information theory to paleontologic problems: Taxonomic Diversity. Jour. of Palaeo. v. 43, p. 1184-1198.

BELANGER, P.E., 1976, The effects of dredge spoil on the benthonic foraminifera of Rhode Island. Environ. Protection Agency, (unpubl), p. 1-160.

BELANGER, P.E., and STREETER, S., 1980, Distribution and ecology of benthic foraminifera in the Norweigian-Greenland Sea. Mar. Micropal. v. 5, p. 401-428.

BOLTOVSKOY, E., and LENA, H., 1969, Seasonal occurrences, standing crop and productivity in benthic foraminifera of Puerto Desado. Contr. Cushman Fdn. Foramin. Res. v. 20, no. 3, p. 81-95.

BRADSHAW, J.S., 1957, Laboratory studies on rate of growth of the foraminifer <u>Strebulus beccari</u> (Linne) var. <u>tepida</u> Cushman. Jour. Palaeo. v. 31, p. 1138.

BRADY, H.B., 1878, On the reticularian and radiolarian Rhizopoda (Foraminifera and Polycystina) of the North Polar expedition of 1875-1876. Ann. Mag. Nat. Hist. v. 1, (ser. 5) p. 425-440.

-----------, 1879, Notes on some of the Reticularian Rhizopoda of the "Challanger" expedition. Quart. Jour. Micro. Sci. v. 19, p. 20-63.

-----------, 1881, Notes on some of the reticularian Rhizopoda of the "Challanger" expedition: Part 3. Quart. Jour. Roy. Micr. Soc. v. 21, p. 31-71.

-----------, 1884, Report on the Foraminifera dredged by H.M.S. Challanger during the years 1873-1876. Challanger Rept. Zoology. v. 9, p. 1-814.

BREMER, M.L. and LOHMANN, G., 1982, Evidence for primary control of the distribution of certain Atlantic Ocean benthonic foraminifera by degree of carbonate saturation. Deep Sea Res. v. 29, p. 987-998.

BROOKS, W., 1973, Distribution of recent foraminifera from the Southern coast of Puerto Rico. Micropalaeo. v. 19, p. 385-416.

BUZAS, M.A., 1965, The distribution and abundance of foraminifera in Long Island Sound. Smithsonian Misc. Coll., v. 149, p. 1-89.

-----------, 1970, Spatial homogeneity: Statistical analysis of unispecies and multispecies populations of foraminifera. Ecology, v. 51, p. 874-879.

-----------, 1970, On the Quantification of biofacies. Proc. North Am. Palaeo. Conv., pt. B, p. 101-116.

-----------, 1978, Foraminifera as prey for benthic deposit feeders : results of predator exclusion experiments. Jour. Mar. Res., v. 56, p. 617-625.

-----------, 1979, The measurement of species diversity. _In_ Foraminiferal Ecology and Palaeoecology. Soc. Econ. Pal. and Min. Short Course no. 6, p. 3-10.

-----------, 1979, Quantitative Biofacies analysis. _In_ Foraminiferal Ecology and Palaeoecology. Soc. Econ. Pal. and Min. Short Course no. 6, p. 11-20.

-----------, and GIBSON, T., 1969, Species diversity and benthonic foraminifera in the Western North Atlantic. Science, v. 163, p. 72-75.

-----------, and CARLE, K.J., 1979, Predators of Foraminifera in the Indian River Florida. Jour. Foram. Res., v. 9, p. 336-340.

-----------, and SEVERIN, K.P., 1982, Distribution and systematics of foraminifera in the Indian River, Florida. Smithson. Contr. Mar. Sci., v. 16, p. 1-73.

-----------, KOCH, C.F., CULVER, S.J., and SOHL, N.F., 1982, On the distribution of species occurrence. Paleobiol., v. 8, p. 143-150.

CARSOLA, A.J. 1952, Marine Geology of the Arctic Ocean and adjacent seas off Alaska and N.W. Canada. Unpubl. Phd thesis, University of California, Los Angeles, p. 1-221.

CHASTER, G.W., 1892, Report upon the Foraminifera of the Southport Society of Natural Science. First Rept. Southport Soc. Nat. Sci. 1890-1891.

CLARK, D.F, 1971, Effects of aquaculture outfall on benthonic foraminifera in Clam Bay, Nova Scotia. Maritime Sediments. v. 7, no. 2, p. 76-84.

CLIMAP Project Members, 1976, The Surface of the ice-age earth. Science, v. 191, p. 1131-1137.

COK, A.E., 1970, Morphology and surficial sediments of the Eastern half of the Nova Scotian Shelf. Unpubl. Phd thesis, Dalhousie University, Halifax Nova Scotia.

COLE, F., 1981, Taxonomic notes on the Bathyal Zone benthonic foraminiferal species off North East Newfoundland. Bedford Inst. Oceanog. Rept. Ser. BI/R/81-7.

COLE, F., and FERGUSON, C., 1975, An illustrated catalogue of Foraminifera and Ostracoda from Canso Strait and Chedabucto Bay Nova Scotia. Bedford Inst. Oceanog. Rept. 75-5, (Unpubl.) p. 1-55.

CONNELL, J. and SLAYTER, R., 1977, Mechanism of succession in natural communities and their role in community stability and organization. The American Nat. v. 111, p. 1119-1144.

COULBOURN, W.T., 1980, Relationship between the distribution of foraminifera and geological structures off Accra Bight South America. Jour. Palaeo. v. 54, p. 696-718.

CULVER, S.J., and BUZAS, M.A., 1980, Distribution of Recent Benthonic Foraminifera off the North American coast. Smithson. Contrib. to Mar. Sci., no. 6, p. 1-512.

CUSHMAN, J.A., 1908, Foraminifera of the Woods Hole region. Proc. of the Boston Soc. Nat. Hist., v. 34, p. 21-24.

-------------, 1910, A monograph of the Foraminifera of the North Pacific Ocean. Pt. 1, Astrorhizidae and Lituolidae. U.S. National Mus. Bull. no. 71 p. 1-134.

-------------, 1911, A monograph of the Foraminifera of the North Pacific Ocean Pt. 2, Textularidae. U.S. National Mus. Bull. no. 71, Pt. 2, p. 1-108.

-------------, 1913, Subclass Foraminifera: In, Sumner, F.B., Osburn, R.C. and Cole, C.J., A biological survey of the waters of Woods Hole and vicinity . Section III, p. 549-552.

-------------, 1917, A monograph of the Foraminifera of the North Pacific Ocean. Pt. 6, Miliolidae. U.S. National Mus. Bull., no. 71. p. 1-108.

-------------, 1918, The Foraminifera of the Atlantic Ocean. Pt. 1, Astrorhizidae. U.S. National Mus. Bull., no. 104, p. 1-111.

-------------, 1920, The Foraminifera of the Atlantic Ocean. Pt. 2, Lituolidae. U.S. National Mus. Bull., no. 104, p.1-111.

-------------, 1922, The Foraminifera of the Atlantic Ocean. Pt. 3, Textularidae. U.S. National Mus. Bull., no. 104, p. 1-149.

-------------, 1922, Results of the Hudson Bay expedition (1920). Contrib. Can. Biol., no. 9, p. 135-147.

-------------, 1923, The Foraminifera of the Atlantic Ocean. Pt. 4, Lagenidae. U.S. National Mus. Bull., no. 104, p. 1-228.

-------------, 1924, The Foraminifera of the Atlantic Ocean. Pt. 5, Chilostomellidae and Globigerinidae. U.S. National Mus. Bull., no. 104, p. 1-55.

-------------, 1927, An outline of a re-classification of the foraminifera. Contr. Cushman Lab. Foramin. Res., v. 3, p. 1-105.

-------------, 1929, The Foraminifera of the Atlantic Ocean. Pt. 6, Miliolidae. U.S. National Mus. Bull. no. 104, p. 1-129.

-------------, 1930, The Foraminifera of the Atlantic Ocean. Pt. 7, Nonionidae, Camerinidae, Peneroplidae and Alveolinellidae. U.S. National Mus. Bull. no. 104, p. 1-79.

-------------, 1930, Some notes on the Genus Patellina. Contr. Cushman Lab. Foramin. Res., v. 6, p. 11-17.

-------------, 1931, The Foraminifera of the Atlantic Ocean. Pt. 8, Rotaliidae, Amphisteginidae, Calcarinidae, Cymbaloporellidae, Globarotaliidae, Anomalinidae, Planorbulinidae, Rupertiidae and Homotremidae. U.S. National Mus. Bull. no. 104, p. 1-179.

-------------, 1944, Foraminifera from the shallow water of the New England coast. Contr. Cushman Lab. Foramin. Res., no. 12, p. 1-37.

-------------,1947, New species and varieties of Foraminifera from off the south east coast of the United states. Contri. Cushman Lab. Foramin. Res., v. 23, pt. 4, p. 86-92.

-------------, and OZAWA, Y., 1928, An outline of a revision of the Polymorphinidae. Contr. Cushman Lab. Foramin. Res., v. 4, p. 13-21.

-------------, and EDWARDS, P., 1937, Astrononion a new genus of foraminifera. Contr. Cushman Lab. Foramin. Res., v. 13, p. 29-36.

-------------, and PARKER, F.L., 1940, The species of genus Bulimina having Recent types. Contr. Cushman Lab. Foramin. Res., v. 16, p. 7-23.

-------------, and TODD, R., 1947, A foraminiferal fauna from Amchitka Island, Alaska. Contr. Cushman Lab. Foramin. Res., v. 23, p. 60-72.

-------------, and BRONNIMANN, P., 1948, Some new genera and species of Foraminifera from brackish waters of Trinidad. Contr. Cushman Lab. Foramin. Res., v. 24, pt. 1, p. 15-21.

-------------, TODD, R. and POSTMA, R., 1954, Recent foraminifera of the Marshall Islands. U.S. Geol. Surv. Prof. Paper, 260H, p. 318-384.

DANIELS, R.A. and LIPPS, J., 1978, Predation of Foraminifera by Antarctic Fish. Jour. Foramin. Res., v. 8, p. 110-113.

DAWSON, G.M., 1870, On Foraminifera from the Gulf and River St. Lawrence. Can. Nat. and Quart. Jour. Sci., v. 5, p. 172-180.

DAWSON, J.W., 1860, Notice of Tertiary fossils from Labrador, Maine etc. and remarks on the climate of Canada, in the newer Pliocene or Pleistocene period. Can. Nat. and Quart. Jour. Sci., v. 5, p. 188-200.

DEEVEY, E.S., 1969, Species diversity in fossil assemblages. In Diversity and Stability in ecological Ecosystems. Brookhaven Symposia in Biology. no. 22, p. 224-241.

DENNISON, J.M., and HAY, W., 1967, Estimating the needed sampling area for sub-aquatic ecologic studies. Jour. Palaeo., v. 41, p. 706-708.

DOUGLAS, R.G., 1979, Benthonic Foraminiferal Ecology and Palaeoecology: A review of concepts and methods. In Foraminiferal Ecology and Palaeoecology. Soc. Econ. Pal. and Min. Short course no. 6, p. 21-51.

-------------, WALCH, C., and BLAKE, G., 1976, Benthic foraminifera of the southern Californian borderland. Bureau of Land Management Technical Rept. TR 76-2, Bureau of Land Management, Washington D.C.

-------------, COTTON, M.L., and WALL, L., 1978, Distributional and variability analysis of benthic foraminifera in the southern California bight. B.L.M. Rept. Vol. II, Rept. 21.0, Bureau of Land Management, Washington D.C.

-------------, WALL, L. and COTTON, M.L., 1978, The effects of sample quality in the recovery of live benthonic foraminifera from the southern Californian borderland. B.L.M. Tech. Rept. 20-0, Vol. II. Bureau of Land Management, Washington D.C.

-------------, and HEITMAN, H.L., 1979, Slope and Basin foraminifera of the California borderlands. Soc. Econ. Pal. and Min. Spec. Publ. no. 27, p. 231-246.

-------------, LIESTMAN, WALCH, C., BLAKE, G. and COTTON, M.L., 1980, Transition from live to sediment assemblages in Benthonic Foraminifera from southern California borderlands. Pacific coast palaeogeography symposium. v. 4, Soc. Econ. Pal.and Min.

DRAPEAU, G., 1971, Sedimentology of the surficial sediments of the western portion of the Scotian Shelf. Unpubl. PhD thesis, Dept. Oceanog. Dalhousie University Halifax Nova Scotia. p. 1-132.

-----------, and KING, L.H., 1972, Surficial Geology of the Yarmouth-Browns Bank map area. Marine Sci. paper 2, Geol. Surv. Can. paper 76-24. p. 1-6.

DRYDEN, A.L., 1931, Accuracy in percentage representation of heavy mineral frequencies. Proced. Nat. Acad. of Sci., v. 17, p. 233-238.

DUNBAR, M.J., 1951, Eastern Arctic waters. Bull. Fish. Res. Bd. Can. v. 88, p. 1-131.

EHRENBERG, C.G., 1839, Uber die Bildung der Kreidefelsen und des Kreidenmergels durch unsichtebare Organismen. Abh. preuss. Akad. Wiss., v. 3, p. 59-147, Berlin.

ELLISON, R.L., 1977, Foraminifera of the outer continental shelf of the mid Atlantic Bight. Virginia Institute of Mar. Sci.; Middle Atlantic Outer continental shelf Environmental studies. Unpubl. v. 2, ch. 7, p. 1-26.

-------------, 1979, Benthic Ecology studies: Foraminifera. Spec. Rept. in applied Mar. Sci. and Ocean Engin., no. 196, p. 1-37.

EMERY, K.O., and GARRISON, L., 1967, Sea Levels, 7-20,000 years ago. Science, v. 157, p. 684-687.

-----------, and UCHUPI, E., 1972, The Western North Atlantic. Am. Assoc. Petr. Geol. Memoir, no. 17, p. 480-511.

FAAS, R.W., 1971, Preliminary report on foraminiferal distribution in the deep basins of the Gulf of Maine. Maritime Sediments, v. 7, no. 1, p. 19-22.

FEYLING-HANSSEN, R.W., 1964, Foraminifera in Late Quaternary deposits from the Oslofijord area. Norges. Geol. Unders. Nr. 225.

FICHTEL. L., and MOLL, J.P., 1778, Testacea microscopia aliaque esc generibus Argonauta et Nautilus ad naturam delineata et descripta. Wien. Camesina.

FILLON, R., 1976, Hamilton Bank, Labrador Shelf: Postglacial sediment dynamics and palaeo-oceanography. Mar. Geol., v. 20, p. 7-25.

FINDLEY, H.J., 1947, New Zealand Foraminifera, Key species in stratigraphy. N.Z. Jour. Sci. and Tech., v. 28, no. 5, sec. B, p. 259-292.

FISHER, R.A., CORBET, A.S. and WILLIAMS, C.B., 1943, The relationship between the number of species and the number of individuals in random samples of an animal population. Jour. Animal Ecol., v. 12, p. 42-58.

FORWARD, C. 1954, Ice distribution in the Gulf of St. Lawrence during the break up season. Geogr. Bull. Dept. Mines and Tech. services., no. 6.

FOURNIER, R., MARRA, R., BOHER, R. and Van DET, M., 1977, Plankton dynamics and Nutrient Enrichment of the Scotian Shelf. Jour. Fish. Res. Bd. Can., v. 34, no. 7, p. 1004-1018.

GALLOWAY, J.J., and WISSLER, S.J., 1927, Pleistocene foraminifera from Lomita Quarry, Palos Verdes Hills, California. Jour. Palaeo., v. 1, p. 35-87.

GARRETT, C. and LOUCKS, R., 1976 Upwelling along the Yarmouth Shore of Nova Scotia. Jour. Fish. Res. Bd. Can., v. 33, p. 116-117.

GATIEN, M.G., 1975, A study of the slope water region, south of Halifax. Unpubl. MSc. thesis, Dalhousie University Dept. of Oceanogr. Halifax Nova Scotia.

GIBSON, L.B., 1966, Some unifying characters of species diversity. Contr. Cushman Fdn. Foramin. Res., v. 17, p. 117-124.

GIBSON, T. and BUZAS, M.A. 1973, Species diversity: Patterns in modern and Miocene foraminifera of the eastern margin of North America. Geol. Soc. Am. Bull., v. 84, p. 217-238.

GRADSTEIN, F. and BERGGREN, W., 1981, Flysh type agglutinated foraminiferal assemblages and the Maastrichtian through Paleogene history of the Labrador and North Sea. Mar. Micropal., v. 6, p. 211-268.

GREEN, K., 1960, Ecology of some Arctic foraminifera. Micropalaeo., v. 6, no. 1, p. 57-58.

GREGORY, M.R., 1970, Distribution of Benthonic foraminifera in Halifax Harbour, Nova Scotia Canada. Unpubl. PhD thesis, Dalhousie University, Dept. of Geology, Halifax Nova Scotia. p. 1-269.

GREINER, G.O., 1970, Environmental factors causing distributions of recent foraminifera. Unpubl. PhD thesis, Case Western Reserve University. p. 1-200.

HAQ, B. and BOERSMA, A. (EDs) 1977, Introduction to Marine Micropalaeontology. Elsevier Publ. Co. New York. P. 1-376.

HAYNES, J.R., 1981, Foraminifera. John Wiley and Sons, Publi. New York. p.1-433.

HESSLER, R. and SANDERS, H., 1967, Faunal diversity in the deep sea. Deep Sea Res. v. 14, p. 65-78.

HILL, P., 1979, Late Quaternary sediments of the Nova Scotian continental slope. Unpubl. Rept. Dalhousie University, Dept. Geology, Halifax Nova Scotia. p. 1-109.

---------, 1981, Detailed morphology and Late Quaternary sedimentation on the Nova Scotian slope south of Halifax. Unpubl. PhD thesis, Dalhousie University Dept. of Geology, Halifax Nova Scotia. p. 1-323.

HOEGLUND, H., 1947, Foraminifera in the Gullmar Fjord and Skagerak. Zool. Bidrag. Fran. Uppsala Bd. 26, p. 1-328.

HOFKER, J., 1951, The foraminifera of the Siboga expedition, pt. III. Siboga-Expeditie, E.J. Bull., Leiden. p. 1-513.

HOOPER, K., 1970, Recent foraminifera on the continental shelf off eastern Canada. Bedford Inst. Oceanogr., Rept. 70-3. (unpubl) p. 1-43.

-----------, 1975, Foraminiferal ecology and associated sediments of the lower St. Lawrence estuary. Jour of Foramin Res., v. 5, p. 218-238.

HOUGHTON, R., SMITH, P.C., and FOURNIER, R.O., 1978, A simple model for cross-shelf mixing on the scotian shelf. Jour. Fish. Res. Bd. Can., v. 35, no. 4, p. 414-421.

IMBRIE, J. and Van ANDEL, T., 1964, Vector analysis of heavy mineral data. Geol. Soc. Am. Bull., v. 75, p. 1131-1156.

---------- and KIPP, N.G., 1971, A new micropalaeontological method for quantitative palaeoclimatology. In The Late Glacial Ages. K. TUREKIAN (Ed.) Yale University Press, New Haven, C.T. p. 71-181.

JORESKOG, K., KLOVAN, J.E. and REYMENT, R., 1976, Methods in Geomathematics: 1 Geological Factor Analysis. Elsevier, Amsterdam, p. 1-178.

KAFESCIOGLU, I.A., 1975, Quantitative distribution of foraminifera on the continental shelf and upper slope off Massachusets. Micropalaeo. v. 21, no. 3, p. 261-305.

KING, L.H., 1969, Submarine end morraines and associated deposits on the Scotian Shelf. Geol. Soc. Am. Bull., v. 80, p. 83-96.

----------, 1970, Surficial geology of the Halifax-Sable Island map area. Marine Sci. paper 1. Ener. Mines and Res. p. 1-16.

----------, and MACLEAN, B., 1976, Geology of the Scotian Shelf. Marine Sci. paper 7, Geol. Surv. Can., paper 74-31.

KIPP, N., 1976, New transfer functions for estimating past sea surface conditions from sea bed distribution of planktonic foraminiferal assemblages, North Atlantic. In Investigations of Late Quaternary palaeo-oceanography and palaeoclimatology. Cline, R.M., and Hays, J.D., (Eds.) Geol. Soc. Am. Mem. 145.

KLOVAN, E. and IMBRIE, J., 1971, An algorithm and Fortran IV program for large scale Q-Mode factor analysis. Math. Geol., v. 3, p. 61-67.

KONTROVITZ, M., SNYDER, S., and BROWN, R., 1978, A flume study of the movement of foraminiferal tests. Palaeogeog. Palaeo. and Palaeoecol., v. 23, p. 141-150.

LAGOE, M.B., 1977, Recent benthonic foraminifera from the Central Arctic Ocean. Jour. Foramin. Res., v. 7, no. 2, p. 106-129.

-----------, 1979, Recent benthonic foraminiferal biofacies in the Arctic Ocean. Micropalaeo., v. 25, p. 214-224.

LAPIN, L., 1975, Statistics, meaning and method. Harcourt, Brace and Jovanovich Inc. (Publi) p. 1-591.

LESLIE, R.J., 1963, Foraminiferal study of a cross-section of Hudson Bay Canada. Geol. Surv. Can. Paper, 63-16. p. 1-28.

-------------, 1965, Ecology and palaeoecology of Hudson Bay foraminifera. Bedford Inst. Oceanogr. Rept. 65-6, p. 1-28.

LINNE, C., 1758, Systema naturae per regna tria naturae, secundum classes, ordines, genera, species cum characteribus differentiis, synoyimis locis. no. 1, p. 1-824. Engleman, G. (Lipsiae).

LIPPS, J. and VALENTINE, J.W., 1970, The role of foraminifera in the trophic structure of marine communities. Lethaia, v. 3, p. 279-286.

LIVINGSTONE, D., 1968, Some interstadial and post-glacial pollen diagrams from eastern Canada. Ecol. Monogr., v. 38, p. 87-125.

LOEBLICH, A. and TAPPAN, H., 1952, _Adercotryma_ a new recent foraminifera genus from the Arctic. Jour. Wash. Acad. Sci., v. 42, p. 141-142.

--------------------------, 1953, Studies of Arctic foraminifera. Smithson. Misc. Coll., v. 121, no. 7

--------------------------, 1955, Revision of some recent foraminiferal genera. Smithson. Misc. Coll., no. 5, v. 128.

--------------------------, 1962, The foraminiferal genus, _Cibicides_ _Heterolepa_ and _Planulina_. Contr. Cushman Fdn. Foramin. Res., v. 13, p. 71-243.

--------------------------, 1962, The status and type species of _Calcarina_, _Tinoporus_ and _Eponides_. Contr. Cushman Fdn. Foramin. Res., v. 13, p. 33-37.

--------------------------, 1964, Sarcodina, chiefly Thecamoebians and Foraminiferida. _In_ Moore, R.C. (Ed.) Treatise on invertebrate palaeontology, Part C, Protista.

LOHMANN, G., 1978, Abyssal benthonic foraminifera as hydrographic indicators in the western south Atlantic Ocean. Jour. Foramin. Res., v. 8, p. 6-34.

MACLEAN, B., and KING, L.H., 1971, Surficial Geology of the Banquereau and Misaine Bank map area. Mar. Sci. paper 3, Geol. Surv. Can., paper 71-52., p. 1-19.

MACLEAN, B., FADER, G.B., and KING, L.H., 1977, Surficial Geology of Canso Bank and adjacent areas. Mar. Sci. paper 20, Geol. Surv. Can. paper 76-15, p. 1-11.

MAGEAU, W.C. and WALKER, D.A., 1976, Effects of ingestion on foraminifera by larger invertebrates. 1st. Internat. Symp. on Benthonic Foraminifera of the continental margins. Schafer, C.T., and Pelletier, B., (Eds.) Maritime Sediments Spec. Public., p. 89-105.

MALMGREN, B. and Haq, B., 1982, Assesment of quantitative techniques in palaeobiogeography. Mar. Micropalaeo., v. 7, p. 213-236.

MANSON, V. and IMBRIE, J., 1964, Fortran program for Factor analysis or Vector analysis of Geological data using IBM 7090 or 7094/1401 computer systems. Kansas Geol. Surv. Spec. Distrib. publ., 13, p. 1-46.

MARLOWE, J. and VILKS,G., 1963, Marine Geology eastern part of Prince Gustaf Adolf Sea. District of Franklin: Polar continental shelf project. Geol. Surv. Can. paper 63-22, p. 1-32.

MATOBA, Y., 1976, Recent foraminiferal assemblages off Sendai, north-east Japan. In 1st internat. symp. on benthic foraminifera of continental margins. Schafer, C., Pelletier, B., (Eds.) Maritime Sediments, Spec. publ. v. 1 and 2.

McLELLAN, H.J., 1954, Temperature-Salinity relations and mixing on the Scotian Shelf. Jour. Fish. Res. Bd. Can., v. 11, p. 419-429.

McLELLAN, H.J., 1957, On the distinctness and origin of the slope water off the Scotian shelf and its easterly flow south of the Grand Banks. Jour. Fish. Res. Bd. Can., v. 14, p. 213-239.

MILAM, R.W., and ANDERSON, J.B., 1981, Distribution and Ecology of recent benthonic foraminifera of the Adelie-George V continental shelf and slope, Antarctica. Mar. Micropalaeo., v. 6, p. 297-325.

MILLER, A.A., SCOTT, D.B., and MEDIOLI, F., 1982, Elphidium excavatum (Terquem): Ecophenotypic versus subspecific variation. Jour. Foramin. Res., v. 12, p. 116-144.

MILLER, A.R., 1950, A study of mixing processes over the edge of the continental shelf. Jour. Mar. Res., v. 9, n0. 2, p. 145-160.

MILLER, K. and LOHMANN, G.P., 1982, Environmental distribution of recent benthic foraminifera on the north east U.S. continental slope. Geol. Surv. Am. Bull., v. 93.

------------, GRADSTEIN, F. and BERGGREN, W., 1982, Late Cretaceous to Early Tertiary agglutinated benthic foraminifera in the Labrador Sea. Micropalaeo. v. 28, no. 1, p. 1-30.

MILLIMAN, J. and EMERY, K., 1968, Sea levels during the past 35,000 years. Science, v. 162, p. 1121-1123.

MILLS, E.L. and FOURNIER, R.O., 1979, Fish Production and the Marine Ecosystems of the Scotian Shelf Eastern Canada. Mar. Biol., v. 54, p. 101-108.

MOLFINO, B., KIPP, N. and MORLEY, J., 1982, Comparison of foraminiferal, coccolithophorid and radiolarian palaeotemperature equations: assemblage coherency and estimate concordancy. Quatenary Res., v. 17, p. 279-313.

MONTAGU, G., 1803, Testacea Britannica, or natural history of British shells, marine, land and fresh water, including the most minute. J.S. Hollis, Romsey England, v. 1, 2, and 3, p. 1-606.

-----------, 1808, Testacea Britannica, supplement. S. Woolmer (Exeter, England) p. 1-183.

de MONTFORT, D., 1808, Conchyliologie systematique et classification methodique des coquilles. v. 1, p. 1-409.

MUDIE, P., 1980, Palynology of Later Quaternary Marine Sediments, Eastern Canada. Unpubl. PhD thesis, Dept. Geology, Dalhousie University, Halifax Nova Scotia.

---------, 1982, Pollen distribution in recent marine sediments, eastern Canada. Can. Jour. Earth Sci., v. 19, p. 729-747.

-----------, GUILBAULT, J.P., 1982, Ecostratigraphic and palaeomagnetic studies of Late Quaternary sediments on the North Eastern Newfoundland Shelf. Current Res. Pt. B., Geol. Surv. Can., paper 82-15, p. 107-116.

---------, KEEN, C.E., HARDY, I. and VILKS, G., 1983, Multivariate analysis and quantitative paleoecology of benthic foraminifera in recent and Late Quaternary shelf sediments, northern Canada. In Press. Mar. Micropalaeo.

MULLINEAUX, L. and LOHMANN, G.P., 1981, Late Quaternary stagnations and recirculation of the eastern Meditaraneaan: Changes in the deep water recorded by fossil benthic foraminifera. Jour. Foramin. Res., v. 11, p. 21-44.

MURRAY, J.W., 1968, Living foraminifers of lagoons and estuaries. Micropalaeo. v. 15, p. 435-455.

------------, 1969, Recent foraminifera from the Atlantic continental shelf off the United States. Micropalaeo., v. 15, no. 4, p. 401-419.

------------, 1973, Distribution and Ecology of Living Benthic Foraminiferids. Heinemann, London (publishers) p. 1-274.

------------, 1976, A method of determining proximity of marginal seas to an ocean. Mar. Geol., v. 22, p. 103-119.

------------, 1979, Recent benthonic Foraminifera from the Celtic Sea. Jour. Foramin. Res., v. 9, no. 3, p. 193-209.

-------------, STURROCK, S. and WESTON, J., 1982, Suspended load transport of foraminiferal tests in a tide and wave swept sea. Jour. Foramin. Res., v. 12, no. 1, p. 51-65.

NATLAND, M.L., 1933, The temperature and depth distribution of some Recent and fossil foraminifera in the southern california region. Scripps Inst. Oceanogr. Tech. Ser., v. 3, p. 225-230.

NICHOLS, R. and NORTON, W., 1969, Foraminiferal populations in a coastal plain estuary. Palaeogeog. Palaeoclim. Palaeoecol., v. 6, p. 197-213.

NORVANG, A., 1945, The zoology of Iceland, Foraminifera. Ejnar Munskgaard (Copenhagen and Reykjavik) v. 2, pt. 2, p. 1-79.

-----------, 1958, Islandiella ng. Cassidulina d'Orbigny. Vidensk. Meddr. dansk. naturh. foren., v. 120, p. 25-41.

NORMAN, A.M., 1892, Rhizopoda. Pt. VIII. Museum Normanianium, Durham, England.

ORBIGNY, A.D. d', 1826, Tableau methodique de la class des cephalopods, III order, Foraminiferes. Annls. Sci. Nat., ser. 1, v. 7, p. 245-314.

----------------, 1939, Voyage dans l'Amerique Meridionale Foraminiferes. Pt. 5, p. 1-88. Pitois-Levrault et Ce (Paris).

----------------, 1846, Foraminiferes fossiles du bassin Tertiare de Vienne, Paris.

OSTERMAN, L. and KELLOGG, T., 1979, Recent benthic foraminiferal distributions from the Ross Sea Antarctica: Relation to ecologic and oceanographic conditions. Jour. Foramin. Res., v. 9, no. 3, p. 250-269.

.PARKER, F.L., 1952, Foraminiferal distribution in the Long Island Sound Buzzards Bay area. Bull. Mus. Comp. Zool. Harvard, v. 106, p. 425-473.

------------, 1952, Foraminifera species off Portsmouth, New Hampshire. Bull. Mus. Comp. Zool. Harvard, v. 106, p. 431-423.

PARKER, W.K., and JONES, T.R., 1859, On the nomenclature of the Foraminifera: Pt. 2. On the species enumerated by Walker and Montagu. Ann. Mag. Ñat. Hist., v. 4, p. 333-351.

-----------, and ------------, 1865, On the Foraminifera from the North Atlantic and Arctic Oceans including Davis Str. and Baffins Bay. Philos. Trans., v. 155, p. 325-441.

PATTEN, B.C., 1962, Species diversity in net phytoplankton of Raritan Bay. Jour. Mar. Res., v. 20, p. 57-75.

PFLUM, C. and FRERICHS, W., 1976, Gulf of Mexico Deep Water Foraminifers. Cushman Fdn. Foramin. Res., Spec. Publ., no. 14, p. 1-107.

PHLEGER, F.B., 1942, Foraminifera of submarine cores from the continental slope, pt. 2. Geol. Soc. Am. Bull., v. 53, p. 1073-1098.

-------------, 1952, Foraminifera distribution in some samples from the Canadian and Greenland Arctic. Contr. Cushman Fdn. Foramin. Res., v. 3, p. 80-89.

-------------, 1952, Foraminiferal ecology off Portsmouth, New Hampshire. Bull. Mus. Comp. Zool., Harvard, v. 106, p. 318-362.

-------------, 1956, Significance of living foraminiferal populations along the central Texas coast. Contr. Cushman Fdn. Foramin. Res., v. 7, p. 106-151.

-------------, 1960, Ecology and Distribution of Recent Foraminifera. John Hopkins Press, Baltimore, U.S.A.

-------------, 1964, Foraminiferal ecology and marine geology. Mar. Geol., v. 1, p. 16-43.

-------------, and PARKER, F., 1951, Gulf of Mexico Foraminifera. Geol. Soc. Am. Mem. no. 46.

PIELOU, E.C., 1979, Precedence analysis : the identification and use of benthic foraminiferal groups as environmental indicators. Jour. Foramin. Res., v. 9, no. 1, p. 14-29.

PIPER, D.J., 1975, Late Quaternary deep water sedimentation of Nova Scotia and the Grand Banks. Can. Soc. Petr. Geol., Mem. no. 4, p. 195-204.

-----------, 1976, The use of ice-rafted marine sediments in determining Glacial conditions. Re. Geogr. Montr., v. XXX, p. 207-755.

REUSS, A.E., 1850, Neues Foraminiferen aus den Schichten des Osterrichischen Tertiarbeckens. K. Akad. Wiss. Wien. Math-natur.c1. Denkschr., v. 1, p. 365-390.

REVELLE, R., 1934, Physico-chemical factors affecting the solubility of calcium carbonate in sea-water. Jour. Sed. Pet., v. 4, p. 103-110.

-----------, and FAIRBRIDGE, R., 1957, Carbonates and carbon dioxide. Treatise on Marine Ecol. and Palaeoecol., v. 1, Ecol., Hedgpeth, J.W., (Ed.).

RHUMBLER, L., 1936, Foraminiferen der Lieder Bucht, gesammelt durch A. Remane, Teil 11, (Ammodisculininae bis einschl. Textulinidae.) Kieler Meeresforschungen, 1, p. 179-242.

ROBE, R.Q., 1971, Ocean observations; North Atlantic Standard monitoring systems, A1, A2, A3, and A4, 1967-68. U.S. Coast Guard Oceanography Rept., no. 43, p. 1-227.

RODRIGUES, C., HOOPER, K. and JONES, P., 1980, The apertural structures of Islandiella and Cassidulina. Jour. Foramin. Res., v. 10, no. 1, p. 48-60.

-------------, and ---------, 1982, Recent benthonic foraminiferal associations from offshore environments in the Gulf of St. Lawrence. Jour. Foramin. Res., v. 12, no. 4, p. 327-352.

RONDE, M. de la, 1972, Temperature salinity and density distributions of the Scotian Shelf. 1965-1971. Bedford Inst. Oceanogr. Data Series, B1-D-72-6, Unpubl.

SANDERS, H.L., 1969, Benthic Marine diversity and the Stability-Time hypothesis. In Diversity and Stability in Ecological ecosystems. Brookhaven Symposia in Biol., no. 22, p. 71-81.

SCHAFER, C.T. and PRAKASH, A. 1968, Current transport and deposition of foraminiferal tests, planktonic organisms and lithogenic particles in Bedford Basin, Nova Scotia. Maritime Sediments, v. 9, no. 3, p. 100-103.

SCHAFER, C.T., and COLE, F.E., 1978, Distribution of Foraminifera in Chaleur Bay, Gulf of St. Lawrence. Geol. Surv. Can. paper 77-30, p. 1-55.

-------------,---------------, and CARTER, L., 1981, Bathyal zone Foraminiferal genera off N.E. Newfoundland. Jour. Foramin. Res., v. 11, no. 4, p. 296-317.

SCHNITKER, D., 1971, Distribution of Foraminifera on the North Carolina continental shelf. Tulane studies in Geol. and Palaeo., v. 8, no. 4, p. 169-215.

-------------, 1974, Western Atlantic abyssal circulation during the past 12,000 years. Nature, v. 248, p. 385-387.

-------------, 1979, The deep waters of the Western North Atlantic during the past 24,000 years and the re-initiation of the Western Boundary undercurrent. Mar. Micropalaeo., v. 4, p. 265-280.

-------------, 1980, Quaternary deep sea benthonic foraminifera and bottom watermasses. Ann. Rev. Earth and Planetary Sci., v. 8, p. 384-370.

SCHULTZE, M.S., 1854, Uber den organismus der Polythalmien (Foraminiferen), nebst Bermerkungen uber die Rhizopoden in Allgemeinen. Leipzig. p. 1-69.

SCHWAGER, C., 1877, Quadro del proposto sistema de classificazine du foraminiferi con guscio. R. Comitato Geol. Italia Bull., v. 8, p. 18-27.

SCOTT, D.B. and MEDIOLI, F.S., 1980a, Living versus Total foraminiferal populations : Their relative usefulness in palaeoecology. Jour. Palaeo., v. 54, no. 4, p. 814-831.

-----------, and -----------, 1980b, Quantitative studies of marsh foraminiferal distributions in Nova Scotia : Implications for sea-level studies. Cushman Fdn. Foramin. Studies, Spec. Publ., no. 17, p. 1-58.

-----------, and -----------, 1980c, Post-glacial emergence curves in the Maritimes determined from sediments in raised basins. Can. Coastal Conference.

-----------, SCHAFER, C. and MEDIOLI, F. 1980, Eastern Canadian Estuarine Foraminifera : A framework for comparison. Jour. Foramin. Res., v. 10, p. 205-234.

SEJRUP, H.P., FJAREN, T., HALD, M., BECK, L., HAGEN, T., MILJETEG, I., MORVIK, I. and NORVIK, O., 1980, Benthonic foraminifera in surface samples from the Norweigian continental margin between 62oN and 65oW. Jour. Foramin. Res., v. 11, no. 4, p. 277-295.

SEN GUPTA, B.K., 1971, The benthonic foraminifera of the Tail of the Grand Banks. Micropalaeo., v. 17, no. 1, p. 69-98.

--------------, and McMULLEN, R.M., 1969, Foraminiferal distribution and sedimentary facies on the Grand Banks of Newfoundland. Can. Jour. Earth Sci., v. 6, p. 475.

-----------, and KILBOURNE, R.T., 1974, Diversity of benthic foraminifera on the Georgia continental shelf. Geol. Soc. Am. Bull., v. 85, p. 969-972.

-----------, and --------------, 1976, Depth distribution of benthonic foraminifera on the Georgia continental shelf. In 1st. Internat. symp. on Benthic Foramin. of the continental margins. Maritime Sediments, Spec. Publ., no. 1, p. 25-38.

-----------, and STRICKART, D.P., 1982, Living foraminifera of the Florida-Hatteras slope : Distribution trends and anomalies. Geol. Soc. Am. Bull., v. 93, p. 218-224.

SILVER, E.A., 1971, Transitional tectonics and Late Cenozoic structure of the continental margin off north western California. Geol. Soc. Am. Bull., v. 82, p. 1-22.

SLITER, W., 1972, Cretaceous bathymetric distribution of benthic foraminifers. Nature, v. 239, p. 514-515.

SLOBODKIN, L. and SANDERS, H., 1969, On the contribution of environmental predictability to species diversity. In Diversity and Stability in Ecological systems. Brookhaven Symposia in Biology, no. 22, p. 82-95.

SOKAL, R.R., and SNEATH, R.H.A., 1963, Principles of numerical taxonomy. W.H. Freeman and Co., publishers, San Fransisco, p. 1-359.

STREETER, S., 1973, Bottom water and benthonic foraminifera in the North Atlantic: Glacial -Interglacial contrasts. Quaternary Res., v. 3, p. 131-141.

------------, 1980, Latest Pleistocene and Holocene benthic foraminifera from the slope and rise of Eastern North America. Geol. Soc. Am. Abs. with programs, v. 12, p. 530.

------------, and SHACKLETON, N.J., 1979, Palaeocirculation of the deep North Atlantic : 150,000 year record of benthic foraminifera and O18. Science, v. 203, p. 168-171.

------------, and LAVERY, S., 1982, Holocene and Latest Glacial benthic foraminifera from the slope and rise off Eastern North America. Geol. Soc. Am. Bull., v. 93.

STANLEY, D.J., SWIFT, D.J., SILVERBERG, N., JAMES, N., and SUTTON, R., 1972, Late Quaternary progradation and sand spillover on the outer continental margin off Nova Scotia, S.E. Canada. Smithson. Contrib. to Earth Sci., no. 8, p. 1-87.

SVERDRUP, H.H, JOHNSON, M.W., FLEMING, R., 1942, The Oceans. Prentice Hall Inc. Publisher, New York.

SWIFT, D.J., STANLEY, D.J. and CURRAY, J.R., 1971, Relict sediments on continental shelves- a reconsideration. Jour. Geol., v. 79, p. 322-346.

TAPPAN, H., 1951, Northern Alaska Index Foraminifera. Contr. Cushman Fdn. Foramin. Res., v. 2, pt. 1, p. 1-8.

TEMPLE, J.T., 1978, The use of Factor analysis in geology. Math. Geol., v. 10, no. 4, p. 379-387.

SLITER, W., 1972, Cretaceous bathymetric distribution of benthic foraminifers. Nature, v. 239, p. 514-515.

SLOBODKIN, L. and SANDERS, H., 1969, On the contribution of environmental predictability to species diversity. In Diversity and Stability in Ecological systems. Brookhaven Symposia in Biology, no. 22, p. 82-95.

SOKAL, R.R., and SNEATH, R.H.A., 1963, Principles of numerical taxonomy. W.H. Freeman and Co., publishers, San Fransisco, p. 1-359.

STREETER, S., 1973, Bottom water and benthonic foraminifera in the North Atlantic: Glacial -Interglacial contrasts. Quaternary Res., v. 3, p. 131-141.

------------, 1980, Latest Pleistocene and Holocene benthic foraminifera from the slope and rise of Eastern North America. Geol. Soc. Am. Abs. with programs, v. 12, p. 530.

------------, and SHACKLETON, N.J., 1979, Palaeocirculation of the deep North Atlantic : 150,000 year record of benthic foraminifera and $O^{18}$. Science, v. 203, p. 168-171.

------------, and LAVERY, S., 1982, Holocene and Latest Glacial benthic foraminifera from the slope and rise off Eastern North America. Geol. Soc. Am. Bull., v. 93.

STANLEY, D.J., SWIFT, D.J., SILVERBERG, N., JAMES, N., and SUTTON, R., 1972, Late Quaternary progradation and sand spillover on the outer continental margin off Nova Scotia, S.E. Canada. Smithson. Contrib. to Earth Sci., no. 8, p. 1-87.

SVERDRUP, H.H, JOHNSON, M.W., FLEMING, R., 1942, The Oceans. Prentice Hall Inc. Publisher, New York.

SWIFT, D.J., STANLEY, D.J. and CURRAY, J.R., 1971, Relict sediments on continental shelves- a reconsideration. Jour. Geol., v. 79, p. 322-346.

TAPPAN, H., 1951, Northern Alaska Index Foraminifera. Contr. Cushman Fdn. Foramin. Res., v. 2, pt. 1, p. 1-8.

TEMPLE, J.T., 1978, The use of Factor analysis in geology. Math. Geol., v. 10, no. 4, p. 379-387.

THALMANN, H., 1950, New names and homonyms in foraminifera. Contr. Cushman Lab. Foramin. Res., v. 1, p. 41-45.

TODD, R., and BRONNIMAN, P., 1957, Recent foraminifera and Thecamoebians from the eastern Gulf of Paria. Cushman Fdn. Foramin. Res., Spec. Publ., no. 3, p. 1-43.

TOLERLUND, D.S., 1969, Seasonal distribution patterns of planktonic foraminifera at 5 ocean stations in the Western North Atlantic. Unpubl. PhD thesis, Dept. of Geology, Columbia University, New York.

UCHIO, T., 1960, Ecology of living benthonic foraminifera from San Diego---California area. Cushman Fdn. Foramin. Res., Spec. Publ., no 5., p. 1-35.

VILKS, G., 1968, Foraminiferal study of the Magdalen Shallows, Gulf of St. Lawrence. Maritime Sediments, v. 4, no. 1, p. 14-21.

---------, 1969, Recent foraminifera in the Canadian Arctic. Micropalaeo., v. 15, p. 35-60.

---------, 1980, Post-Glacial basin sedimentation on the Labrador Shelf. Geol. Surv. Can., paper, 78-28.

---------, and RASHID, M., 1976, Post-Glacial palaeo-oceanography of Emerald Basin, Scotian Shelf. Can. Jour. Earth Sci., v. 13, no. 9, p. 1256-1267.

---------, DEONARINE, B., WAGNER, F., and WINTERS, G., 1982, Foraminifera and Mollusca in surface sediments of the S.E. Labrador shelf. Geol. Soc. Am. Bull., v. 93, p. 225-238.

VOLOSHINOVA, N.A., 1958, O Novoi sistematike nonionid Mikrofauna SSSr, Sbornik 9, Trudy Vess. Neft. Vyp. 115, p. 115-191.

WALKER, D., 1976, An insitu investigation of life cycles of benthonic mid-littoral foraminifera. In 1st, Internat. Symp. on Benthonic Foraminifera. Maritime Sediments, Spec. Publi., no. 1, p. 119-129.

WALKER, D., LINTON, A., and SCHAFER, C.T., 1974, Sudan Black: A superior stain to Rose bengal for distinguishing living from non-living foraminifera. Jour. Foramin. Res., v. 4, p. 205-215.

WALKER, K.R., and BAMBACH, R.K., 1971, The significance of fossil assemblages from fine grained sediments-time averaged communities. Geol. Surv. Am. Abst. with program, v. 3, p. 783-784.

-------------, and -------------, 1974, Analysis of Communities. In Principles of Benthic Community analysis. Short Course, Sedimenta IV, Comparative Sed. Lab.

WALKER, G. and JACOB, E., 1798, In Adams essays on the microscope, containing a practical description of the most improved microscopes; a general history of insects. A description of 383 animacula. Dillon and Keating, London.

WARNER, J.L., 1970, Water movement on the Scotian Shelf. Unpubl. PhD thesis, Dept. Oceanogr. Dalhousie University, Halifax, Nova Scotia, p. 1-227.

WHITEAVES, J.F., 1901, Catalogue of the marine Invertebrata of eastern Canada. Geol. Surv. Can., no. 772, p. 1-271.

WILLIAMS, C.B., 1964, Patterns in the balance of Nature. P. 1-234, Academic Press.

WILLIAMSON, W.C., 1958, On the Recent Foraminifera of Gt. Britain. Ray. Soc. Publs., v. 20, p. 1-107.

WIRSEN, C. and JANNACHSH, H., 1975, Activity of marine psychrophilic bacteria at elevated hydrostatic pressures and low temperatures. Mar. Biol., v. 31, p. 201-208.

WHITTAKER, R.H., 1970, Communities and Ecosystems. Macmillan, Publishers, London, p. 1-161.

# APPENDIX I

## SAMPLE LOCATION AND DEPTH

STATION LATS.AND LONGS. AS USED IN FACTOR ANALYSIS OF FORAM. DATA.
SAMLOC.

| SAMPLE NO. | LATITUDE | LONGITUDE | DEPTH |
|---|---|---|---|
| 7902 | 42 46.5 | 63 25.0 | 602 |
| 7903 | 42 45.6 | 63 25.0 | 700 |
| 7904 | 42 43.3 | 63 24.5 | 798 |
| 7906 | 42 41.4 | 63 25.0 | 1000 |
| 7907 | 42 39.0 | 63 24.5 | 1200 |
| 7908 | 42 37.6 | 63 25.0 | 1400 |
| 7909 | 42 32.0 | 63 25.0 | 1600 |
| 7910 | 42 26.2 | 63 25.0 | 1800 |
| 7911 | 42 09.0 | 63 25.0 | 2400 |
| 7912 | 42 13.5 | 63 25.0 | 2200 |
| 7913 | 42 19.9 | 63 25.0 | 2000 |
| 7914 | 43 45.9 | 63 04.8 | 271 |
| 7917 | 43 46.3 | 62 54.0 | 251 |
| 7918 | 43 46.0 | 62 51.7 | 240 |
| 7920 | 43 46.4 | 62 46.7 | 220 |
| 7947 | 42 47.6 | 61 53.5 | 1200 |
| 7948 | 42 40.2 | 61 53.5 | 1680 |
| 7949 | 42 37.0 | 61 53.5 | 1800 |
| 7950 | 42 34.2 | 61 35.5 | 2000 |
| 7951 | 42 32.2 | 61 54.0 | 2200 |
| 7952 | 42 29.8 | 61 54.0 | 2400 |
| 7953 | 42 51.1 | 63 17.7 | 170 |
| 7955 | 42 58.7 | 63 21.9 | 156 |
| 7956 | 43 04.7 | 63 29 1 | 166 |
| 7957 | 43 09.5 | 63 32.0 | 140 |
| 7958 | 43 13.5 | 63 34.6 | 175 |
| 7959 | 43 20.4 | 63 33.2 | 190 |
| 7960 | 43 24.3 | 63 42.7 | 220 |
| 0802 | 43 22.5 | 61 27.5 | 18 |
| 0817 | 45 21.8 | 60 48.5 | 110 |
| 0818 | 45 21.0 | 60 44.0 | 70 |
| 0819 | 45 19.5 | 60 37.5 | 113 |
| 0820 | 45 18.5 | 60 30.5 | 163 |
| 0821 | 45 18.5 | 60 13.5 | 119 |
| 0822 | 45 13.0 | 59 59.3 | 137 |
| 0824 | 45 09.1 | 59 38.1 | 102 |
| 0825 | 45 51.3 | 60 08.6 | 16 |
| 0830 | 45 50.3 | 60 02.5 | 59 |
| 0832 | 45 48.7 | 60 01.3 | 29 |
| 0833 | 45 25.6 | 61 02.1 | 31 |
| 0835 | 45 25.2 | 61 07.7 | 51 |
| 0838 | 45 24.5 | 61 16.6 | 27 |
| 0839 | 45 24.1 | 61 18.8 | 33 |
| 0841 | 45 23.3 | 61 24.4 | 33 |
| 0843 | 45 19.0 | 60 36.5 | 73 |
| 0844 | 45 10.6 | 60 46.0 | 174 |
| 0846 | 45 52.8 | 60 59.0 | 238 |
| 0847 | 44 44.0 | 61 07.5 | 82 |
| 0848 | 44 34.8 | 61 11.3 | 104 |
| 0849 | 44 27.9 | 61 17.5 | 128 |
| 0850 | 44 20.5 | 61 20.6 | 196 |

| | | | |
|---|---|---|---|
| 0851 | 44 15.0 | 56 12.3 | 200 |
| 0852 | 44 08.5 | 61 34.3 | 108 |
| 0856 | 43 40.0 | 62 12.5 | 101 |
| 0857 | 43 28.0 | 62 22.5 | 86 |
| 8002 | 43 47.5 | 62 45.1 | 214 |
| 8004 | 43 24.8 | 63 20.0 | 206 |
| 8005 | 43 24.0 | 63 20.0 | 203 |
| 8006 | 43 23.0 | 63 20.0 | 197 |
| 8007 | 43 22.0 | 63 20.0 | 190 |
| 8010 | 43 22.5 | 63 20.0 | 195 |
| 8011 | 43 22.5 | 63 20.0 | 195 |
| 8012 | 43 22.5 | 63 20.0 | 195 |
| 8013 | 42 05.0 | 63 30.3 | 2500 |
| 8014 | 41 48.5 | 63 28.7 | 3050 |
| 8017 | 42 50.2 | 63 27.0 | 180 |
| 8018 | 42 48.7 | 63 28.0 | 195 |
| 8027 | 42 50.2 | 63 22.2 | 185 |
| 8035 | 45 02.6 | 60 42.1 | 135 |
| 8036 | 45 04.5 | 60 44.0 | 114 |
| 8037 | 45 06.4 | 60 45.8 | 154 |
| 8038 | 45 06.6 | 60 47.6 | 167 |
| 8039 | 45 09.8 | 60 49.6 | 156 |
| 8040 | 45 10.9 | 60 50.4 | 135 |
| 8042 | 45 12.7 | 60 52.2 | 103 |
| 8043 | 45 13.5 | 60 54.0 | 60 |
| 8044 | 45 14.0 | 60 53.0 | 76 |
| 8060 | 43 12.3 | 60 59.5 | 492 |
| 8061 | 43 10.8 | 61 00.4 | 648 |
| 8062 | 43 09.8 | 61 00.5 | 775 |
| 8063 | 43 07.6 | 61 00.9 | 990 |
| 8064 | 43 04.2 | 61 00.7 | 1708 |
| 8065 | 43 02.3 | 61 05.8 | 2120 |
| 8066 | 43 09.5 | 61 09.7 | 1350 |
| 8067 | 43 11.0 | 61 09.0 | 1050 |
| 8068 | 43 12.3 | 61 09.5 | 781 |
| 7802 | 44 08.4 | 58 06.1 | 834 |
| 6003 | 44 03.6 | 63 30.5 | 156 |
| 6005 | 43 45.0 | 63 30.0 | 175 |
| 6006 | 43 30.1 | 63 30.2 | 160 |
| 6007 | 43 20.5 | 63 29.9 | 167 |
| 6018 | 42 48.5 | 63 27.5 | 230 |
| 6032 | 42 43.5 | 63 22.1 | 750 |
| 6033 | 42 42.5 | 63 22.5 | 970 |
| 6034 | 42 42.5 | 63 22.6 | 1045 |
| 6036 | 42 46.9 | 63 21.8 | 450 |
| 6041 | 42 47.8 | 63 26.2 | 280 |
| 6042 | 42 47.5 | 63 26.5 | 280 |
| 6050 | 42 47.7 | 63 27.5 | 350 |
| 6051 | 42 47.3 | 63 25.5 | 380 |
| 6052 | 44 10.7 | 62 50.2 | 170 |
| 6053 | 44 21.4 | 62 51.5 | 152 |
| 6055 | 44 24.5 | 62 52.0 | 100 |
| 6056 | 44 28.5 | 62 52.0 | 115 |
| 6057 | 44 31.5 | 62 52.0 | 88 |

| | | | |
|---|---|---|---|
| 6058 | 44 34.3 | 62 50.3 | 75 |
| 6062 | 43 54.2 | 62 06.6 | 165 |
| 6063 | 43 44.1 | 64 11.5 | 185 |
| 6064 | 43 39.1 | 64 14.5 | 180 |
| 6065 | 43 34.3 | 64 12.2 | 190 |
| 6066 | 43 30.9 | 64 07.8 | 125 |
| 6068 | 43 22.7 | 64 06.5 | 97 |
| 6069 | 43 13.8 | 64 06.3 | 87 |
| 6070 | 43 01.4 | 64 11.8 | 95 |
| 6071 | 42 55.0 | 64 14.4 | 116 |
| 6072 | 42 48.1 | 64 18.9 | 105 |
| 6073 | 42 40.9 | 64 20.5 | 140 |
| 6074 | 42 37.3 | 64 22.8 | 280 |
| 6075 | 42 37.3 | 64 22.8 | 300 |
| 6076 | 42 31.2 | 64 26.6 | 770 |
| 6077 | 42 31.3 | 64 27.3 | 650 |
| 6078 | 42 33.4 | 64 28.3 | 400 |
| 6079 | 42 39.8 | 64 30.3 | 130 |
| 6080 | 42 45.7 | 64 33.4 | 110 |
| 6081 | 42 55.8 | 64 38.8 | 100 |
| 6082 | 43 04.8 | 64 42.6 | 94 |
| 6083 | 43 09.7 | 64 54.7 | 123 |
| 6084 | 43 17.4 | 64 57.9 | 140 |
| 6085 | 43 17.8 | 64 58.4 | 160 |
| 6086 | 43 19.2 | 64 58.4 | 155 |
| 6087 | 43 19.2 | 64 55.1 | 142 |
| 6088 | 43 22.1 | 64 53.3 | 128 |
| 6089 | 43 23.6 | 64 49.6 | 110 |
| 6090 | 43 26.4 | 64 43.7 | 56 |
| 6092 | 43 16.2 | 64 59.6 | 161 |
| 6094 | 43 16.7 | 64 59.4 | 155 |
| 6096 | 43 19.4 | 65 10.0 | 150 |
| 6097 | 43 36.7 | 64 36.4 | 141 |
| 6098 | 43 31.8 | 64 29.0 | 144 |
| 6099 | 44 03.2 | 64 12.8 | 113 |
| 6100 | 44 03.0 | 64 12.8 | 112 |
| 6101 | 44 02.2 | 64 13.7 | 110 |
| 6102 | 44 04.5 | 64 12.2 | 103 |
| 6106 | 44 15.2 | 64 10.6 | 66 |
| 6108 | 43 57.1 | 64 09.2 | 150 |
| 6109 | 43 57.5 | 64 09.2 | 149 |
| 6111 | 43 51.6 | 64 00.0 | 205 |
| 6112 | 43 49.4 | 64 03.9 | 228 |
| 6113 | 43 50.5 | 64 04.0 | 170 |
| 6114 | 43 52.2 | 64 05.8 | 168 |
| 6115 | 43 54.7 | 64 08.5 | 155 |
| 6116 | 43 55.1 | 64 08.9 | 150 |
| 6117 | 43 55.7 | 64 09.5 | 155 |
| 6110 | 43 57.3 | 64 09.5 | 148 |
| 1008 | 42 56.0 | 62 15.0 | 360 |
| 1009 | 43 00.0 | 62 07.0 | 130 |
| 1010 | 43 07.0 | 61 56.5 | 100 |
| 1011 | 43 22.0 | 61 40.0 | 77 |
| 1015 | 43 44.0 | 60 04.0 | 60 |

| | | | |
|---|---|---|---|
| 1016 | 43 44.0 | 59 27.0 | 140 |
| 1017 | 43 39.0 | 59 21.2 | 200 |
| 1018 | 43 38.6 | 59 20.0 | 280 |
| 1020 | 43 33.5 | 59 18.1 | 320 |
| 1021 | 43 32.7 | 59 19.5 | 440 |
| 1022 | 43 43.0 | 59 19.0 | 120 |
| 1026 | 44 11.0 | 59 19.0 | 260 |
| 1027 | 44 14.4 | 59 19.1 | 235 |
| 1028 | 44 20.0 | 50 20.0 | 215 |
| 1029 | 44 23.0 | 59 20.5 | 120 |
| 1034 | 44 13.0 | 58 12.0 | 129 |
| 1035 | 44 13.0 | 58 10.5 | 200 |
| 1036 | 44 11.9 | 58 08.0 | 440 |
| 1037 | 44 11.5 | 58 07.5 | 625 |
| 1038 | 44 10.7 | 58 06.8 | 775 |
| 1039 | 44 09.9 | 58 05.6 | 1000 |
| 1040 | 44 07.2 | 57 58.7 | 1600 |
| 1043 | 44 41.0 | 57 23.0 | 63 |
| 1044 | 44 44.0 | 57 20.0 | 70 |
| 1045 | 44 44.3 | 57 19.0 | 160 |
| 1046 | 44 44.2 | 57 18.6 | 240 |
| 1047 | 44 44.3 | 57 16.7 | 300 |
| 1048 | 44 41.1 | 57 15.5 | 380 |
| 1051 | 45 04.5 | 57 46.0 | 120 |
| 1053 | 45 07.0 | 57 52.5 | 60 |
| 1054 | 45 10.0 | 57 54.0 | 72 |
| 1055 | 45 13.0 | 57 55.5 | 175 |
| 1056 | 45 15.5 | 58 02.0 | 84 |
| 1057 | 45 20.0 | 58 04.0 | 220 |
| 1058 | 45 23.5 | 58 09.0 | 160 |
| 1059 | 45 27.0 | 58 12.0 | 100 |
| 1060 | 45 29.5 | 58 14.5 | 180 |
| 1062 | 45 32.0 | 58 21.5 | 100 |
| 1063 | 45 34.5 | 58 24.0 | 113 |
| 1064 | 45 35.5 | 58 24.0 | 340 |
| 1065 | 45 40.0 | 58 30.0 | 360 |
| 1066 | 45 51.5 | 58 34.5 | 80 |
| 1067 | 45 46.0 | 58 43.0 | 270 |
| 1068 | 45 51.0 | 58 52.0 | 200 |
| 1069 | 45 54.5 | 58 52.0 | 140 |
| 1070 | 45 56.0 | 59 02.0 | 105 |
| 1071 | 45 57.5 | 59 08.0 | 70 |
| 1072 | 45 54.0 | 59 25.0 | 55 |
| 1073 | 45 47.5 | 59 23.0 | 120 |
| 1074 | 45 42.0 | 59 13.0 | 160 |
| 1075 | 45 39.0 | 59 03.5 | 275 |
| 1076 | 45 28.0 | 59 02.0 | 145 |
| 1077 | 45 22.5 | 58 56.0 | 80 |
| 1078 | 45 18.0 | 58 51.0 | 80 |
| 1080 | 45 06.0 | 58 43.5 | 75 |
| 1081 | 45 00.0 | 58 39.6 | 145 |
| 1082 | 44 54.1 | 58 29.8 | 91 |
| 1083 | 44 48.0 | 58 38.2 | 200 |
| 1084 | 44 43.0 | 58 41.0 | 100 |
| 1085 | 44 43.0 | 58 49.0 | 85 |

| | | | |
|---|---|---|---|
| 1086 | 44 48.0 | 58 51.0 | 260 |
| 1087 | 44 50.5 | 58 52.0 | 200 |
| 1088 | 44 52.5 | 58 55.0 | 300 |
| 1089 | 44 48.0 | 59 01.0 | 310 |
| 1090 | 44 43.0 | 59 05.0 | 280 |
| 1093 | 44 52.5 | 59 10.0 | 209 |
| 1095 | 44 53.5 | 59 18.5 | 100 |
| 1096 | 44 52.0 | 59 23.9 | 166 |
| 1097 | 44 48.5 | 59 29.5 | 240 |
| 1099 | 44 42.0 | 59 44.0 | 100 |
| 1100 | 44 40.0 | 59 47.0 | 155 |
| 1101 | 44 43.5 | 59 53.0 | 80 |
| 1102 | 44 48.0 | 59 55.0 | 234 |
| 1103 | 44 50.9 | 59 51.6 | 130 |
| 1104 | 44 58.0 | 59 55.0 | 150 |
| 1105 | 44 54.0 | 60 00.0 | 210 |
| 1106 | 44 52.5 | 60 02.5 | 170 |
| 1107 | 44 42.0 | 60 02.0 | 210 |
| 1109 | 44 38.0 | 59 56.0 | 90 |
| 1110 | 44 34.0 | 59 53.0 | 110 |
| 1111 | 44 24.0 | 59 49.0 | 140 |
| 1112 | 44 20.5 | 59 53.0 | 140 |
| 1113 | 44 13.0 | 59 59.0 | 113 |
| 1114 | 44 09.0 | 59 49.0 | 135 |
| 1115 | 44 11.0 | 59 56.0 | 130 |
| 1116 | 44 11.5 | 60 10.0 | 220 |
| 1119 | 44 13.9 | 60 37.0 | 140 |
| 1120 | 44 17.0 | 60 46.0 | 160 |
| 1124 | 44 18.0 | 61 11.0 | 83 |
| 1125 | 44 34.0 | 61 16.0 | 105 |
| 1126 | 44 44.0 | 61 19.0 | 112 |
| 1127 | 44 48.0 | 61 22.0 | 92 |
| 1128 | 44 53.0 | 61 30.0 | 130 |
| 1130 | 44 53.0 | 61 40.0 | 105 |
| 1131 | 44 45.3 | 61 38.0 | 118 |
| 1132 | 44 35.0 | 61 37.5 | 165 |
| 1133 | 44 25.0 | 61 37.0 | 171 |
| 1134 | 44 21.0 | 61 51.0 | 160 |
| 1135 | 44 17.0 | 61 57.0 | 170 |
| 1136 | 44 27.5 | 61 56.0 | 170 |
| 1137 | 44 39.0 | 61 56.0 | 135 |
| 1138 | 44 43.5 | 61 09.5 | 115 |
| 1139 | 44 38.5 | 62 18.5 | 155 |
| 1140 | 44 22.0 | 62 22.0 | 230 |
| 1141 | 44 19.5 | 62 19.0 | 160 |
| 1142 | 44 18.0 | 62 18.4 | 80 |
| 1143 | 44 14.0 | 62 23.0 | 92 |
| 1118 | 44 12.0 | 60 27.5 | 125 |
| 4003 | 43 53.5 | 64 33.5 | 77 |
| 4004 | 43 36.5 | 64 59.5 | 55 |
| 4005 | 43 21.0 | 65 23.2 | 55 |
| 4006 | 43 14.3 | 65 49.0 | 44 |
| 4007 | 43 14.6 | 66 24.6 | 83 |

# APPENDIX II

# SHELF VARIMAX FACTOR MATRIX AND FACTOR SCORES

# SPECIES ABBREVIATIONS AS USED IN THE ANALYSES

| | |
|---|---|
| ALVESCIT | *Alveophragmium scitulum* |
| AMMOBACU | *Ammobaculites dilatatus* |
| AMMOCATI | *Ammodiscus catinus* |
| AMMOTCAS | *Ammotium cassis* |
| ASTRGALO | *Astrononion gallowayi* |
| BOLISUBS | *Bolivina subspinescens* |
| BULIEXIL | *Bulimina exilis* |
| BULIACLE | *Bulimina aculeata* |
| BULISTRI | *Bulimina striata* |
| BUCCFRIG | *Buccella frigida* |
| BRIZSPAT | *Bolivina spathulata* |
| BRIZSUBA | *Bolivina subaenariensis* |
| CIBILOBA | *Cibicides lobatulus* |
| CIBIPSEU | *Cibicides pseudoungerianus* |
| CIBIWUEL | *Planulina wuellerstorfi* |
| CASSLAEV | *Cassidulina laevigata* |
| CRIBCRAS | *Cribrostomoides crassimargo* |
| CRIBJEFF | *Cribrostomoides jeffreysi* |
| CRIBSUBG | *Cribrostomoides subglobosum* |
| CYCLCANC | *Cyclammina cancellata* |
| ELPHEXCL | *Elphidium excavatum f. clavata* |
| ELPHBART | *Elphidium bartletti* |
| ELPHSUBA | *Elphidium subarcticum* |
| EGGLADVA | *Eggerella advena* |
| EPONUMBO | *Eponides sp.* |
| FISSERAT | *Fissurina serrata* |

| | |
|---|---|
| FURSLOEB | *Fursenkoina loeblichi* |
| FURSFUSI | *Fursenkoina fusiformis* |
| GLANLAEV | *Glandulina laevigata* |
| GYROSOLD | *Gyroidina soldani* |
| GLOBAURC | *Globobulimina auriculata* |
| GLOBTURG | *Globobulimina pacifica* |
| HOEGELGS | *Hoeglundina elegans* |
| HYPEELON | *Hyperammina elongata* |
| HAPLACAR | *Haplophragmoides canariensis* |
| ISLAISLA | *Islandiella islandica* |
| ISLATERE | *Islandiella teretis* |
| KAREINFL | *Karreriella bradyi* |
| LAGEMOLL | *Lagena mollis* |
| LENTSPAA | *Astocolus hyalacrulus* |
| NONILABR | *Nonionellina labradorica* |
| NONITURG | *Nonionella turgida* |
| MELOPOMP | *Melonis pompilioides* |
| PATEHAUR | *Pateroris hauerinoides* |
| PULEQUIN | *Pullenia quinqueloba* |
| QUICSEMI | *Quinqueloculina seminulum* |
| REOPSCOR | *Reophax scorpiurus* |
| REOPGUTT | *Reophax guttifera* |
| REOPNODU | *Reophax nodulosus* |
| REOPARCT | *Reophax arctica* |
| REOPSCOT | *Reophax scotti* |
| PAROSEMI | *Discamolina semipunctata* |
| SACCATLA | *Saccammina atlantica* |
| SACCSPHA | *Saccammina sphaerica* |

| | |
|---|---|
| SACCDIFF | *Saccammina difflugiformis* |
| STAINAPT | *Stainforthia concava* |
| TROCHINF | *Trochammina inflata* |
| TROCHLOB | *Trochammina lobata* |
| TROCHGLO | *Trochammina globigeriniformis* |
| TRIFANGU | *Trifarina angulosa* |
| TRITCONI | *Tritaxis conica* |
| TEXTTORQ | *Textularia torquata* |
| UVIGPERE | *Uvigerina peregrina* |
| ORIDTENR | *Oridorsalis umbonatus* |
| VALVLAEV | *Valvulineria laevigata* |
| RECUTURB | *Recurvoides turbinatus* |
| ADERGLOM | *Adercotryma glomerata* |
| SPIROBIF | *Spiroplectammina biformis* |
| TRILOCSP | *Triloculina trihedra* |
| ELPHACTT | *Elphidiella arctica* |
| SIGMSCHL | *Sigmoilopsis schlumbergeri* |
| OSANGSPA | *Osangularia rugosa* |
| TRIFOCCI | *Trifarina occidentalis* |
| TROCHSQA | *Trochammina squamata* |
| MBULIMAR | *Bulimina marginata* |

# VARIMAX FACTOR MATRIX

|  | COMM. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| 7914 | .649 | -.012 | .062 | .321 | .033 | .151 | -.032 | -.022 | -.697 |
| 7917 | .719 | -.006 | .176 | .526 | -.009 | -.015 | -.014 | -.039 | -.631 |
| 7918 | .767 | -.002 | .172 | .417 | -.012 | .043 | -.014 | -.037 | -.739 |
| 7920 | .593 | -.004 | .105 | .588 | -.067 | -.072 | .002 | -.032 | -.469 |
| 7953 | .964 | .001 | .470 | -.001 | -.005 | .727 | -.025 | .217 | -.397 |
| 7955 | .939 | -.003 | .401 | -.061 | .002 | .656 | -.029 | .112 | -.563 |
| 7956 | .891 | -.003 | .293 | -.065 | .014 | .606 | -.033 | .052 | -.636 |
| 7957 | .891 | -.000 | .146 | -.045 | .035 | .439 | -.028 | .014 | -.805 |
| 7958 | .862 | -.000 | .373 | .198 | .066 | .220 | -.029 | .066 | -.775 |
| 7959 | .820 | .001 | .076 | .637 | .072 | .156 | -.010 | .221 | -.566 |
| 7960 | .827 | -.013 | .066 | .859 | .061 | .036 | -.008 | -.022 | -.214 |
| 0802 | .936 | .056 | .020 | -.008 | -.003 | -.003 | .965 | .015 | .000 |
| 0817 | .889 | .719 | .026 | .012 | -.103 | -.009 | .511 | -.021 | -.016 |
| 0818 | .996 | -.006 | .987 | .007 | .000 | .110 | -.003 | -.099 | -.005 |
| 0819 | .953 | .972 | .043 | .011 | -.010 | -.007 | .014 | -.020 | -.008 |
| 0820 | .951 | .974 | .012 | .018 | -.007 | -.007 | -.037 | -.012 | -.007 |
| 0821 | .909 | .626 | .571 | .077 | -.025 | .418 | -.010 | .074 | .028 |
| 0822 | .973 | .981 | .027 | .010 | .047 | -.006 | -.058 | .000 | -.004 |
| 0824 | .963 | .977 | .010 | .013 | .072 | -.006 | -.020 | -.006 | -.004 |
| 0825 | .927 | .044 | .018 | -.006 | .008 | .004 | .957 | .021 | .005 |
| 0830 | .964 | .114 | .018 | -.001 | .245 | -.001 | .940 | .027 | .000 |
| 0832 | .970 | -.007 | .936 | -.024 | .014 | .144 | .043 | -.092 | -.245 |
| 0833 | .846 | .392 | .029 | .016 | -.020 | -.007 | .731 | -.015 | -.018 |
| 0835 | .872 | .214 | .021 | -.003 | -.104 | -.006 | .879 | -.003 | -.008 |
| 0838 | .968 | .091 | .020 | .011 | .186 | -.003 | .960 | .020 | -.006 |
| 0839 | .815 | .141 | .017 | .032 | .111 | -.005 | .832 | .010 | -.014 |
| 0841 | .738 | .259 | .020 | .010 | .141 | -.004 | .767 | .002 | -.014 |
| 0843 | .983 | .009 | .980 | .001 | -.000 | .111 | -.003 | -.095 | .000 |
| 0844 | .917 | .890 | .018 | .022 | .348 | -.003 | .013 | .006 | -.007 |
| 0846 | .916 | .951 | .011 | .019 | .095 | -.006 | -.049 | -.006 | -.008 |
| 0847 | .980 | .446 | .871 | .016 | .001 | .118 | -.015 | .079 | .021 |
| 0848 | .937 | .839 | .123 | .041 | .423 | .167 | -.005 | .009 | .008 |
| 0849 | .873 | .057 | .039 | .407 | .817 | .053 | .078 | .039 | -.002 |
| 0850 | .607 | .009 | .012 | .741 | .078 | -.028 | .013 | -.018 | -.212 |
| 0851 | .904 | -.010 | .005 | .940 | -.056 | -.009 | -.004 | -.026 | -.126 |
| 0852 | .590 | .005 | .019 | .756 | .035 | .100 | -.009 | -.025 | -.016 |
| 0856 | .595 | .049 | .172 | .127 | .178 | .540 | .011 | .382 | -.275 |
| 0857 | .979 | .046 | .190 | .031 | .184 | .109 | .063 | .943 | .018 |
| 8002 | .351 | -.004 | -.028 | .280 | -.029 | .274 | .010 | -.007 | -.425 |
| 8004 | .784 | -.006 | .035 | .521 | -.055 | -.027 | .036 | -.007 | -.686 |
| 8005 | .912 | -.003 | .067 | .523 | -.036 | .035 | .019 | -.001 | -.782 |
| 8006 | .923 | .021 | .012 | .374 | -.022 | .027 | .027 | .008 | -.877 |
| 8007 | .930 | -.009 | .007 | .375 | -.023 | .222 | -.001 | .018 | -.859 |
| 8010 | .915 | -.004 | .049 | .192 | .038 | .142 | .011 | .014 | -.921 |
| 8011 | .908 | -.006 | .017 | .252 | -.015 | .120 | .015 | .021 | -.901 |
| 8012 | .895 | -.001 | .013 | .272 | .028 | .064 | .035 | .029 | -.888 |
| 8017 | .960 | .003 | .284 | -.003 | -.017 | .891 | -.012 | .195 | -.216 |
| 8018 | .953 | .001 | .279 | .023 | -.014 | .806 | -.015 | .188 | -.435 |
| 8027 | .974 | .002 | .357 | -.004 | -.015 | .883 | -.011 | .180 | -.186 |
| 8035 | .819 | .841 | .017 | .046 | .169 | -.009 | -.000 | -.015 | -.021 |
| 8036 | .967 | .002 | .403 | .019 | -.003 | .862 | -.010 | .179 | -.172 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8037 | .955 | .975 | .010 | .018 | -.035 | -.008 | -.043 | -.011 | -.007 |
| 8038 | .956 | .967 | .007 | .011 | -.045 | -.005 | -.077 | -.007 | .000 |
| 8039 | .973 | .966 | .009 | .018 | .177 | -.006 | -.049 | -.000 | -.005 |
| 8040 | .947 | .971 | .013 | .014 | -.011 | -.002 | -.048 | -.014 | -.007 |
| 8042 | .928 | .923 | .015 | .006 | -.065 | -.010 | .254 | -.011 | -.007 |
| 8043 | .851 | .901 | .020 | .022 | -.042 | -.002 | .095 | -.022 | -.008 |
| 8044 | .964 | -.003 | .965 | .013 | -.003 | .122 | -.016 | .100 | -.083 |
| 6003 | .857 | .004 | .008 | .874 | -.033 | -.010 | .004 | -.021 | -.298 |
| 6005 | .960 | .730 | .058 | .161 | .604 | .039 | -.005 | .018 | .011 |
| 6006 | .919 | .008 | .175 | .123 | .005 | .482 | .018 | .021 | -.800 |
| 6007 | .872 | -.010 | .095 | .161 | .013 | .276 | -.019 | -.002 | -.868 |
| 6018 | .787 | -.003 | .414 | .009 | -.010 | .753 | -.006 | -.015 | -.213 |
| 6041 | .895 | .004 | .172 | .153 | .031 | .886 | -.008 | .029 | -.214 |
| 6042 | .893 | .000 | .348 | .034 | .005 | .846 | -.002 | .101 | -.206 |
| 6052 | .662 | -.006 | .003 | .604 | -.037 | -.039 | .058 | .010 | -.446 |
| 6053 | .884 | -.009 | .004 | .929 | .006 | -.006 | .005 | -.023 | -.132 |
| 6055 | .910 | .016 | .848 | .042 | .012 | .403 | -.011 | .131 | -.051 |
| 6056 | .699 | .011 | .001 | .742 | .194 | .058 | -.006 | -.011 | .011 |
| 6057 | .868 | .891 | .016 | .018 | -.002 | -.002 | .189 | -.014 | -.009 |
| 6058 | .736 | .099 | .630 | .129 | -.023 | .536 | .114 | -.020 | -.087 |
| 6062 | .816 | .067 | .044 | .891 | -.029 | .045 | -.012 | -.024 | -.099 |
| 6063 | .650 | .188 | .024 | .113 | .400 | -.004 | .073 | -.017 | -.028 |
| 6064 | .910 | -.013 | .003 | .939 | .025 | .004 | -.006 | -.018 | -.104 |
| 6065 | .664 | .016 | .011 | .777 | .129 | .040 | -.003 | .016 | .002 |
| 6066 | .782 | .002 | .639 | .139 | .066 | .424 | -.013 | -.049 | -.408 |
| 6068 | .995 | .000 | .628 | .040 | -.036 | .076 | .002 | .770 | .002 |
| 6069 | .997 | .025 | .411 | .017 | -.045 | .018 | .041 | .907 | -.001 |
| 6070 | .994 | .034 | .738 | .005 | -.025 | .196 | -.001 | .638 | -.034 |
| 6071 | .974 | .038 | .572 | -.016 | .030 | .629 | -.009 | .469 | -.169 |
| 6072 | .967 | -.001 | .472 | -.025 | -.009 | .845 | -.013 | -.004 | -.172 |
| 6073 | .877 | .005 | .175 | -.001 | -.016 | .918 | .000 | .045 | .021 |
| 6074 | .983 | .004 | .076 | -.011 | -.011 | .939 | -.006 | .063 | -.302 |
| 6075 | .789 | .056 | -.021 | .065 | .069 | .477 | .030 | .008 | -.641 |
| 6079 | .929 | .014 | .418 | -.001 | .012 | .865 | .003 | .025 | -.060 |
| 6080 | .966 | .004 | .760 | -.015 | .013 | .573 | -.017 | -.040 | -.239 |
| 6081 | .991 | .010 | .722 | .009 | .012 | .031 | -.023 | .684 | -.028 |
| 6082 | .903 | .013 | .862 | .041 | .043 | .201 | .098 | .008 | -.310 |
| 6083 | .906 | .124 | .671 | .085 | .296 | .413 | -.002 | .010 | -.418 |
| 6084 | .958 | .585 | .020 | .029 | .761 | .000 | .078 | .032 | -.006 |
| 6085 | .845 | .062 | .023 | .841 | .269 | .016 | .014 | .233 | .015 |
| 6086 | .949 | .331 | .004 | .041 | .908 | -.001 | .067 | .037 | -.007 |
| 6087 | .967 | .638 | .007 | .032 | .728 | -.004 | .090 | .031 | -.005 |
| 6088 | .923 | .690 | .028 | .014 | .573 | .000 | .291 | .026 | -.004 |
| 6089 | .996 | .018 | .868 | .012 | -.023 | .045 | .017 | .489 | -.009 |
| 6090 | .995 | -.002 | .728 | .011 | -.031 | .016 | -.025 | .680 | .014 |
| 6092 | .881 | .197 | -.000 | .646 | .638 | .060 | .042 | .018 | -.001 |
| 6094 | .937 | .381 | .004 | .036 | .878 | .002 | .073 | .035 | -.012 |
| 6096 | .824 | .229 | .003 | .691 | .529 | .114 | .025 | .019 | -.001 |
| 6097 | .814 | .100 | .010 | .084 | .886 | .002 | .083 | .031 | .005 |
| 6098 | .769 | .260 | .008 | .087 | .830 | .004 | .065 | .033 | -.002 |
| 6099 | .897 | .940 | .013 | .014 | .039 | -.009 | .084 | -.011 | -.009 |
| 6100 | .976 | .978 | .010 | .014 | .127 | -.008 | .047 | -.003 | -.006 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6101 | .756 | .854 | .006 | .017 | -.023 | -.005 | .137 | -.006 | -.014 |
| 6102 | .948 | .958 | .014 | .016 | -.022 | -.008 | .124 | -.013 | -.010 |
| 6106 | .886 | .003 | .675 | .038 | -.018 | .270 | .047 | .411 | -.429 |
| 6108 | .745 | .309 | .020 | .104 | .707 | -.011 | .069 | .008 | -.009 |
| 6109 | .953 | .076 | .005 | .089 | .960 | .002 | .086 | .037 | -.007 |
| 6110 | .567 | .357 | .015 | .120 | .559 | .003 | .049 | .010 | -.002 |
| 6111 | .878 | .047 | .048 | .921 | -.005 | -.007 | .012 | -.016 | -.144 |
| 6112 | .717 | .179 | .013 | .570 | .529 | .050 | .016 | .011 | .018 |
| 6113 | .883 | .028 | .040 | .882 | .011 | .004 | -.000 | .284 | -.139 |
| 6114 | .814 | .604 | .011 | .332 | .574 | .042 | .036 | .018 | -.008 |
| 6115 | .788 | .406 | .010 | .108 | .764 | -.004 | .018 | .022 | -.005 |
| 6116 | .974 | .175 | .002 | .066 | .965 | .002 | .078 | .040 | -.007 |
| 6117 | .780 | .078 | .025 | .825 | .284 | .071 | .024 | -.006 | -.057 |
| 1009 | .991 | .023 | .247 | .020 | -.028 | .202 | .008 | .942 | -.026 |
| 1010 | .926 | .013 | .031 | .013 | .061 | .954 | .016 | .061 | .075 |
| 1011 | .996 | .012 | .195 | .018 | -.016 | -.050 | .054 | .975 | -.006 |
| 1015 | .923 | .055 | .019 | -.007 | -.046 | -.002 | .956 | .016 | .002 |
| 1016 | .825 | .175 | .006 | .079 | .145 | .073 | .776 | .050 | -.197 |
| 1017 | .917 | .047 | -.059 | .232 | .331 | .724 | .395 | .089 | -.036 |
| 1018 | .584 | .126 | .139 | .384 | .241 | .256 | .170 | .031 | -.246 |
| 1020 | .822 | .046 | .321 | .283 | .614 | .211 | .135 | .298 | -.232 |
| 1021 | .626 | .019 | .252 | .578 | .387 | .138 | .062 | .002 | -.183 |
| 1022 | .942 | .258 | .019 | .003 | .166 | .002 | .914 | .026 | .003 |
| 1026 | .990 | .007 | .926 | .046 | .008 | .324 | .152 | .046 | -.013 |
| 1027 | .903 | .465 | .019 | .018 | .449 | .009 | .688 | .028 | -.006 |
| 1028 | .172 | .001 | -.000 | .350 | -.052 | .032 | .013 | -.013 | -.040 |
| 1029 | .988 | .417 | .227 | .038 | .193 | .115 | .197 | .808 | -.030 |
| 1034 | .932 | .081 | .167 | .013 | -.059 | .312 | .807 | .363 | -.013 |
| 1035 | .813 | .022 | .121 | .064 | .062 | .783 | .370 | .053 | -.007 |
| 1043 | .992 | -.006 | .985 | .003 | .007 | .092 | .063 | -.090 | .027 |
| 1044 | .994 | -.011 | .992 | .015 | -.004 | .092 | -.019 | .020 | .025 |
| 1045 | .982 | -.002 | .795 | .010 | -.030 | .365 | .003 | .462 | .055 |
| 1046 | .927 | .004 | .484 | .119 | -.010 | .804 | .121 | .003 | .052 |
| 1047 | .647 | -.006 | .280 | .709 | -.054 | .098 | .003 | -.039 | -.138 |
| 1051 | .974 | .176 | .189 | .051 | -.037 | .531 | .062 | .784 | .049 |
| 1053 | .997 | -.011 | .992 | .001 | -.003 | .107 | -.017 | -.009 | .018 |
| 1054 | .992 | -.008 | .991 | .011 | .007 | .090 | -.018 | .001 | .022 |
| 1055 | .838 | .788 | .009 | .021 | .363 | .002 | .291 | .015 | -.007 |
| 1056 | .973 | .047 | .859 | .011 | -.025 | .117 | .291 | .366 | .021 |
| 1057 | .867 | .410 | -.042 | .360 | .516 | .516 | .114 | .063 | .076 |
| 1058 | .922 | .946 | .010 | .020 | .155 | .005 | .053 | -.000 | -.005 |
| 1059 | .970 | .094 | .676 | .024 | -.033 | .066 | .154 | .687 | .011 |
| 1060 | .886 | .934 | .018 | .013 | .007 | -.010 | -.023 | -.018 | -.010 |
| 1062 | .852 | .918 | .009 | .025 | -.014 | .012 | -.042 | -.002 | .008 |
| 1063 | .972 | .894 | .058 | .012 | -.078 | -.029 | .083 | .391 | -.006 |
| 1064 | .930 | .920 | .013 | .039 | .253 | -.006 | -.015 | -.004 | -.016 |
| 1065 | .806 | .724 | .015 | .394 | -.025 | .204 | -.055 | .263 | .041 |
| 1066 | .984 | .129 | .705 | .013 | -.036 | .118 | -.031 | .672 | -.053 |
| 1067 | .969 | .972 | .007 | .008 | .061 | -.007 | -.070 | -.002 | -.002 |
| 1068 | .956 | .962 | .005 | .012 | .057 | .003 | -.066 | .001 | .001 |
| 1069 | .983 | .886 | .006 | .024 | .414 | .001 | -.017 | .016 | -.003 |
| 1070 | .914 | .738 | .101 | .060 | -.056 | .231 | -.001 | .547 | -.011 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1071 | .994 | -.011 | .991 | .002 | -.003 | .102 | -.017 | .026 | -.007 |
| 1072 | .992 | -.004 | .991 | .002 | -.004 | .091 | .024 | -.005 | .012 |
| 1073 | .931 | .948 | .018 | .013 | .025 | -.008 | .121 | -.015 | -.012 |
| 1074 | .974 | .972 | .007 | .015 | .154 | -.003 | -.016 | .002 | -.004 |
| 1075 | .744 | .575 | -.009 | .603 | .114 | .170 | -.024 | .004 | .065 |
| 1076 | .946 | .943 | .014 | .025 | .209 | -.009 | .064 | -.005 | -.013 |
| 1077 | .991 | -.004 | .805 | -.001 | -.025 | .125 | -.026 | .566 | -.070 |
| 1078 | .994 | .003 | .740 | .021 | -.032 | .098 | .004 | .660 | -.004 |
| 1080 | .994 | -.008 | .945 | .011 | -.017 | .062 | -.024 | .308 | -.019 |
| 1081 | .904 | .945 | .007 | .021 | .098 | -.008 | .015 | -.002 | -.008 |
| 1082 | .972 | .268 | .503 | .065 | .242 | .194 | -.009 | .736 | -.015 |
| 1083 | .944 | .967 | .008 | .014 | .046 | -.006 | .078 | -.003 | -.006 |
| 1084 | .862 | .908 | .048 | .033 | .102 | .063 | .037 | .121 | -.014 |
| 1085 | .992 | .154 | .906 | .020 | -.010 | .115 | -.017 | .366 | .005 |
| 1086 | .980 | .987 | .012 | .024 | .061 | -.002 | .009 | -.006 | -.002 |
| 1087 | .970 | .976 | .013 | .021 | .113 | -.008 | -.034 | -.009 | -.009 |
| 1088 | .972 | .980 | .010 | .020 | .086 | -.010 | -.046 | -.007 | -.009 |
| 1089 | .957 | .975 | .010 | .007 | -.060 | -.010 | -.042 | -.013 | -.007 |
| 1090 | .966 | .981 | .011 | .005 | .000 | -.009 | .003 | -.008 | -.005 |
| 1093 | .950 | .956 | .016 | .035 | .107 | -.005 | .026 | -.012 | -.014 |
| 1095 | .693 | .791 | .078 | .044 | .051 | -.005 | .070 | .081 | -.001 |
| 1098 | .685 | .812 | .004 | .008 | -.058 | -.002 | .146 | -.003 | -.005 |
| 1097 | .958 | .971 | .009 | .019 | .111 | -.009 | -.053 | -.004 | -.008 |
| 1099 | .932 | .957 | .011 | .024 | .054 | -.003 | -.047 | -.000 | .006 |
| 1100 | .950 | .940 | .015 | .023 | .240 | -.010 | .061 | -.003 | -.012 |
| 1101 | .921 | .550 | .558 | .032 | .076 | .136 | .200 | .485 | .034 |
| 1102 | .964 | .955 | .014 | .022 | .199 | -.008 | .073 | -.005 | -.013 |
| 1103 | .984 | .866 | .008 | .029 | .474 | -.003 | .001 | .016 | -.004 |
| 1104 | .984 | .949 | .006 | .016 | .251 | -.002 | -.048 | .007 | -.003 |
| 1105 | .981 | .988 | .009 | .011 | -.031 | -.008 | -.041 | -.009 | -.004 |
| 1106 | .967 | .954 | .007 | .020 | .226 | -.005 | .002 | .006 | -.004 |
| 1107 | .943 | .969 | .015 | .013 | .036 | -.002 | -.001 | -.013 | -.008 |
| 1109 | .915 | .830 | .036 | .029 | .377 | .006 | .226 | .018 | .006 |
| 1110 | .865 | .855 | .015 | .022 | -.036 | .006 | .344 | .006 | .009 |
| 1111 | .951 | .717 | .030 | .041 | .633 | .005 | .138 | .024 | -.005 |
| 1112 | .913 | .885 | .024 | .028 | .307 | .066 | -.011 | .035 | -.001 |
| 1113 | .622 | .707 | .018 | .039 | .334 | .009 | .057 | .005 | -.003 |
| 1114 | .910 | .756 | .009 | .079 | .509 | .043 | .237 | .024 | -.008 |
| 1115 | .955 | .837 | .009 | .032 | .468 | .006 | .112 | .021 | -.002 |
| 1116 | .930 | .955 | .012 | .030 | .082 | .005 | .075 | .002 | .003 |
| 1119 | .933 | .748 | .026 | .048 | .602 | -.004 | .055 | .013 | -.017 |
| 1120 | .971 | .911 | .018 | .020 | .230 | -.005 | .295 | .005 | -.006 |
| 1124 | .948 | .310 | .017 | .011 | .378 | .003 | .827 | .034 | .004 |
| 1125 | .975 | .761 | .004 | .029 | .591 | .040 | .085 | .031 | .005 |
| 1126 | .961 | .950 | .011 | .016 | .176 | .000 | .164 | .002 | -.008 |
| 1127 | .909 | .948 | .027 | .018 | .054 | -.002 | .076 | -.005 | .001 |
| 1129 | .867 | .926 | .010 | .023 | .051 | -.009 | -.003 | -.007 | -.004 |
| 1130 | .922 | .940 | .146 | .040 | .048 | .064 | -.021 | .064 | -.038 |
| 1131 | .877 | .688 | .014 | .036 | .622 | .006 | .020 | .021 | -.001 |
| 1132 | .801 | .205 | .004 | .080 | .835 | -.006 | .063 | .027 | -.023 |
| 1133 | .925 | .010 | .088 | .799 | .041 | .020 | .026 | .507 | -.133 |
| 1134 | .904 | .028 | .027 | .879 | .329 | -.003 | .032 | -.009 | -.043 |
| 1135 | .912 | .058 | .060 | .864 | .120 | -.018 | .022 | .276 | -.250 |

```
1136                .943    .115    .005    .835    .438    .014    .039    .012   -.142
1137                .954    .500    .010    .065    .835   -.003    .035    .028   -.008
1138                .952    .803    .009    .025    .551   -.006    .041    .015   -.012
1139                .883    .508    .008    .232    .753    .020    .036    .022   -.033
1140                .563    .011   -.008    .556   -.039   -.007    .073   -.000   -.444
1141                .409    .450    .060    .369    .103    .086   -.006    .027   -.217
1142                .977    .046    .863    .020   -.011    .165   -.011    .445   -.034
1143                .893    .291    .700    .042    .072    .454   -.017    .285   -.051
1119                .973    .947    .010    .019    .203    .001    .148    .009    .001
4003                .983    .062    .604    .030   -.022    .134    .011    .768   -.065
4004                .952    .048    .920    .006   -.020    .063    .042    .312    .001
4005                .994    .046    .881    .005    .075    .128   -.006    .439   -.041
4006                .993   -.008    .980   -.009    .008    .142   -.000    .089   -.064
4007                .992   -.010    .973   -.011    .013    .204   -.019   -.014   -.058

           VARIANCE       29.428  14.935   9.018   8.425   7.783   5.499   5.998   6.118
           CUM. VAR       29.428  44.363  53.381  61.806  69.589  75.088  81.086  87.204
```

```
VARIMAX FACTOR SCORES

   VAR.              1        2        3        4        5        6        7        8
 ALVESCIT         -.049     .013     .253     .565     .014    -.080    -.025     .010
 AMMOBACU          .005     .000    -.000     .006    -.000    -.005    -.001     .001
 AMMOCATI          .050    -.005     .021     .009     .004     .047    -.009     .004
 AMMOTCAS          .044     .056    -.038     .123    -.050     .548    -.075    -.057
 ASTRGALO         -.011     .117     .134    -.005     .441     .280     .099     .084
 BOLISUBS         -.017    -.018    -.037     .079     .008     .004     .039    -.154
 BULIEXTL          .050    -.006     .307    -.084     .057    -.035     .014     .085
 BULIACLE          .013     .093    3.157    -.771   -1.115     .102    -.110   -2.697
 BUCCERIG          .036     .230     .205    -.007     .619     .099     .492   -1.866
 BRIZSPAT         -.023    -.224     .053    -.038    1.300     .061    -.134    -.646
 BRIZSUBA         -.004    -.002    2.237    -.423     .027     .076    -.128    -.156
 CIBTLOBA         -.099    8.070    -.018     .015     .767    -.129    -.936     .197
 CIBIPSEU          .005    -.048     .019    -.025     .049     .004     .001    -.193
 CASSLAEV          .012    -.056    -.016    -.015     .389    -.024    -.037    -.271
 CRIBCRAS         1.251     .178     .137    -.329    -.012     .876    -.256    -.156
 CRIBJEFF          .275     .189     .541    1.098     .034    -.037     .027     .260
 CRIBSUBG         -.007     .019     .086     .104    -.021    -.001    -.005    -.028
 ELPHEXCL         -.036     .090    -.939     .224    1.129    -.293    -.090   -6.837
 ELPHBART         -.000     .087    -.257     .022     .854    -.122     .161    -.910
 ELPHSUBA         -.002     .125    -.027     .005    -.052    -.012     .025    -.094
 EGGLADVA          .255     .155    -.083    -.532    -.015    7.809     .130     .026
 EPONUMBO          .001    -.003     .031     .030    -.008    -.007    -.003    -.035
 FISSERAT         -.003     .034    -.003     .013    -.002     .001     .004    -.019
 FURSLOEB          .033     .017     .399    -.066     .029    -.026    -.019     .054
 FURSEUST         -.074    -.100     .713    -.046    -.287     .596     .177   -2.465
 GLANLAEV          .003    -.012     .011     .012     .101    -.009    -.003     .021
 GYROSOLD         -.001    -.035    -.020     .006     .198    -.015    -.005    -.046
 GLOBAURC         -.087    -.072    5.884    -.163     .358    -.127    -.072     .866
 GLOBTURG          .000    -.002    -.002    -.001     .016    -.002     .003    -.000
 HOEGELGS          .003    -.024     .009    -.011     .036    -.003     .006    -.085
 HYPEELON          .034     .032     .089     .080    -.011     .013    -.020    -.008
 HAPLCARE          .014     .108     .321     .222     .103    -.026    -.042     .110
 ISLIISLD          .059     .984     .132    -.341    -.488    -.164    8.068     .020
 ISLITERE          .021     .108    1.646    -.047     .801    -.099    -.149     .038
 KAREINFL         -.015     .020     .071     .044    -.002     .002    -.019     .007
 LAGEMOLL          .000    -.005     .087    -.025    -.025     .009     .013    -.095
 LENTSPCA         -.002    -.058     .037    -.014     .260    -.017    -.004    -.024
```

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NONILABR | -.131 | -.013 | 3.347 | .159 | .211 | .003 | -.016 | -.244 |
| NONITURG | -.019 | .002 | .070 | .055 | .033 | .004 | .032 | -.080 |
| PATEHAUP | -.001 | .017 | .003 | .001 | -.001 | .001 | -.005 | .001 |
| PULEQUIN | .001 | -.025 | -.020 | .006 | .039 | .002 | .000 | -.114 |
| QUICSEMI | .000 | .093 | .013 | -.001 | -.036 | .004 | .007 | .020 |
| REOPSCOR | .181 | .042 | .707 | 1.747 | -.078 | .119 | -.049 | -.237 |
| REOPGUTT | .027 | -.009 | .271 | .223 | .054 | -.009 | -.024 | -.203 |
| REOPNODU | .000 | -.007 | .013 | .042 | .008 | .032 | .028 | .004 |
| REOPARCT | .812 | -.044 | .044 | -.495 | .022 | .805 | .017 | -.006 |
| REOPSCOT | .077 | .021 | .090 | .054 | .028 | .022 | -.045 | .065 |
| PAROSEMI | .001 | -.030 | .001 | -.011 | .239 | -.016 | -.024 | .053 |
| SACCATLA | .558 | -.026 | .180 | 7.612 | .024 | .717 | .373 | -.043 |
| SACCDIFF | -.134 | .057 | .657 | 1.143 | -.070 | -.114 | -.065 | .063 |
| SACCSPHA | -.009 | -.002 | .126 | .031 | .025 | -.007 | -.004 | .061 |
| STATNAPT | -.004 | -.003 | .109 | -.002 | -.056 | .001 | .025 | -.157 |
| TROCHINF | -.038 | .042 | .100 | .424 | -.036 | -.037 | -.021 | -.015 |
| TROCHLOB | .499 | -.036 | .166 | .317 | .371 | .427 | .127 | .120 |
| TROCHGLO | .004 | -.013 | .012 | -.000 | -.031 | .068 | .034 | -.091 |
| TRIFANGU | .067 | -.740 | .073 | -.186 | 7.693 | .074 | .582 | .827 |
| TRITCONI | .090 | .099 | -.044 | .617 | .138 | -.023 | -.083 | -.152 |
| TEXTTORQ | .308 | -.012 | .019 | .330 | -.020 | -.115 | .032 | -.025 |
| ORIDTENR | -.009 | .022 | .045 | .023 | .063 | -.007 | -.041 | -.125 |
| VALVLAEV | -.008 | -.008 | .002 | .036 | .024 | .002 | .001 | -.058 |
| RECUTURB | 1.666 | .087 | -.076 | .018 | -.089 | -.051 | -.120 | -.074 |
| ADERGLOM | 7.727 | .043 | .049 | -.427 | -.046 | -.780 | -.038 | .003 |
| SPIROBIF | 1.169 | .026 | .026 | -.617 | -.038 | 1.502 | -.105 | -.068 |
| TRILOCSP | -.001 | -.010 | .005 | -.001 | .052 | -.003 | .003 | .011 |
| ELPHACTT | -.000 | .077 | -.001 | .002 | -.026 | -.003 | -.049 | -.004 |
| TROCHSQA | .027 | -.041 | .022 | -.038 | .154 | .213 | .009 | .067 |
| MBULIMAR | .012 | -.029 | .205 | -.056 | .045 | -.011 | .002 | -.286 |

# APPENDIX III

## SLOPE VARIMAX FACTOR MATRIX AND FACTOR SCORES

```
                 COMM.        1          2          3          4
7902             .794       .174       .851       .098      -.174

7903             .735       .184       .822       .051      -.150
7904             .773       .378       .682       .095      -.394
7906             .818       .604       .415       .089      -.522
7907             .945       .841       .262       .090      -.401
7908             .980       .909       .209       .086      -.320
7909             .991       .944       .135       .076      -.275
7910             .990       .963       .129       .077      -.199
7911             .954       .843       .153       .081      -.462
7912             .960       .853       .153       .082      -.450
7913             .980       .910       .137       .078      -.356
7948             .939       .958       .078       .059       .103
7949             .942       .963       .053       .056       .091
7950             .969       .979       .080       .064      -.021
7951             .874       .888       .012       .037       .290
7952             .843       .905       .093       .066      -.106
8013             .923       .770       .171       .083      -.542
8014             .008       .051       .069       .006       .012
8060             .560      -.024       .743       .036      -.079
8061             .774       .122       .829       .130      -.237
8062             .543       .121       .616       .082      -.377
8063             .546       .318       .464       .178      -.444
8064             .891       .930       .084       .058       .128
8065             .910       .922       .174       .090      -.149
8066             .900       .635       .353       .134      -.595
8067             .754       .298       .753       .142      -.278
8068             .336       .062       .546      -.056      -.173
7802             .402       .085       .595       .055      -.196
6032             .880       .074       .180       .872      -.286
6033             .775       .424       .585       .220      -.452
6034             .794       .403       .307       .555      -.478
6036             .811       .475       .445       .105      -.613
6050             .547       .124       .207       .076      -.695
6051             .277      -.075       .139       .056      -.499
6076             .895       .033       .075       .937      -.102
6077             .742       .421       .380       .059      -.646
6078             .532       .099       .568       .176      -.411
1008             .518       .041       .598       .082      -.390
1036             .841       .030       .904       .120       .089
1037             .851       .104       .859       .321      -.010
1038             .920      -.018       .106       .953      -.000
1039             .686       .249       .534       .545      -.205
1040             .604       .069       .528       .545       .151
             VARIANCE     33.513     21.427      9.039     12.079
             CUM. VAR     33.513     54.940     63.979     76.058
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VARIMAX FACTOR SCORES

   VAR.                  1          2          3          4
 ALVESCIT             -.048       .380       .661       .176

 AMMOBACU              .014       .335     -.162       .028
 AMMOCATI             -.003       .011     -.007      -.034
 AMMOTCAS             -.014       .025     -.016      -.042
 ASTRGALO             -.077       .466       .171       .239
 BOLISUBS              .011       .333       .663       .090
 BULIEXIL             -.204      5.421       .687      2.486
 BULISTRI              .506       .002       .142       .155
 BULIACLE             -.286      3.557       .118       .593
 BUCCFRIG             -.415      1.526       .867      -.109
 BRIZSPAT             -.846      -.296       .407     -3.213
 BRIZSUBA             -.033      -.081       .324      -.062
 CIBILOBA             -.215      1.745      -.137      -.215
 CIBIPSEU              .203       .377       .039      -.776
 CIBIWUEL              .022       .086       .198       .092
 CASSLAEV             -.127       .591       .602      -.183
 CRIBCRAS             -.009       .131      -.010      -.037
 CRIBJEFF             -.008       .029       .055      -.201
 CRIBSUBG             -.004       .037      -.025      -.028
 CYCLCANC              .020       .069       .014      -.065
 ELPHEXCL             5.116      1.494       .667     -5.645
 ELPHBART             -.178      1.177      -.281       .150
 ELPHSUBA             -.033       .245      -.090       .040
 EGGLADVA              .039       .163       .115      -.026
 EPONUMBO              .049       .029       .118       .052
 FISSEPAT              .016       .135      -.000       .075
 FURSLOEB              .255       .002      -.017       .107
 FURSFUST             -.334      1.049       .720      -.915
 GLANLAEV             -.023       .218      -.027      -.055
 GYROSOLD              .022       .580       .137       .084
 GLOBAURC             -.101       .741      -.165      -.468
 GLOBTURG              .492       .264       .173       .365
 HOEGELGS              .387      -.035      -.020       .146
 HYPEELON              .236       .057      -.098      -.208
 HAPLCARE             -.003       .134      -.056      -.006
 ISLIISLD             -.014       .051      -.038      -.115
 ISLITERE             -.347      1.775      -.845      -.522
 KARETNEL              .033       .471      -.001      -.158
 LAGEMOLL             -.018       .107       .064      -.096
 LENTSPCA             -.045       .013       .102      -.132
 NONILABR             -.204      1.808      -.378       .132
 NONITURG             -.062       .965      1.534       .104
 MELOPOMP              .020       .147      -.061       .041
 PATEHAUR             -.001       .047      -.012      -.004
 PULEQUIN              .106       .498       .416      -.138
 REOPSCOR             -.138      1.510       .271      -.399
 REOPGUTT             -.063       .449      -.036      -.026
 REOPNODU             -.003       .135       .013      -.085
 REUPARCT             -.007       .053      -.025       .009
 REOPSCOT             -.001       .075      -.038      -.032
 PAROSEMI              .001       .032       .006      -.061
 SACCATLA             -.304      1.164       .502      -.467
 SACCDIFF              .068       .732      -.014      -.093
 SACCSPHA              .032       .360       .256       .174
 STAINAPT              .057       .015      -.039      -.191
 TROCHINF             -.015      -.046       .276      -.060
 TROCHLOB             -.035       .123       .033      -.036
 TROCHGLO              .003       .301      -.142      -.166
 TRIFANGU             -.671      1.345      -.596     -2.027
 TRITCONI             -.052       .335      -.025      -.052
 UVIGPERE             6.458      -.324       .150      3.815
 ORIDTENR              .070       .063      -.040      -.075
 VALVLAEV             -.099       .720       .435      -.484
 RECUTURB              .078       .089      -.026       .093
 ADERGLOM             -.006       .009       .000      -.015
 SPIROBIF             -.003       .026      -.018       .002
 SIGMSCHL              .119       .043      -.025       .058
 OSANGSPA             -.058      -.045      -.010      -.226
 TRIFOCCI             -.488      -.944      7.898       .243
 TROCHSQA              .002       .329       .314       .422
 MBULIMAR             -.161       .692       .028      -.010
```

# APPENDIX IV

## LIVE SPECIES VERSUS FACTOR SCORE TABLES (1--8)

## COMPARISON OF FACTOR 1 WITH OBSERVED LIVING DATA

| STATION | FACTOR LOADING | MAIN SPECIES FROM THE FACTOR SCORE MATRIX (FSM) | | | | | OTHER LIVE SPECIES NOT DOMINANT IN FSM |
|---|---|---|---|---|---|---|---|
| | | | ADERGLOM 7.1 | RECUTURB 1.6 | SPIROBIF 1.1 | CRIBCRAS 1.2 | |
| 0819 | .97 | OBSERVED LIVE % | 74 | 14 | | 11 | |
| 0820 | .97 | | 100 | | | | |
| 0822 | .98 | | 83 | | | | |
| 8037 | .96 | | 76 | | | | |
| 8038 | .96 | | 50 | 13 | | | |
| 8039 | .97 | | 43 | 13 | 2 | 17 | |
| 1058 | .94 | | 63 | 9 | | | |
| 1062 | .91 | | 41 | 5 | 1 | 6 | |
| 1086 | .98 | | 50 | 6 | | | |
| 1087 | .97 | | 85 | 9 | | | |
| 1088 | .98 | | 87 | 12 | | | |
| 1089 | .97 | | 60 | 40 | | | |
| 1090 | .98 | | 68 | 33 | | | |
| 1093 | .95 | | 62 | 19 | 2 | | |
| 1097 | .97 | | 70 | 23 | | | |
| 1100 | .94 | | 71 | 20 | | | |
| 1104 | .95 | | 56 | 11 | 7 | | |
| 1105 | .98 | | 63 | 9 | 9 | | |
| 1106 | .95 | | 67 | 8 | | | |
| 1127 | .94 | | 50 | 20 | | 9 | |
| 1128 | .92 | | 50 | 20 | 4 | 2 | |
| 1130 | .94 | | 72 | 6 | 3 | 8 | |

## COMPARISON OF FACTOR 2 WITH OBSERVED LIVING DATA

| STATION | FACTOR LOADING | MAIN SPECIES FROM THE FACTOR SCORE MATRIX | | | | | OTHER LIVE SPECIES NOT DOMINANT IN FSM |
|---|---|---|---|---|---|---|---|
| | | OBSERVED LIVE % | CIBILOBA 8.0 | CASSRENI 1. | | | |
| 0818 | .98 | | 83 | | | | BUCCFRIG |
| 0832 | .93 | | 69 | 9 | | | |
| 0843 | .98 | | 50 | | | | BUCCFRIG<br>CRIBCRAS<br>FISSMARG |
| 6089 | .86 | | | | | | |
| 1026 | .92 | | | | | | |
| 1043 | .98 | | 74 | | | | EGGEADVE |
| 1044 | .99 | | 80 | 20 | | | |
| 1054 | .99 | | 100 | | | | |
| 1053 | .99 | | 85 | 3 | | | CRIBJEFF |
| 1071 | .99 | | 71 | 14 | | | |
| 1072 | .99 | | 86 | 4 | | | |
| 4004 | .92 | | 49 | | | | |

## COMPARISON OF FACTOR 3 WITH OBSERVED LIVING DATA

| STATION | FACTOR LOADING | MAIN SPECIES FROM THE FACTOR SCORE MATRIX | | | | | OTHER LIVE SPECIES NOT DOMINANT IN FSM |
|---|---|---|---|---|---|---|---|
| | | OBSERVED LIVE % | GLOBAURC 5.8 | NONIL ABR 3.3 | BULIACLE 3.1 | BOLISUBS 2.2 | |
| 7959 | .64 | | 24 | 14 | | 5 | CASSLAEV SACCATAL REOPGUTT TROCHLOB |
| 7960 | .86 | | 35 | | | | |
| 0852 | .76 | | 32 | | | 8 | HYPELONG CRIBJEFF TRITCON ORIDTENE |
| 6052 | .60 | | | | | | FURFUS HAPLOCARI |
| 6065 | .77 | | 32 | | | 6 | CRIBJEFF " " CRIBCRAS |
| 6085 | .85 | | 70 | 16 | | | FURSFUS " " |
| 6092 | .66 | | 100 | | | | |
| 6096 | .70 | | 33 | 40 | | 11 | BUCCFRIG |
| 6111 | .99 | | 46 | 5 | | 20 | |
| 6113 | .88 | | 20 | 5 | | 18 | FURSFUS |
| 6117 | .82 | | 25 | 5 | | 40 | |
| 1047 | .70 | | 30 | | | 40 | " " " |
| 1075 | .60 | | 27 | 2 | | | ALVESCIT BULIEXIL TRIFANGU ADERGLOM |
| 1133 | .79 | | 26 | | | 26 | |
| 1136 | .83 | | | | | 100 | |

## COMPARISON OF FACTOR 4 WITH OBSERVED LIVING DATA

| STATION | FACTOR LOADING | MAIN SPECIES FROM THE FACTOR SCORE MATRIX | | | | | OTHER LIVE SPECIES NOT DOMINANT IN FSM |
|---|---|---|---|---|---|---|---|
| | | OBSERVED LIVE % | SACCATLA 7.6 | REOPSCOR 1.7 | CRIBJEFF 1.0 | SACCDIFF 1.0 | |
| 0849 | .82 | | 45 | | 18 | | GLOBAURC NONLAB |
| 6084 | .76 | | 60 | | | | HAPLCAR ADERGLOM |
| 6017 | .88 | | 20 | | 32 | | AMMOCAS ALVESCIT HAPLCAR |
| 6098 | .83 | | | | 33 | | CASSRENI ADERGLOM " " |
| 1131 | .62 | | 20 | | 27 | | RECUTURB " " TRITCONI |
| 1132 | .86 | | 42 | 4 | 10 | | " " " " |
| 1137 | .83 | | 40 | 4 | | | " " |

## COMPARISON OF FACTOR 5 WITH OBSERVED LIVING DATA

| STATION | FACTOR LOADING | MAIN SPECIES FROM THE FACTOR SCORE MATRIX | | | | | OTHER LIVE SPECIES NOT DOMINANT IN FSM |
|---|---|---|---|---|---|---|---|
| | | OBSERVED LIVE % | TRIFANGU 7·6 | ELPHEXCA 1.1 | BULISPAT 1.3 | | |
| 7953 | .727 | | 14 | | | | CIBILOBA BUCCFRIG ISLETERE PARSEMI |
| 7955 | .656 | | | | 11 | | " " CASSLAEV ELPHSUBA |
| 8017 | .891 | | | | 33 | | BUCCFRIG " " ISLETERE |
| 8018 | .806 | | | | 44 | | BOLISUBS " " " " |
| 8027 | .883 | | | | 77 | | FURSFUSI |
| 8036 | .862 | | | | 92 | | |
| 1017 | .724 | | | | | | " - " |
| 1035 | .783 | | | | | | " " EGGEADVA ASTROGAL |
| 1046 | .804 | | 8 | | 28 | | BOLISUBS |

## COMPARISON OF FACTOR 6 WITH OBSERVED LIVING DATA

| STATION | FACTOR LOADING | MAIN SPECIES FROM THE FACTOR SCORE MATRIX | | | | | OTHER LIVE SPECIES NOT DOMINANT IN FSM |
|---|---|---|---|---|---|---|---|
| | | OBSERVED LIVE % | EGGEADVA 7.8 | SPIROBIF 1.0 | | | |
| 0802 | .95 | | 90 | 10 | | | |
| 0825 | .94 | | 100 | | | | |
| 0830 | .73 | | 91 | | | | AMMOTCAS |
| 0833 | .89 | | 20 | 8 | | | " " |
| 0835 | .96 | | 38 | | | | " " |
| 0838 | .96 | | 71 | 11 | | | " " |
| 0841 | .76 | | 37 | 20 | | | |
| 1015 | .99 | | 94 | 12 | | | FURSFUS BACCATLA |
| 1016 | .77 | | 50 | | | | |
| 1022 | .91 | | 87 | | | | |
| 1027 | .68 | | | | | | |
| 1034 | .88 | | 44 | | | | ASTROGAL CASSRENI |
| 1124 | .82 | | 77 | | | | AMMOCATI SACCATLA |
| 0839 | .83 | | | | | | |

## COMPARISON OF FACTOR 7 WITH OBSERVED LIVING DATA

| STATION | FACTOR LOADING | MAIN SPECIES FROM THE FACTOR SCORE MATRIX | | | | | OTHER LIVE SPECIES NOT DOMINANT IN FSM |
|---|---|---|---|---|---|---|---|
| | | OBSERVED LIVE % | CASSRENE 8C | | | | |
| 0857 | .94 | | 13 | | | | ISLATERE TRITCONI SACCATLA CIBILOBA |
| 6068 | .77 | | 14 | | | | FURSFUSI ELPHBART |
| 6069 | .90 | | 45 | | | | EGGLADVA ADERGLOM " " |
| 6070 | .63 | | 30 | | | | ISLATERE FURSFUSI TROCHLOB " " |
| 6090 | .68 | | 77 | | | | " " |
| 1029 | .80 | | | | | | EGGLADVA " " ADERGLOM " " |
| 1066 | .67 | | 48 | | | | " " " " |

## COMPARISON OF FACTOR 8 WITH OBSERVED LIVING DATA

| STATION | FACTOR LOADING | MAIN SPECIES FROM THE FACTOR SCORE MATRIX | | | | | OTHER LIVE SPECIES NOT DOMINANT IN FSM |
|---|---|---|---|---|---|---|---|
| | | OBSERVED LIVE % | ELPHEXCV 6.8 | FURSFUSI 2.4 | BULIACLE 2.4 | BUCCFRIG 1.8 | |
| | | | | | | 27 | ASTROGAL CIBILOBA ELPHBART ISLATERE |
| 7957 | .80 | | | | | | λ |
| 7958 | .78 | | | 11 | | | ALVESCIT HYPEELON SACATLA " " |
| 8004 | .67 | | | 100 | | | |
| 8005 | .78 | | | 59 | | 11 | BOLISUBS REOPGUT |
| 8006 | .89 | | | 100 | | | |
| 8007 | .85 | | | 75 | | | |
| 8010 | .92 | | | 100 | | | |
| 8011 | .90 | | | 100 | | | |
| 8012 | .88 | | | 80 | | | " " HAPLCARE |

# APPENDIX V

## GENERAL FAUNAL DATA

H(s) = Shannon-Weiner diversity value

E = Equitability

$\alpha$ = Fisher index

S = Species number

L = Total living

L/D = Live/Dead

T = Total, live + dead

| STATION | H(S) | E | $\alpha$ | S | L | L/D | T |
|---|---|---|---|---|---|---|---|
| 7914 | 1.6 | 0.23 | 4.0 | 17.0 | 0.0 | 0.0 | 972.0 |
| 7917 | 2.2 | 0.52 | 4.5 | 18.0 | 0.0 | 0.0 | 368.0 |
| 7818 | 2.1 | 0.43 | 3.75 | 18.0 | 4.0 | 0.007 | 512.0 |
| 7920 | 1.8 | 0.48 | 1.75 | 12.0 | 0.0 | 0.0 | 963.0 |
| 7955 | 2.9 | 0.60 | 4.5 | 24.0 | 112.0 | 0.093 | 1200.0 |
| 7956 | 2.2 | 0.37 | 3.4 | 20.0 | 40.0 | 0.016 | 2496.0 |
| 7957 | 1.9 | 0.35 | 5.5 | 30.0 | 120.0 | 0.090 | 1320.0 |
| 7958 | 2.0 | 0.23 | 7.85 | 35.0 | 27.0 | 0.030 | 927.0 |
| 7959 | 2.7 | 0.42 | 5.5 | 30.0 | 105.0 | 0.070 | 1560.0 |
| 7960 | 2.9 | 0.58 | 3.7 | 16.0 | 10.0 | 0.010 | 570.0 |
| 0802 | 2.1 | 0.52 | 4.0 | 7.0 | 38.0 | 0.075 | 506.0 |
| 0817 | 1.8 | 0.70 | 1.5 | 8.0 | 0.0 | 0.0 | 221.0 |
| 0818 | 1.1 | 0.17 | 2.0 | 16.0 | 384.0 | 0.03 | 10688.0 |
| 0819 | 1.6 | 0.45 | 2.5 | 11.0 | 27.0 | 0.13 | 201.0 |
| 0820 | 1.4 | 0.51 | 1.0 | 8.0 | 6.0 | 0.08 | 71.0 |
| 0821 | 2.1 | 0.61 | 2.2 | 14.0 | 108.0 | 0.08 | 1208.0 |
| 0822 | 1.2 | 0.37 | 2.5 | 9.0 | 6.0 | 0.03 | 164.0 |
| 0824 | 1.5 | 0.48 | 2.0 | 9.0 | 17.0 | 0.05 | 285.0 |
| 0825 | 0.6 | 0.45 | 1.0 | 9.0 | 40.0 | 0.17 | 231.0 |
| 0830 | 1.3 | 0.40 | 1.8 | 9.0 | 22.0 | 0.04 | 532.0 |
| 0832 | 1.4 | 0.27 | 3.2 | 15.0 | 128.0 | 0.11 | 1168.0 |
| 0833 | 1.9 | 0.60 | 2.1 | 10.0 | 60.0 | 0.17 | 350.0 |
| 0835 | 1.7 | 0.35 | 2.2 | 10.0 | 49.0 | 0.09 | 516.0 |
| 0838 | 1.3 | 0.70 | 2.5 | 11.0 | 35.0 | 0.12 | 295.0 |
| 0839 | 1.6 | 0.70 | 1.1 | 7.0 | 16.0 | 0.02 | 1016.0 |
| 0841 | 1.9 | 0.74 | 1.5 | 9.0 | 108.0 | 0.22 | 486.0 |
| 0843 | 1.4 | 0.20 | 5.5 | 20.0 | 352.0 | 0.157 | 2240.0 |
| 0844 | 1.56 | 0.40 | 2.75 | 13.0 | 34.0 | 0.062 | 542.0 |
| 0846 | 1.3 | 0.45 | 2.0 | 8.0 | 28.0 | 0.172 | 162.0 |
| 0847 | 2.0 | 0.35 | 4.75 | 20.0 | 55.0 | 0.19 | 278.0 |
| 0848 | 2.2 | 0.46 | 4.75 | 20.0 | 51.0 | 0.26 | 191.0 |
| 0849 | 1.8 | 0.11 | 3.75 | 17.0 | 22.0 | 0.04 | 546.0 |
| 0850 | 1.8 | 0.60 | 1.25 | 10.0 | 0.0 | 0.0 | 8616.0 |
| 0851 | 1.8 | 0.74 | 1.50 | 8.0 | 0.0 | 0.0 | 1795.0 |
| 0852 | 2.4 | 0.48 | 3.75 | 22.0 | 152.0 | 0.112 | 1352.0 |
| 0856 | 2.5 | 0.52 | 5.0 | 24.0 | 20.0 | 0.032 | 618.0 |
| 0857 | 1.7 | 0.35 | 3.25 | 16.0 | 46.0 | 0.08 | 566.0 |
| 8002 | 2.8 | 0.60 | 4.75 | 27.0 | 68.0 | 0.005 | 11136.0 |
| 8005 | 2.7 | 0.60 | 5.5 | 25.0 | 34.0 | 0.05 | 574.0 |
| 8006 | 2.3 | 0.41 | 4.25 | 20.0 | 120.0 | 0.07 | 1734.0 |
| 8007 | 2.5 | 0.61 | 3.5 | 21.0 | 24.0 | 0.01 | 1728.0 |
| 8010 | 2.5 | 0.48 | 3.8 | 25.0 | 108.0 | 0.03 | 2704.0 |
| 8011 | 2.5 | 0.60 | 3.25 | 20.0 | 90.0 | 0.04 | 1818.0 |
| 8012 | 2.6 | 0.60 | 4.25 | 25.0 | 150.0 | 0.08 | 1776.0 |
| 8017 | 2.3 | 0.38 | 3.75 | 26.0 | 96.0 | 0.018 | 5088.0 |
| 8018 | 2.4 | 0.51 | 2.75 | 21.0 | 144.0 | 0.028 | 5120.0 |
| 8027 | 2.4 | 0.43 | 4.5 | 24.0 | 36.0 | 0.027 | 1324.0 |
| 8035 | 1.5 | 0.20 | 1.75 | 7.0 | 16.0 | 0.105 | 152.0 |
| 8036 | 2.3 | 0.36 | 4.5 | 27.0 | 104.0 | 0.026 | 3927.0 |
| 8037 | 1.1 | 0.13 | 2.0 | 8.0 | 42.0 | 0.078 | 534.0 |
| 8038 | 1.1 | 0.11 | 2.05 | 12.0 | 6.0 | 0.027 | 221.0 |
| 8039 | 1.5 | 0.38 | 2.0 | 12.0 | 92.0 | 0.142 | 646.0 |
| 8040 | 1.4 | 0.33 | 2.75 | 12.0 | 47.0 | 0.206 | 228.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8042 | 1.8 | 0.57 | 1.30 | 11.0 | 384.0 | 0.162 | 2360.0 |
| 8043 | 1.8 | 0.68 | 2.0 | 9.0 | 25.0 | 0.13 | 192.0 |
| 8044 | 1.7 | 0.27 | 2.3 | 21.0 | 96.0 | 0.008 | 11296.0 |
| 6003 | 2.1 | 0.38 | 3.5 | 21.0 | 0.0 | 0.0 | 1744.0 |
| 6005 | 1.9 | 0.40 | 3.5 | 15.0 | 0.0 | 0.0 | 245.0 |
| 6007 | 2.3 | 0.52 | 3.75 | 19.0 | 0.0 | 0.0 | 1662.0 |
| 6018 | 1.9 | 0.51 | 1.5 | 13.0 | 0.0 | 0.0 | 2544.0 |
| 6041 | 2.3 | 0.47 | 6.0 | 21.0 | 0.0 | 0.0 | 189.0 |
| 6042 | 1.9 | 0.40 | 3.0 | 19.0 | 0.0 | 0.0 | 215.0 |
| 6052 | 2.3 | 0.53 | 3.2 | 18. | 0.0 | 0.0 | 1248.0 |
| 6053 | 2.1 | 0.51 | 3.0 | 16.0 | 0.0 | 0.0 | 1012.0 |
| 6055 | 1.7 | 0.34 | 2.2 | 16.0 | 0.0 | 0.0 | 2816.0 |
| 6056 | 2.0 | 0.41 | 4.5 | 18.0 | 0.0 | 0.0 | 888.0 |
| 6057 | 2.0 | 0.67 | 2.0 | 11.0 | 0.0 | 0.0 | 542.0 |
| 6058 | 2.1 | 0.30 | 4.5 | 24.0 | 0.0 | 0.0 | 1028.0 |
| 6062 | 2.4 | 0.62 | 3.2 | 19.0 | 0.0 | 0.0 | 2196.0 |
| 6063 | 1.9 | 0.79 | 2.1 | 9.0 | 0.0 | 0.0 | 153.0 |
| 6064 | 2.0 | 0.47 | 4.0 | 17.0 | 0.0 | 0.0 | 261.0 |
| 6065 | 2.4 | 0.59 | 5.3 | 20.0 | 0.0 | 0.0 | 203.0 |
| 6066 | 2.9 | 0.62 | 5.2 | 28.0 | 0.0 | 0.0 | 570.0 |
| 6068 | 1.3 | 0.26 | 2.2 | 15.0 | 112.0 | 0.04 | 2496.0 |
| 6069 | 1.1 | 0.30 | 1.5 | 10.0 | 0.0 | 0.0 | 2960.0 |
| 6070 | 1.7 | 0.30 | 2.5 | 17.0 | 272.0 | 0.04 | 7088.0 |
| 6071 | 2.0 | 0.44 | 3.0 | 18.0 | 0.0 | 0.0 | 3736.0 |
| 6072 | 1.7 | 0.36 | 1.0 | 15.0 | 0.0 | 0.0 | 5664.0 |
| 6073 | 1.7 | 0.34 | 2.2 | 16.0 | 0.0 | 0.0 | 2608.0 |
| 6074 | 1.9 | 0.40 | 3.7 | 18.0 | 0.0 | 0.0 | 1520.0 |
| 6075 | 2.9 | 0.68 | 8.2 | 27.0 | 0.0 | 0.0 | 242.0 |
| 6079 | 2.0 | 0.54 | 3.0 | 15.0 | 0.0 | 0.0 | 164.0 |
| 6080 | 1.6 | 0.25 | 2.75 | 19.0 | 0.0 | 0.0 | 6128.0 |
| 6081 | 1.5 | 0.32 | 1.8 | 14.0 | 0.0 | 0.0 | 5724.0 |
| 6082 | 2.0 | 0.45 | 3.1 | 17.0 | 0.0 | 0.0 | 790.0 |
| 6083 | 2.6 | 0.52 | 3.75 | 25.0 | 0.0 | 0.0 | 3348.0 |
| 6084 | 1.6 | 0.41 | 3.2 | 12.0 | 9.0 | 0.05 | 185.0 |
| 6085 | 2.3 | 0.56 | 2.8 | 17.0 | 200.0 | 0.20 | 1008.0 |
| 6086 | 1.8 | 0.43 | 3.5 | 14.0 | 0.0 | 0.0 | 282.0 |
| 6087 | 1.6 | 0.45 | 2.0 | 11.0 | 0.0 | 0.0 | 282.0 |
| 6088 | 1.7 | 0.43 | 3.5 | 13.0 | 0.0 | 0.0 | 251.0 |
| 6089 | 1.3 | 0.30 | 1.4 | 12.0 | 200.0 | 0.04 | 5408.0 |
| 6090 | 0.7 | 0.70 | 0.9 | 3.0 | 0.0 | 0.0 | 12928.0 |
| 6092 | 2.3 | 0.52 | 3.5 | 19.0 | 12.0 | 0.10 | 960.0 |
| 6094 | 1.7 | 0.46 | 2.2 | 12.0 | 0.0 | 0.0 | 294.0 |
| 6096 | 2.4 | 0.55 | 3.7 | 19.0 | 108.0 | 0.012 | 1404.0 |
| 6097 | 1.8 | 0.50 | 2.0 | 13.0 | 50.0 | 0.08 | 580.0 |
| 6098 | 2.0 | 0.40 | 4.0 | 19.0 | 84.0 | 0.013 | 639.0 |
| 6099 | 1.8 | 0.56 | 1.8 | 11.0 | 34.0 | 0.070 | 466.0 |
| 6100 | 1.6 | 0.49 | 2.0 | 10.0 | 35.0 | 0.124 | 282.0 |
| 6101 | 1.5 | 0.42 | 2.0 | 11.0 | 30.0 | 0.13 | 222.0 |
| 6102 | 1.9 | 0.60 | 2.2 | 12.0 | 42.0 | 0.159 | 264.0 |
| 6106 | 2.0 | 0.47 | 2.2 | 17.0 | 0.0 | 0.0 | 3702.0 |
| 6108 | 2.3 | 0.70 | 7.8 | 25.0 | 0.0 | 0.0 | 245.0 |
| 6109 | 1.8 | 0.63 | 2.0 | 10.0 | 0.0 | 0.0 | 241.0 |
| 6111 | 2.3 | 0.44 | 4.0 | 22.0 | 37.0 | 0.117 | 315.0 |
| 6112 | 2.5 | 0.57 | 5.1 | 21.0 | 0.0 | 0.0 | 162.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6113 | 2.1 | 0.40 | 4.0 | 22.0 | 0.0 | 0.0 | 1706.0 |
| 6114 | 2.6 | 0.57 | 6.0 | 24.0 | 0.0 | 0.0 | 213.0 |
| 6115 | 1.9 | 0.70 | 1.75 | 9.0 | 0.0 | 0.0 | 488.0 |
| 6116 | 1.7 | 0.45 | 1.7 | 12.0 | 0.0 | 0.0 | 768.0 |
| 6117 | 2.5 | 0.56 | 3.7 | 23.0 | 152.0 | 0.135 | 1124.0 |
| 6110 | 2.2 | 0.80 | 2.8 | 12.0 | 0.0 | 0.0 | 197.0 |
| 1009 | 1.5 | 0.32 | 2.0 | 14.0 | 0.0 | 0.0 | 1468.0 |
| 1010 | 1.5 | 0.28 | 3.2 | 16.0 | 8.0 | 0.01 | 554.0 |
| 1011 | 0.8 | 0.24 | 1.7 | 10.0 | 59.0 | 0.09 | 604.0 |
| 1015 | 0.5 | 0.21 | 1.5 | 8.0 | 159.0 | 0.71 | 223.0 |
| 1016 | 2.0 | 0.44 | 3.0 | 16.0 | 84.0 | 0.11 | 734.0 |
| 1017 | 2.0 | 0.58 | 2.7 | 13.0 | 4.0 | 0.006 | 572.0 |
| 1018 | 2.6 | 0.58 | 4.5 | 22.0 | 38.0 | 0.07 | 490.0 |
| 1020 | 2.6 | 0.49 | 6.5 | 29.0 | 76.0 | 0.12 | 602.0 |
| 1021 | 2.9 | 0.78 | 4.5 | 22.0 | 0.0 | 0.0 | 536.0 |
| 1022 | 1.5 | 0.38 | 2.1 | 11.0 | 80.0 | 0.26 | 306.0 |
| 1026 | 1.9 | 0.39 | 5.1 | 18.0 | 2.0 | 0.008 | 232.0 |
| 1027 | 1.8 | 0.75 | 5.0 | 18.0 | 0.0 | 0.0 | 149.0 |
| 1028 | 1.8 | 0.75 | 2.9 | 14.0 | 10.0 | 0.028 | 245.0 |
| 1029 | 1.9 | 0.42 | 3.2 | 17.0 | 18.0 | 0.046 | 391.0 |
| 1034 | 1.9 | 0.40 | 3.5 | 15.0 | 18.0 | 0.05 | 307.0 |
| 1035 | 2.1 | 0.67 | 2.5 | 13.0 | 28.0 | 0.06 | 434.0 |
| 1043 | 1.1 | 0.41 | 1.2 | 7.0 | 58.0 | 0.26 | 219.0 |
| 1044 | 0.7 | 0.40 | 1.0 | 5.0 | 10.0 | 0.56 | 178.0 |
| 1045 | 0.8 | 0.33 | 1.2 | 7.0 | 40.0 | 0.04 | 1100.0 |
| 1046 | 2.4 | 0.51 | 3.1 | 17.0 | 28.0 | 0.47 | 602.0 |
| 1047 | 2.4 | 0.50 | 4.0 | 20.0 | 40.0 | 0.06 | 600.0 |
| 1051 | 2.1 | 0.47 | 3.5 | 18.0 | 36.0 | 0.05 | 632.0 |
| 1053 | 0.6 | 0.27 | 1.0 | 7.0 | 2880.0 | 0.21 | 13344.0 |
| 1054 | 1.0 | 0.38 | 1.0 | 7.0 | 97.0 | 0.57 | 170.0 |
| 1055 | 1.9 | 0.79 | 2.0 | 9.0 | 5.0 | 0.03 | 157.0 |
| 1056 | 1.9 | 0.51 | 2.0 | 9.0 | 34.0 | 0.128 | 264.0 |
| 1057 | 2.3 | 0.64 | 3.8 | 15.0 | 24.0 | 0.10 | 219.0 |
| 1058 | 1.7 | 0.60 | 2.2 | 10.0 | 5.0 | 0.02 | 233.0 |
| 1059 | 2.0 | 0.47 | 4.0 | 16.0 | 24.0 | 0.07 | 322.0 |
| 1060 | 1.4 | 0.41 | 2.2 | 10.0 | 49.0 | 0.18 | 261.0 |
| 1062 | 1.8 | 0.58 | 2.5 | 10.0 | 72.0 | 0.38 | 185.0 |
| 1063 | 1.3 | 0.33 | 2.2 | 11.0 | 231.0 | 0.70 | 330.0 |
| 1064 | 1.6 | 0.48 | 1.7 | 10.0 | 128.0 | 0.24 | 522.0 |
| 1065 | 2.2 | 0.68 | 3.0 | 14.0 | 96.0 | 0.31 | 309.0 |
| 1066 | 1.8 | 0.38 | 2.5 | 16.0 | 248.0 | 0.10 | 2328.0 |
| 1067 | 0.8 | 0.55 | 0.9 | 4.0 | 241.0 | 0.69 | 348.0 |
| 1068 | 1.3 | 0.42 | 1.7 | 9.0 | 66.0 | 0.10 | 624.0 |
| 1069 | 1.6 | 0.38 | 2.7 | 13.0 | 356.0 | 0.51 | 698.0 |
| 1070 | 2.1 | 0.52 | 3.0 | 16.0 | 122.0 | 0.14 | 864.0 |
| 1071 | 1.0 | 0.30 | 0.9 | 9.0 | 792.0 | 0.03 | 20544.0 |
| 1072 | 1.2 | 0.33 | 1.3 | 10.0 | 290.0 | 0.29 | 996.0 |
| 1073 | 1.6 | 0.47 | 2.0 | 11.0 | 47.0 | 0.15 | 303.0 |
| 1074 | 1.5 | 0.53 | 2.0 | 9.0 | 48.0 | 0.19 | 247.0 |
| 1075 | 2.1 | 0.51 | 3.0 | 17.0 | 486.0 | 0.25 | 1936.0 |
| 1076 | 1.8 | 0.61 | 1.8 | 10.0 | 241.0 | 0.50 | 482.0 |
| 1077 | 1.3 | 0.54 | 0.9 | 7.0 | 0.0 | 0.0 | 5120.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1078 | 1.4 | 0.33 | 2.2 | 12.0 | 0.0 | 0.0 | 376.0 |
| 1080 | 0.9 | 0.49 | 0.5 | 5.0 | 0.0 | 0.0 | 4614.0 |
| 1081 | 1.8 | 0.61 | 1.8 | 11.0 | 62.0 | 0.14 | 442.0 |
| 1082 | 2.1 | 0.51 | 2.5 | 17.0 | 0.0 | 0.0 | 614.0 |
| 1083 | 1.8 | 0.61 | 2.0 | 10.0 | 50. | 0.14 | 339.0 |
| 1084 | 2.1 | 0.54 | 3.5 | 15.0 | 35.0 | 0.11 | 298.0 |
| 1085 | 1.7 | 0.37 | 2.3 | 15.0 | 344.0 | 0.12 | 2835.0 |
| 1086 | 1.8 | 0.45 | 3.5 | 14.0 | 68.0 | 0.21 | 318.0 |
| 1087 | 1.6 | 0.48 | 2.0 | 10.0 | 0.0 | 0.0 | 226.0 |
| 1088 | 1.7 | 0.53 | 1.5 | 10.0 | 80.0 | 0.08 | 939.0 |
| 1089 | 1.3 | 0.48 | 1.8 | 8.0 | 080.0 | 0.07 | 852.0 |
| 1090 | 1.4 | 0.58 | 1.3 | 7.0 | 76.0 | 0.16 | 466.0 |
| 1093 | 1.8 | 0.47 | 2.2 | 13.0 | 186.0 | 0.29 | 628.0 |
| 1095 | 1.8 | 0.62 | 2.2 | 10.0 | 0.0 | 0.0 | 171.0 |
| 1096 | 1.7 | 0.62 | 2.2 | 9.0 | 16.0 | 0.09 | 163.0 |
| 1097 | 1.5 | 0.61 | 1.75 | 8.0 | 140.0 | 0.23 | 608.0 |
| 1099 | 1.4 | 0.40 | 2.0 | 10.0 | 0.0 | 0.0 | 307.0 |
| 1100 | 1.8 | 0.52 | 2.3 | 12.0 | 49.0 | 0.17 | 286.0 |
| 1101 | 2.1 | 0.48 | 4.0 | 17.0 | 63.0 | 0.13 | 481.0 |
| 1102 | 1.8 | 0.65 | 2.0 | 10.0 | 26.0 | 0.09 | 282.0 |
| 1103 | 1.8 | 0.52 | 2.5 | 11.0 | 91.0 | 0.33 | 274.0 |
| 1104 | 1.5 | 0.47 | 1.8 | 10.0 | 52.0 | 0.11 | 498.0 |
| 1105 | 1.3 | 0.35 | 1.8 | 11.0 | 46.0 | 0.06 | 730.0 |
| 1106 | 1.7 | 0.49 | 2.2 | 11.0 | 40.0 | 0.13 | 290.0 |
| 1107 | 1.6 | 0.62 | 2.2 | 10.0 | 37.0 | 0.15 | 241.0 |
| 1109 | 1.9 | 0.66 | 2.2 | 10.0 | 43.0 | 0.21 | 237.0 |
| 1110 | 1.5 | 0.62 | 1.5 | 7.0 | 0.0 | 0.00 | 151.0 |
| 1111 | 1.9 | 0.55 | 2.0 | 12.0 | 59.0 | 0.12 | 506.0 |
| 1112 | 2.4 | 0.56 | 1.9 | 20.0 | 51.0 | 0.04 | 1284.0 |
| 1113 | 1.9 | 0.62 | 1.9 | 11.0 | 103.0 | 0.11 | 994.0 |
| 1114 | 2.3 | 0.52 | 3.5 | 20.0 | 36.0 | 0.29 | 1260.0 |
| 1115 | 2.0 | 0.58 | 2.3 | 13.0 | 128.0 | 0.18 | 702.0 |
| 1116 | 2.0 | 0.59 | 3.0 | 14.0 | 55.0 | 0.22 | 285.0 |
| 1119 | 1.6 | 0.53 | 2.25 | 10.0 | 60.0 | 0.24 | 250.0 |
| 1120 | 1.8 | 0.65 | 1.5 | 10.0 | 192.0 | 0.16 | 1184.0 |
| 1124 | 1.6 | 0.52 | 2.0 | 10.0 | 65.0 | 0.21 | 299.0 |
| 1125 | 1.6 | 0.59 | 1.75 | 9.0 | 50.0 | 0.09 | 527.0 |
| 2619 | 1.4 | 0.17 | 1.1 | 11.0 | 58.0 | 0.06 | 945.0 |
| 1127 | 1.9 | 0.58 | 2.1 | 12.0 | 34.0 | 0.12 | 277.0 |
| 1128 | 1.9 | 0.72 | 1.5 | 10.0 | 264.0 | 0.19 | 1332.0 |
| 1130 | 2.2 | 0.56 | 3.5 | 17.0 | 168.0 | 0.20 | 816.0 |
| 1131 | 2.0 | 0.65 | 3.1 | 12.0 | 198.0 | 0.27 | 714.0 |
| 1132 | 1.6 | 0.38 | 2.0 | 14.0 | 106.0 | 0.09 | 1041.0 |
| 1133 | 2.3 | 0.54 | 3.9 | 19.0 | 38.0 | 0.05 | 664.0 |
| 1134 | 2.3 | 0.67 | 3.7 | 16.0 | 0.0 | 0.0 | 252.0 |
| 1135 | 2.6 | 0.58 | 4.7 | 23.0 | 0.0 | 0.0 | 474.0 |
| 1136 | 2.5 | 0.60 | 4.0 | 20.0 | 6.0 | 0.01 | 530.0 |
| 1137 | 2.0 | 0.58 | 2.2 | 13.0 | 76.0 | 0.10 | 702.0 |
| 1138 | 1.9 | 0.46 | 2.6 | 14.0 | 96.0 | 0.18 | 520.0 |
| 1139 | 2.2 | 0.43 | 4.2 | 20.0 | 0.0 | 0.0 | 508.0 |
| 1140 | 2.6 | 0.47 | 5.0 | 29.0 | 180.0 | 0.15 | 1200.0 |
| 1141 | 2.6 | 0.55 | 4.0 | 26.0 | 288.0 | 0.15 | 1812.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1142 | 1.8 | 0.40 | 2.75 | 15.0 | 58.0 | 0.07 | 768.0 |
| 1143 | 2.1 | 0.61 | 5.0 | 18.0 | 62.0 | 0.28 | 217.0 |
| 1118 | 1.9 | 0.59 | 1.7 | 13.0 | 240.0 | 0.13 | 1240.0 |
| 4003 | 1.9 | 0.43 | 1.2 | 15.0 | 0.0 | 0.0 | 5184.0 |
| 4004 | 1.6 | 0.43 | 1.1 | 12.0 | 1184.0 | 0.20 | 5728.0 |
| 4005 | 1.2 | 0.28 | 1.5 | 14.0 | 0.0 | 0.0 | 10464.0 |
| 4006 | 1.5 | 0.31 | 0.7 | 7.0 | 0.0 | 0.0 | 2656.0 |
| 4007 | 1.0 | 0.37 | 0.5 | 6.0 | 0.0 | 0.0 | 3216.0 |
| 7902 | 3.1 | 0.60 | 7.5 | 38.0 | 12.0 | 0.032 | 387.0 |
| 7903 | 2.9 | 0.54 | 11.5 | 34.0 | 0.0 | 0.0 | 235.0 |
| 7904 | 2.8 | 0.51 | 16.0 | 34.0 | 1.0 | 0.0004 | 207.0 |
| 7906 | 3.1 | 0.52 | 14.0 | 40.0 | 2.0 | 0.0008 | 230.0 |
| 7907 | 2.4 | 0.42 | 6.0 | 27.0 | 0.0 | 0.0 | 536.0 |
| 7908 | 2,3 | 0.36 | 5.75 | 27.0 | 0.0 | 0.0 | 618.0 |
| 7909 | 1.6 | 0.26 | 3.75 | 19.0 | 0.0 | 0.0 | 570.0 |
| 7910 | 1.6 | 0.23 | 4.50 | 21.0 | 0.0 | 0.0 | 614.0 |
| 7911 | 1.45 | 0.23 | 3.75 | 18.0 | 0.0 | 0.0 | 588.0 |
| 7912 | 1.39 | 0.25 | 2.0 | 16.0 | 48.0 | 0.006 | 7392.0 |
| 7913 | 1.37 | 0.26 | 2.75 | 15.0 | 0.0 | 0.0 | 550.0 |
| 7948 | 1.24 | 0.16 | 4.5 | 21.0 | 0.0 | 0.0 | 1680.0 |
| 7949 | 1.45 | 0.28 | 2.25 | 15.0 | 0.0 | 0.0 | 2016.0 |
| 7950 | 1.4 | 0.30 | 2.25 | 14.0 | 0.0 | 0.0 | 1690.0 |
| 7951 | 1.2 | 0.37 | 2.0 | 12.0 | 0.0 | 0.0 | 1140.0 |
| 7952 | 1.8 | 0.35 | 3.5 | 17.0 | 0.0 | 0.0 | 480.0 |
| 8013 | 1.9 | 0.37 | 4.0 | 19.0 | 0.0 | 0.0 | 410.0 |
| 8014 | 2.9 | 0.72 | 6.2 | 20.0 | 0.0 | 0.0 | 400.0 |
| 8060 | 2.8 | 0.52 | 10.0 | 30.0 | 0.0 | 0.0 | 202.0 |
| 8061 | 2.7 | 0.50 | 7.2 | 30.0 | 0.0 | 0.0 | 576.0 |
| 8062 | 3.0 | 0.66 | 9.0 | 30.0 | 0.0 | 0.0 | 460.0 |
| 8063 | 3.1 | 0.63 | 9.5 | 36.0 | 0.0 | 0.0 | 454.0 |
| 8064 | 1.7 | 0.16 | 7.0 | 33.0 | 0.0 | 0.0 | 786.0 |
| 8065 | 2.1 | 0.37 | 4.0 | 22.0 | 0.0 | 0.0 | 840.0 |
| 8066 | 2.8 | 0.60 | 7.8 | 30.0 | 0.0 | 0.0 | 452.0 |
| 8067 | 2.7 | 0.62 | 9.7 | 30.0 | 0.0 | 0.0 | 267.0 |
| 8068 | 1.6 | 0.21 | 9.0 | 23.0 | 0.0 | 0.0 | 158.0 |
| 6033 | 2.0 | 0.39 | 4.0 | 20.0 | 0.0 | 0.0 | 864.0 |
| 6034 | 2.0 | 0.39 | 4.0 | 20.0 | 0.0 | 0.0 | 864.0 |
| 6036 | 2.9 | 0.70 | 6.0 | 23.0 | 0.0 | 0.0 | 215.0 |
| 6050 | 2.5 | 0.45 | 4.0 | 22.0 | 0.0 | 0.0 | 964.0 |
| 6051 | 2.1 | 0.47 | 3.5 | 18.0 | 0.0 | 0.0 | 630.0 |
| 6076 | 2.4 | 0.43 | 4.7 | 25.0 | 33.0 | 0.03 | 1008.0 |
| 6077 | 2.0 | 0.43 | 7.0 | 29.0 | 0.0 | 0.0 | 680.0 |
| 6078 | 3.0 | 0.63 | 10.0 | 31.0 | 0.0 | 0.0 | 275.0 |
| 1008 | 2.73 | 0.69 | 4.5 | 22.0 | 0.0 | 0.0 | 570.0 |
| 1036 | 2.7 | 0.53 | 6.1 | 28.0 | 0.0 | 0.0 | 592.0 |
| 1037 | 2.8 | 0.59 | 5.5 | 28.0 | 0.0 | 0.0 | 1212.0 |
| 1038 | 2.2 | 0.32 | 5.5 | 30.0 | 15.0 | 0.01 | 1116.0 |
| 1039 | 2.9 | 0.79 | 5.0 | 23.0 | 4.0 | 0.007 | 520.0 |
| 1040 | 2.4 | 0.48 | 5.0 | 24.0 | 0.0 | 0.0 | 610.0 |

# APPENDIX VI

## MEASUREMENTS OF DEPTH, TEMPERATURE, SALINITY AND SUBSTRATE CHARACTER

| SAMPLE | DEPTH | T °C | S ‰ | % G | % S | % M |
|---|---|---|---|---|---|---|
| 7914 | 271.0 | 10.0 | 34.8 | 0.0 | 4.0 | 95.0 |
| 7917 | 251.0 | 10.0 | 34.8 | 0.0 | 4.0 | 95.0 |
| 7918 | 240.0 | 10.0 | 34.8 | 0.0 | 4.0 | 95.0 |
| 7920 | 220.0 | 10.0 | 34.8 | 0.0 | 4.0 | 95.0 |
| 7953 | 160.0 | 9.5 | 35.0 | 8.0 | 90.0 | 2.0 |
| 7955 | 156.0 | 9.5 | 35.0 | 8.0 | 90.0 | 2.0 |
| 7956 | 166.0 | 9.5 | 35.0 | 18.0 | 78.0 | 4.0 |
| 7957 | 140.0 | 9.5 | 35.0 | 12.0 | 88.0 | 0.0 |
| 7958 | 175.0 | 9.5 | 35.0 | 12.0 | 88.0 | 0.0 |
| 7959 | 190.0 | 9.5 | 35.0 | 12.0 | 88.0 | 0.0 |
| 7960 | 220.0 | 9.5 | 35.0 | 0.0 | 4.0 | 95.0 |
| 0802 | 18.0 | 4.0 | 31.8 | 2.0 | 67.0 | 31.0 |
| 0817 | 110.0 | 1.9 | 32.3 | 5.0 | 60.0 | 35.0 |
| 0818 | 70.0 | 1.9 | 32.3 | 22.0 | 78.0 | 0.0 |
| 0819 | 113.0 | 1.9 | 32.3 | 20.0 | 80.0 | 0.0 |
| 0820 | 163.0 | 1.9 | 32.3 | 0.0 | 58.0 | 42.0 |
| 0821 | 119.0 | 1.9 | 32.3 | 0.0 | 68.0 | 32.0 |
| 0822 | 137.0 | 1.9 | 32.3 | 0.0 | 20.0 | 80.0 |
| 0824 | 102.0 | 1.9 | 32.3 | 10.0 | 90.0 | 0.0 |
| 0825 | 16.0 | 4.0 | 31.8 | 0.0 | 56.0 | 44.0 |
| 0830 | 59.0 | 4.0 | 31.8 | 20.0 | 80.0 | 0.0 |
| 0832 | 29.0 | 4.0 | 31.8 | 0.0 | 60.0 | 40.0 |
| 0833 | 31.0 | 4.0 | 31.8 | 20.0 | 76.0 | 4.0 |
| 0835 | 51.0 | 4.0 | 31.8 | 0.0 | 60.0 | 40.0 |
| 0838 | 27.0 | 4.0 | 31.8 | 20.0 | 76.0 | 4.0 |
| 0839 | 33.0 | 4.0 | 31.8 | 20.0 | 76.0 | 4.0 |
| 0841 | 33.0 | 4.0 | 31.8 | 0.0 | 60.0 | 40.0 |
| 0843 | 73.0 | 4.0 | 31.8 | 10.0 | 76.0 | 12.0 |
| 0844 | 174.0 | 1.9 | 32.3 | 0.0 | 66.0 | 34.0 |
| 0846 | 238.0 | 1.9 | 32.3 | 0.0 | 52.0 | 48.0 |
| 0847 | 82.0 | 4.3 | 33.3 | 2.0 | 67.0 | 31.0 |
| 0848 | 104.0 | 4.3 | 33.3 | 0.0 | 95.0 | 5.0 |
| 0849 | 128.0 | 4.3 | 33.3 | 0.0 | 95.0 | 5.0 |
| 0850 | 196.0 | 4.3 | 33.3 | 0.0 | 0.0 | 100.0 |
| 0851 | 200.0 | 8.5 | 34.4 | 0.0 | 0.0 | 100.0 |
| 0852 | 108.0 | 7.1 | 34.1 | 0.0 | 80.0 | 20.0 |
| 0856 | 101.0 | 8.5 | 34.3 | 20.0 | 80.0 | 0.0 |
| 0857 | 86.0 | 8.5 | 34.3 | 10.0 | 90.0 | 0.0 |
| 8002 | 214.0 | 8.5 | 34.3 | 0.0 | 4.0 | 95.0 |
| 8004 | 206.0 | 10.0 | 34.8 | 0.0 | 30.0 | 70.0 |
| 8005 | 203.0 | 9.0 | 34.9 | 0.0 | 30.0 | 70.0 |
| 8006 | 197.0 | 10.0 | 34.8 | 0.0 | 30.0 | 70.0 |
| 8007 | 190.0 | 10.0 | 34.8 | 0.0 | 30.0 | 70.0 |
| 8010 | 195.0 | 10.0 | 34.8 | 0.0 | 30.0 | 70.0 |
| 8011 | 195.0 | 10.0 | 34.8 | 0.0 | 30.0 | 70.0 |
| 8012 | 195.0 | 10.0 | 34.8 | 0.0 | 30.0 | 70.0 |
| 8017 | 180.0 | 10.3 | 35.0 | 0.0 | 88.0 | 12.0 |
| 8018 | 195.0 | 10.3 | 35.0 | 0.0 | 88.0 | 12.0 |
| 8027 | 185.0 | 10.3 | 35.0 | 0.0 | 88.0 | 12.0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8035 | 135.0 | 1.9 | 32.3 | 2.0 | 58.0 | 40.0 |
| 8036 | 114.0 | 1.9 | 32.3 | 12.0 | 78.0 | 10.0 |
| 8037 | 154.0 | 1.9 | 32.3 | 2.0 | 58.0 | 40.0 |
| 8038 | 167.0 | 1.9 | 32.3 | 0.0 | 40.0 | 60.0 |
| 8039 | 156.0 | 1.9 | 32.3 | 0.0 | 52.0 | 48.0 |
| 8040 | 135.0 | 1.9 | 32.3 | 0.0 | 52.0 | 48.0 |
| 8042 | 103.0 | 4.0 | 31.8 | 22.0 | 68.0 | 10.0 |
| 8043 | 60.0 | 4.0 | 31.8 | 10.0 | 77.0 | 13.0 |
| 8044 | 76.0 | 4.0 | 31.8 | 20.0 | 80.0 | 0.0 |
| 6003 | 156.0 | 4.0 | 31.8 | 0.0 | 4.0 | 96.0 |
| 6005 | 175.0 | 9.5 | 35.0 | 0.0 | 1.0 | 99.0 |
| 6006 | 160.0 | 9.5 | 35.0 | 0.0 | 1.0 | 99.0 |
| 6007 | 167.0 | 9.5 | 35.0 | 9.0 | 88.0 | 3.0 |
| 6018 | 230.0 | 9.5 | 35.0 | 0.0 | 78.0 | 22.0 |
| 6041 | 280.0 | 9.5 | 35.0 | 0.0 | 69.0 | 31.0 |
| 6042 | 280.0 | 9.5 | 35.0 | 0.0 | 72.0 | 28.0 |
| 6052 | 170.0 | 3.1 | 32.8 | 0.0 | 12.0 | 88.0 |
| 6053 | 152.0 | 3.1 | 32.8 | 0.0 | 8.0 | 92.0 |
| 6055 | 100.0 | 3.1 | 32.8 | 0.0 | 72.0 | 28.0 |
| 6056 | 115.0 | 3.1 | 32.8 | 0.0 | 80.0 | 20.0 |
| 6057 | 88.0 | 3.1 | 32.8 | 10.0 | 90.0 | 0.0 |
| 6058 | 75.0 | 3.1 | 32.8 | 9.0 | 91.0 | 0.0 |
| 6062 | 165.0 | 8.5 | 34.3 | 0.0 | 1.0 | 99.0 |
| 6063 | 185.0 | 8.5 | 34.3 | 0.0 | 1.0 | 99.0 |
| 6064 | 180.0 | 8.5 | 34.3 | 0.0 | 0.0 | 100.0 |
| 6065 | 190.0 | 8.5 | 34.3 | 0.0 | 1.0 | 99.0 |
| 6066 | 125.0 | 8.5 | 34.3 | 0.0 | 21.0 | 79.0 |
| 6068 | 97.0 | 5.6 | 33.5 | 96.0 | 4.0 | 0.0 |
| 6069 | 87.0 | 5.6 | 33.5 | 1.0 | 97.0 | 2.0 |
| 6070 | 95.0 | 5.6 | 33.5 | 99.0 | 1.0 | 0.0 |
| 6071 | 116.0 | 5.6 | 33.5 | 46.0 | 50.0 | 3.0 |
| 6072 | 105.0 | 5.6 | 33.5 | 12.6 | 88.0 | 0.0 |
| 6073 | 140.0 | 5.6 | 33.5 | 11.0 | 89.0 | 0.0 |
| 6074 | 280.0 | 10.3 | 35.0 | 0.0 | 75.0 | 25.0 |
| 6075 | 300.0 | 10.3 | 35.0 | 0.0 | 80.0 | 20.0 |
| 6079 | 130.0 | 5.6 | 33.5 | 10.0 | 90.0 | 0.0 |
| 6080 | 110.0 | 5.6 | 33.5 | 8.0 | 92.0 | 0.0 |
| 6081 | 100.0 | 5.6 | 33.5 | 7.0 | 93.0 | 0.0 |
| 6082 | 94.0 | 5.6 | 33.5 | 11.0 | 89.0 | 0.0 |
| 6083 | 123.0 | 5.0 | 33.5 | 0.0 | 12.0 | 88.0 |
| 6084 | 140.0 | 5.0 | 33.0 | 0.0 | 8.0 | 92.0 |
| 6085 | 160.0 | 5.0 | 33.0 | 0.0 | 25.0 | 75.0 |
| 6086 | 155.0 | 5.0 | 33.0 | 0.0 | 8.0 | 92.0 |
| 6087 | 142.0 | 5.0 | 33.0 | 0.0 | 8.0 | 92.0 |
| 6088 | 128.0 | 6.0 | 32.0 | 18.0 | 82.0 | 0.0 |
| 6089 | 110.0 | 6.0 | 32.0 | 24.0 | 76.0 | 6.0 |
| 6090 | 56.0 | 6.0 | 32.0 | 14.0 | 86.0 | 0.0 |
| 6092 | 161.0 | 6.0 | 32.0 | 0.0 | 12.0 | 88.0 |
| 6094 | 155.0 | 6.0 | 32.0 | 0.0 | 10.0 | 90.0 |
| 6096 | 150.0 | 6.0 | 32.0 | 0.0 | 0.0 | 100.0 |
| 6097 | 141.0 | 6.0 | 32.0 | 0.0 | 20.0 | 80.0 |
| 6098 | 144.0 | 6.0 | 32.0 | 0.0 | 18.0 | 82.0 |
| 6099 | 113.0 | 6.0 | 32.0 | 0.0 | 56.0 | 44.0 |

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|---|---|---|---|---|---|---|
| 6100 | 112.0 | 6.0 | 32.0 | 0.0 | 65.0 | 35.0 |
| 6101 | 110.0 | 6.0 | 32.0 | 0.0 | 60.0 | 40.0 |
| 6102 | 103.0 | 6.0 | 32.0 | 0.0 | 59.0 | 41.0 |
| 6106 | 66.0 | 6.0 | 32.0 | 64.0 | 36.0 | 0.0 |
| 6108 | 150.0 | 6.0 | 32.0 | 0.0 | 36.0 | 54.0 |
| 6109 | 149.0 | 6.0 | 32.0 | 0.0 | 41.0 | 59.0 |
| 6111 | 205.0 | 6.0 | 32.0 | 0.0 | 30.0 | 70.0 |
| 6112 | 228.0 | 6.0 | 32.0 | 0.0 | 28.0 | 72.0 |
| 6113 | 170.0 | 6.0 | 32.0 | 0.0 | 38.0 | 62.0 |
| 6114 | 168.0 | 6.0 | 32.0 | 0.0 | 38.0 | 62.0 |
| 6115 | 155.0 | 6.0 | 32.0 | 0.0 | 38.0 | 62.0 |
| 6116 | 150.0 | 6.0 | 32.0 | 0.0 | 38.0 | 62.0 |
| 6117 | 155.0 | 6.0 | 32.0 | 0.0 | 38.0 | 62.0 |
| 6110 | 148.0 | 6.0 | 32.0 | 0.0 | 38.0 | 62.0 |
| 1009 | 130.0 | 6.0 | 34.3 | 2.0 | 79.0 | 19.0 |
| 1010 | 100.0 | 8.5 | 34.3 | 1.0 | 99.0 | 0.0 |
| 1011 | 77.0 | 8.5 | 34.3 | 2.0 | 98.0 | 0.0 |
| 1015 | 60.0 | 8.5 | 34.3 | 6.0 | 94.0 | 0.0 |
| 1016 | 140.0 | 9.5 | 35.0 | 0.0 | 99.0 | 1.0 |
| 1017 | 200.0 | 7.3 | 34.5 | 0.0 | 90.0 | 10.0 |
| 1018 | 280.0 | 9.0 | 35.0 | 0.0 | 90.0 | 10.0 |
| 1020 | 320.0 | 9.0 | 35.0 | 0.0 | 90.0 | 10.0 |
| 1021 | 440.0 | 9.0 | 35.0 | 0.0 | 87.0 | 13.0 |
| 1022 | 120.0 | 9.0 | 35.0 | 0.0 | 86.0 | 14.0 |
| 1026 | 260.0 | 6.0 | 32.0 | 0.0 | 83.0 | 17.0 |
| 1027 | 235.0 | 6.0 | 32.0 | 0.0 | 20.0 | 80.0 |
| 1028 | 215.0 | 6.0 | 32.0 | 0.0 | 0.0 | 100.0 |
| 1029 | 120.0 | 5.0 | 33.7 | 0.0 | 0.0 | 100.0 |
| 1034 | 129.0 | 7.0 | 34.5 | 10.0 | 90.0 | 0.0 |
| 1035 | 200.0 | 7.0 | 34.5 | 10.0 | 90.0 | 0.0 |
| 1043 | 63.0 | 2.1 | 32.1 | 2.0 | 98.0 | 0.0 |
| 1044 | 70.0 | 1.9 | 32.3 | 5.0 | 95.0 | 0.0 |
| 1045 | 160.0 | 1.9 | 32.3 | 5.0 | 95.0 | 0.0 |
| 1046 | 240.0 | 1.9 | 32.3 | 2.0 | 80.0 | 18.0 |
| 1047 | 300.0 | 1.9 | 32.3 | 0.0 | 78.0 | 22.0 |
| 1051 | 120.0 | 1.4 | 32.4 | 0.0 | 97.0 | 3.0 |
| 1053 | 60.0 | 1.4 | 32.4 | 18.0 | 82.0 | 0.0 |
| 1054 | 72.0 | 1.2 | 32.3 | 9.0 | 91.0 | 0.0 |
| 1055 | 175.0 | 1.9 | 32.3 | 0.0 | 97.0 | 3.0 |
| 1056 | 84.0 | 1.3 | 32.3 | 0.0 | 97.0 | 3.0 |
| 1057 | 220.0 | 1.9 | 32.3 | 0.0 | 70.0 | 30.0 |
| 1058 | 160.0 | 0.8 | 32.3 | 0.0 | 86.0 | 14.0 |
| 1059 | 100.0 | 1.5 | 32.8 | 0.0 | 83.0 | 17.0 |
| 1060 | 180.0 | 2.5 | 33.1 | 0.0 | 18.0 | 82.0 |
| 1062 | 100.0 | 1.9 | 32.3 | 10.0 | 60.0 | 30.0 |
| 1063 | 113.0 | 1.9 | 32.3 | 10.0 | 53.0 | 37.0 |
| 1064 | 340.0 | 1.9 | 32.3 | 0.0 | 0.0 | 100.0 |
| 1065 | 360.0 | 1.9 | 32.3 | 0.0 | 3.0 | 97.0 |
| 1066 | 80.0 | 1.9 | 32.3 | 0.0 | 97.0 | 3.0 |
| 1067 | 270.0 | 1.9 | 32.3 | 0.0 | 2.0 | 98.0 |
| 1068 | 200.0 | 1.9 | 32.3 | 0.0 | 8.0 | 92.0 |
| 1069 | 140.0 | 1.9 | 32.3 | 0.0 | 78.0 | 22.0 |

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|---|---|---|---|---|---|---|
| 1070 | 105.0 | 1.9 | 32.3 | 30.0 | 70.0 | 0.0 |
| 1071 | 70.0 | 1.9 | 32.3 | 10.0 | 90.0 | 0.0 |
| 1072 | 55.0 | 1.9 | 32.3 | 10.0 | 90.0 | 0.0 |
| 1073 | 120.0 | 1.9 | 32.3 | 0.0 | 56.0 | 44.0 |
| 1074 | 160.0 | 1.9 | 32.3 | 0.0 | 75.0 | 25.0 |
| 1075 | 275.0 | 1.9 | 32.3 | 0.0 | 18.0 | 82.0 |
| 1076 | 145.0 | 1.9 | 32.3 | 10.0 | 90.0 | 0.0 |
| 1077 | 80.0 | 1.9 | 32.3 | 69.0 | 31.0 | 0.0 |
| 1078 | 80.0 | 1.9 | 32.3 | 35.0 | 65.0 | 0.0 |
| 1080 | 75.0 | 1.9 | 32.3 | 67.0 | 33.0 | 0.0 |
| 1081 | 145.0 | 1.9 | 32.3 | 5.0 | 90.0 | 5.0 |
| 1082 | 91.0 | 2.3 | 32.4 | 1.0 | 99.0 | 0.0 |
| 1083 | 200.0 | 2.3 | 32.4 | 0.0 | 27.0 | 73.0 |
| 1084 | 100.0 | 1.1 | 32.5 | 0.0 | 42.0 | 58.0 |
| 1085 | 85.0 | 1.9 | 32.3 | 7.0 | 63.0 | 0.0 |
| 1086 | 260.0 | 1.9 | 32.3 | 0.0 | 26.0 | 74.0 |
| 1087 | 200.0 | 1.9 | 32.3 | 0.0 | 20.0 | 80.0 |
| 1088 | 300.0 | 1.9 | 32.3 | 0.0 | 24.0 | 76.0 |
| 1089 | 310.0 | 1.9 | 32.5 | 0.0 | 18.0 | 82.0 |
| 1090 | 280.0 | 1.4 | 32.3 | 0.0 | 22.0 | 78.0 |
| 1093 | 209.0 | 1.9 | 32.3 | 0.0 | 31.0 | 69.0 |
| 1095 | 100.0 | 1.9 | 32.3 | 2.0 | 79.0 | 19.0 |
| 1096 | 166.0 | 1.9 | 32.3 | 0.0 | 32.0 | 68.0 |
| 1097 | 240.0 | 1.9 | 32.3 | 0.0 | 10.0 | 90.0 |
| 1099 | 100.0 | 2.2 | 32.7 | 10.0 | 90.0 | 0.0 |
| 1100 | 155.0 | 1.9 | 32.3 | 0.0 | 47.0 | 53.0 |
| 1101 | 80.0 | 1.9 | 32.3 | 8.0 | 92.0 | 0.0 |
| 1102 | 234.0 | 3.7 | 33.0 | 0.0 | 7.0 | 96.0 |
| 1103 | 130.0 | 1.9 | 32.3 | 0.0 | 39.0 | 61.0 |
| 1104 | 150.0 | 1.9 | 32.3 | 0.0 | 35.0 | 65.0 |
| 1105 | 210.0 | 1.9 | 32.3 | 0.0 | 20.0 | 80.0 |
| 1106 | 170.0 | 1.9 | 32.3 | 0.0 | 32.0 | 68.0 |
| 1107 | 210.0 | 1.9 | 32.3 | 0.0 | 0.0 | 100.0 |
| 1109 | 90.0 | 1.9 | 32.3 | 2.0 | 98.0 | 0.0 |
| 1110 | 110.0 | 1.9 | 32.3 | 8.0 | 91.0 | 0.0 |
| 1111 | 140.0 | 1.9 | 32.3 | 0.0 | 92.0 | 8.0 |
| 1112 | 140.0 | 1.9 | 32.3 | 0.0 | 47.0 | 53.0 |
| 1113 | 113.0 | 2.3 | 33.3 | 0.0 | 72.0 | 28.0 |
| 1114 | 135.0 | 1.9 | 32.3 | 0.0 | 87.0 | 13.0 |
| 1115 | 130.0 | 1.9 | 32.3 | 41.0 | 59.0 | 0.0 |
| 1116 | 220.0 | 2.2 | 32.7 | 0.0 | 39.0 | 61.0 |
| 1119 | 140.0 | 1.9 | 32.3 | 0.0 | 39.0 | 61.0 |
| 1120 | 160.0 | 1.9 | 32.3 | 0.0 | 39.0 | 61.0 |
| 1124 | 83.0 | 1.9 | 32.3 | 1.0 | 99.0 | 0.0 |
| 1125 | 105.0 | 1.9 | 32.3 | 4.0 | 66.0 | 30.0 |
| 1126 | 112.0 | 1.9 | 32.3 | 2.0 | 55.0 | 43.0 |
| 1127 | 92.0 | 2.9 | 32.0 | 10.0 | 90.0 | 0.0 |
| 1128 | 130.0 | 2.9 | 32.0 | 10.0 | 90.0 | 0.0 |
| 1130 | 105.0 | 2.9 | 32.0 | 88.0 | 12.0 | 0.0 |
| 1131 | 118.0 | 2.9 | 32.0 | 0.0 | 40.0 | 60.0 |
| 1132 | 165.0 | 2.9 | 32.0 | 0.0 | 15.0 | 75.0 |
| 1133 | 171.0 | 8.5 | 34.3 | 0.0 | 15.0 | 75.0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1134 | 160.0 | 8.5 | 34.3 | 0.0 | 15.0 | 85.0 |
| 1135 | 170.0 | 8.5 | 34.3 | 0.0 | 15.0 | 85.0 |
| 1136 | 170.0 | 8.5 | 34.3 | 0.0 | 15.0 | 85.0 |
| 1137 | 135.0 | 8.5 | 34.3 | 0.0 | 54.0 | 46.0 |
| 1138 | 115.0 | 8.5 | 34.3 | 0.0 | 54.0 | 46.0 |
| 1139 | 155.0 | 8.5 | 34.3 | 0.0 | 15.0 | 85.0 |
| 1140 | 230.0 | 10.0 | 35.0 | 0.0 | 44.0 | 55.0 |
| 1141 | 160.0 | 10.0 | 35.0 | 0.0 | 40.0 | 60.0 |
| 1142 | 80.0 | 10.0 | 35.0 | 9.0 | 89.0 | 2.0 |
| 1143 | 92.0 | 6.1 | 33.6 | 8.0 | 92.0 | 0.0 |
| 1118 | 125.0 | 1.9 | 32.3 | 0.0 | 39.0 | 61.0 |
| 4003 | 77.0 | 4.0 | 31.8 | 99.0 | 1.0 | 0.0 |
| 4004 | 55.0 | 4.0 | 31.8 | 94.0 | 6.0 | 0.0 |
| 4005 | 55.0 | 4.0 | 31.8 | 97.0 | 3.0 | 0.0 |
| 4006 | 44.0 | 4.0 | 31.8 | 76.0 | 24.0 | 0.0 |
| 4007 | 83.0 | 4.0 | 31.8 | 99.0 | 1.0 | 0.0 |
| 4007 | 83.0 | 4.0 | 31.8 | 99.0 | 1.0 | 0.0 |

| | | | |
|---|---|---|---|
| 7902 | 602.0 | 9.0 | 35.5 |
| 7903 | 700.0 | 9.0 | 35.5 |
| 7904 | 798.0 | 9.0 | 35.5 |
| 7906 | 1000.0 | 6.0 | 35.0 |
| 7907 | 1200.0 | 4.0 | 35.0 |
| 7908 | 1400.0 | 4.0 | 35.0 |
| 7909 | 1600.0 | 4.0 | 35.5 |
| 7910 | 1800.0 | 4.0 | 35.5 |
| 7911 | 2400.0 | 4.0 | 35.0 |
| 7912 | 2200.0 | 4.0 | 35.0 |
| 7913 | 2000.0 | 4.0 | 35.0 |
| 7948 | 1680.0 | 4.0 | 35.0 |
| 7949 | 1800.0 | 4.0 | 35.0 |
| 7950 | 2000.0 | 4.0 | 35.0 |
| 7951 | 2200.0 | 4.0 | 35.0 |
| 7952 | 2400.0 | 4.0 | 35.0 |
| 8013 | 2500.0 | 4.0 | 35.0 |
| 8014 | 3050.0 | 4.0 | 35.0 |
| 8060 | 492.0 | 9.0 | 35.5 |
| 8061 | 592.0 | 9.0 | 35.5 |
| 8062 | 648.0 | 9.0 | 35.5 |
| 8063 | 990.0 | 9.0 | 35.5 |
| 8064 | 1708.0 | 4.0 | 35.0 |
| 8065 | 2120.0 | 4.0 | 35.0 |
| 8066 | 1350.0 | 4.0 | 35.0 |
| 8067 | 1050.0 | 6.0 | 35.5 |
| 8068 | 781.0 | 9.0 | 35.5 |
| 7802 | 834.0 | 9.0 | 35.5 |
| 6032 | 750.0 | 9.0 | 35.5 |
| 6033 | 970.0 | 9.0 | 35.5 |
| 6034 | 1045.0 | 6.0 | 35.5 |
| 6036 | 450.0 | 9.0 | 35.5 |
| 6050 | 350.0 | 9.0 | 35.5 |
| 6051 | 380.0 | 9.0 | 35.5 |
| 6076 | 777.0 | 9.0 | 35.5 |
| 6077 | 650.0 | 9.0 | 35.5 |
| 6078 | 400.0 | 9.0 | 35.5 |
| 1008 | 360.0 | 4.5 | 34.5 |
| 1036 | 440.0 | 4.5 | 34.5 |
| 1037 | 625.0 | 4.5 | 34.5 |
| 1038 | 775.0 | 4.5 | 34.5 |
| 1039 | 1000.0 | 4.5 | 34.5 |
| 1040 | 1600.0 | 4.5 | 34.5 |

# APPENDIX VII

# RAW ABUNDANCE DATA

The following list consists of the raw data for each species entered into the analysis. The column to the extreme left indicates each station number. Values in each column to the right of this are for % total occurrence (live+dead) of each species shown at the top of the column(in code),any value to the immediate right of each column represents % live occurrence of that species at that station.

## SPECIES ABBREVIATIONS AS USED IN THE ANALYSES

| | |
|---|---|
| ALVESCIT | *Alveophragmium scitulum* |
| AMMOBACU | *Ammobaculites dilatatus* |
| AMMOCATI | *Ammodiscus catinus* |
| AMMOTCAS | *Ammotium cassis* |
| ASTRGALO | *Astrononion gallowayi* |
| BOLISUBS | *Bolivina subspinescens* |
| BULIEXIL | *Bulimina exilis* |
| BULIACLE | *Bulimina aculeata* |
| BULISTRI | *Bulimina striata* |
| BUCCFRIG | *Buccella frigida* |
| BRIZSPAT | *Bolivina spathulata* |
| BRIZSUBA | *Bolivina subaenariensis* |
| CIBILOBA | *Cibicides lobatulus* |
| CIBIPSEU | *Cibicides pseudoungerianus* |
| CIBIWUEL | *Planulina wuellerstorfi* |
| CASSLAEV | *Cassidulina laevigata* |
| CRIBCRAS | *Cribrostomoides crassimargo* |
| CRIBJEFF | *Cribrostomoides jeffreysi* |
| CRIBSUBG | *Cribrostomoides subglobosum* |
| CYCLCANC | *Cyclammina cancellata* |
| ELPHEXCL | *Elphidium excavatum f. clavata* |
| ELPHBART | *Elphidium bartletti* |
| ELPHSUBA | *Elphidium subarcticum* |
| EGGLADVA | *Eggerella advena* |
| EPONUMBO | *Eponides sp.* |
| FISSERAT | *Fissurina serrata* |

| | |
|---|---|
| FURSLOEB | <u>Fursenkoina loeblichi</u> |
| FURSFUSI | <u>Fursenkoina fusiformis</u> |
| GLANLAEV | <u>Glandulina laevigata</u> |
| GYROSOLD | <u>Gyroidina soldani</u> |
| GLOBAURC | <u>Globobulimina auriculata</u> |
| GLOBTURG | <u>Globobulimina pacifica</u> |
| HOEGELGS | <u>Hoeglundina elegans</u> |
| HYPEELON | <u>Hyperammina elongata</u> |
| HAPLACAR | <u>Haplophragmoides canariensis</u> |
| ISLAISLA | <u>Islandiella islandica</u> |
| ISLATERE | <u>Islandiella teretis</u> |
| KAREINFL | <u>Karreriella bradyi</u> |
| LAGEMOLL | <u>Lagena mollis</u> |
| LENTSPAA | <u>Astocolus hyalacrulus</u> |
| NONILABR | <u>Nonionellina labradorica</u> |
| NONITURG | <u>Nonionella turgida</u> |
| MELOPOMP | <u>Melonis pompilioides</u> |
| PATEHAUR | <u>Pateroris hauerinoides</u> |
| PULEQUIN | <u>Pullenia quinqueloba</u> |
| QUICSEMI | <u>Quinqueloculina seminulum</u> |
| REOPSCOR | <u>Reophax scorpiurus</u> |
| REOPGUTT | <u>Reophax guttifera</u> |
| REOPNODU | <u>Reophax nodulosus</u> |
| REOPARCT | <u>Reophax arctica</u> |
| REOPSCOT | <u>Reophax scotti</u> |
| PAROSEMI | <u>Discamolina semipunctata</u> |
| SACCATLA | <u>Saccammina atlantica</u> |
| SACCSPHA | <u>Saccammina sphaerica</u> |

| | |
|---|---|
| SACCDIFF | *Saccammina difflugiformis* |
| STAINAPT | *Stainforthia concava* |
| TROCHINF | *Trochammina inflata* |
| TROCHLOB | *Trochammina lobata* |
| TROCHGLO | *Trochammina globigeriniformis* |
| TRIFANGU | *Trifarina angulosa* |
| TRITCONI | *Tritaxis conica* |
| TEXTTORQ | *Textularia torquata* |
| UVIGPERE | *Uvigerina peregrina* |
| ORIDTENR | *Oridorsalis umbonatus* |
| VALVLAEV | *Valvulineria laevigata* |
| RECUTURB | *Recurvoides turbinatus* |
| ADERGLOM | *Adercotryma glomerata* |
| SPIROBIF | *Spiroplectammina biformis* |
| TRILOCSP | *Triloculina trihedra* |
| ELPHACTT | *Elphidiella arctica* |
| SIGMSCHL | *Sigmoilopsis schlumbergeri* |
| OSANGSPA | *Osangularia rugosa* |
| TRIFOCCI | *Trifarina occidentalis* |
| TROCHSQA | *Trochammina squamata* |
| MBULIMAR | *Bulimina marginata* |

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PERCENT FOR NS GRABS AND CORE TOPS


 OF VARIABLES =  75       NUMBER OF SAMPLES =  258
PERCENT FOR NS GRABS AND CORE TOPS


   RAW DATA


  SAMPLE  NAME          1           2           3           4           5           6           7           8           9          10

                     ALVESCIT    AMMOBACU    AMMOCATI    AMMOTCAS    ASTRGALO    BOLISUBS    BULIEXIL    BULISTRI    BULIACLE    BUCCFRIG

  7902                1.000       0.000       0.000        .300       0.000       0.000      19.000       0.000       3.500       5.500
  7903                 .400       4.300       0.000       0.000       0.000       0.000      10.200       0.000      13.600       1.700
  7904                1.400       2.400       0.000       0.000       0.000       0.000       7.800       0.000       9.800       0.000
  7906                 .800       1.300       0.000       0.000       0.000        .400       3.000       0.000       4.000        .400
  7907                0.000       0.000       0.000       0.000       0.000        .800        .800       1.800       3.000       0.000
  7908                0.000       1.300       0.000       0.000       0.000        .600        .600       3.400       2.900        .300
  7909                0.000        .700       0.000       0.000       0.000       0.000       0.000       2.800       1.000       0.000
  7910                0.000       0.000       0.000       0.000       0.000        .700       1.300       2.900       0.000       0.000
  7911                0.000       0.000       0.000       0.000       0.000       0.000       0.000        .700       0.000       0.000
  7912                0.000       0.000       0.000       0.000       0.000       0.000       0.000       2.900       0.000       0.000
  7913                0.000       0.000       0.000       0.000       0.000       0.000       0.000        .700       0.000       0.000
  7914                0.000       0.000       0.000       0.000       0.000       0.000        .800       0.000       0.000       0.000
  7917                 .700       0.000       0.000       0.000       0.000       0.000       1.000       0.000      32.900       0.000
  7918                0.000       0.000       0.000       0.000       0.000       0.000        .800       0.000      30.800       0.000
  7948                0.000       0.000       0.000       0.000       0.000       1.000       1.700       5.000       0.000       0.000
  7949                0.000       0.000       0.000       0.000       0.000        .800       0.000       4.300       0.000       0.000
  7950                0.000       0.000       0.000       0.000       0.000       0.000       0.000       1.700       0.000       0.000
  7952                0.000       0.000       0.000       0.000       0.000       0.000       0.000       3.700       0.000       0.000
  7953                0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000        .600       2.500 9.0
  7955                0.000       0.000       0.000       0.000        .700 3.6   0.000       0.000       0.000       0.000       2.000
  7956                0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000        .600        .600
  7957                0.000       0.000       0.000       0.000        .300 3.3   0.000       0.000       0.000       0.000      11.300 26
  7958                1.300       0.000       0.000       0.000        .600       0.000       0.000       0.000       4.200       5.500
  7959                 .300 22    0.000       0.000       0.000       0.000       0.000       0.000       0.000      10.000       4.000
  7960                0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000      13.000       1.400
  7947                 .600       0.000       0.000       0.000       0.000       0.000       1.800       7.400       5.000       0.000
  0802                0.000       0.000       0.000      14.000       0.000       0.000       0.000       0.000       0.000       0.000
  0817                0.000       0.000       0.000       1.800       0.000       0.000       0.000       0.000       0.000       0.000
  0818                0.000       0.000       0.000       0.000       1.500       0.000       0.000       0.000       0.000       3.000 17
  0819                0.000       0.000       0.000        .500       0.000       0.000       0.000       0.000       0.000       0.000
  0820                0.000       0.000       0.000       5.600       0.000       0.000       0.000       0.000       0.000       0.000
  0821                0.000       0.000       0.000       0.000        .900       0.000       0.000       0.000       0.000       3.200
  0822                0.000       0.000       0.000        .600       0.000       0.000       0.000       0.000       0.000       0.000
  0824                0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
  0825                0.000       0.000       0.000        .800       0.000       0.000       0.000       0.000       0.000       0.000
  0830                0.000       0.000       0.000       3.70  9     0.000       0.000       0.000       0.000       0.000       0.000
  0832                0.000       0.000       0.000       3.200       1.000       0.000       0.000       0.000       0.000       0.000
  0833                0.000       0.000       0.000       4.00  7     0.000       0.000       0.000       0.000       0.000       0.000
  0835                0.000       0.000        .400      11.60  19    0.000       0.000       0.000       0.000       0.000       0.000
  0838                0.000       0.000        .300        .600       0.000       0.000       0.000       0.000       0.000       0.000
  0839                0.000       0.000       0.000       2.000       0.000       0.000       0.000       0.000       0.000       0.000
  0841                0.000       0.000       0.000      12.300       0.000       0.000       0.000       0.000       0.000       0.000
  0843                0.000       0.000       0.000       0.000       1.400       0.000       0.000       0.000       0.000       1.700 5
  0844                0.000       0.000       1.500       0.000       0.000       0.000       0.000       0.000       0.000       0.000
  0846                0.000        .600       0.000       3.800       0.000       0.000       0.000       0.000       0.000       0.000
  0847                0.000       0.000       0.000       0.000       4.300 11    0.000       0.000       0.000       0.000       1.000
  0848                0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       1.000
  0849                1.500       0.000       0.000       0.000       0.000       0.000        .400       0.000       1.800       0.000
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0851      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000    23.400     0.000
0852      2.600     0.000     0.000     0.000      .300     0.000     0.000     0.000     3.500      .900
0856      0.000     0.000     0.000     0.000     1.600     0.000     0.000     0.000     0.000     2.900
0857      0.000     0.000     0.000     0.000     1.400     0.000     0.000     0.000     0.000     0.000
8002      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     3.600     0.000
8004      0.000     0.000     0.000     0.000      .800     0.000     0.000     0.000    30.000     2.800
8005       .700     0.000     0.000     0.000     0.000     0.000     1.800     0.000    22.000    10.800 12
8006      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000    19.000     8.600
8007      0.000     0.000     0.000     0.000     1.000     0.000     0.000     0.000     2.500    13.000
8010      0.000     0.000     0.000     0.000      .600     3.300     0.000     0.000    11.600    12.600
8011      0.000     0.000     0.000     0.000      .300     0.000     0.000     0.000    10.800    16.600
8012       .600     0.000     0.000     0.000     0.000     0.000     0.000     0.000    12.800    11.800
8013      0.000     0.000     0.000     0.000     0.000     0.000     0.000     1.000     0.000     0.000
8017      0.000     0.000     0.000     0.000      .600     0.000     0.000     0.000     0.000     6.300 16
8018      0.000     0.000     0.000     0.000      .300     0.000      .300     0.000      .300     9.000
8027      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     4.500
8035      0.000     0.000     0.000     1.300     0.000     0.000     0.000     0.000     0.000     0.000
8036      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     5.700
8037      0.000     0.000     0.000      .700     0.000     0.000     0.000     0.000     0.000     0.000
8038      0.000     0.000      .200      .50016   0.000     0.000     6.800     0.000     0.000     0.000
8039      0.000     1.200     0.000     2.50011   0.000     0.000     0.000     0.000     0.000     0.000
8040      0.000     0.000     0.000      .300     0.000     0.000     0.000     0.000     0.000     0.000
8042      0.000     0.000      .300     1.300 2   0.000     0.000     0.000     0.000     0.000     0.000
8043      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
8044      0.000     0.000     0.000     0.000     4.20067   0.000     0.000     0.000     0.000    10.700
8060       .50010   0.000     0.000     0.000     0.000     0.000     4.000     0.000    17.300    10.400
8061       .700     0.000     0.000     0.000     0.000     0.000    11.800     0.000    10.700     0.000
8062      3.000     0.000     0.000     0.000     1.300     2.100     5.200     0.000     5.200     2.600
8063      2.600      .400      .400     0.000     0.000     2.200     1.300     2.200     2.200     1.700
8064      0.000     0.000     0.000     0.000     0.000      .400      .800     6.800     1.100     0.000
8065       .700     0.000     0.000     0.000     0.000     0.000     3.50010   2.800     0.000     0.000
8066      0.000     0.000     0.000     0.000     0.000     2.200     3.500     3.500     3.000     0.000
8067      1.10010   0.000      .40011   0.000     0.000     2.700    20.000     0.000     3.400     0.000
6003       .900     0.000     0.000     0.000     0.000     0.000     0.000     0.000    21.500     0.000
6005      2.500     1.300     0.000      .800     0.000     0.000     0.000     0.000     0.000     0.000
6006      0.000     0.000     0.000     0.000     2.100     0.000     0.000     0.000     6.800    12.800
6007      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     2.800     6.900
6019      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000      .600     6.600
6032      1.400     0.000     0.000     0.000     0.000     2.400     1.000     0.000     9.600     4.300
6033       .700     0.000     0.000     0.000     0.000     4.300    12.500     0.000     5.800     0.000
6034      0.000     0.000     0.000     0.000     0.000     0.000     0.000     1.000     7.000     0.000
6036      2.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000    10.600    10.600
6041      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     2.600
6042      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     5.700
6050      0.000     0.000     0.000     0.000     1.200     0.000     0.000     0.000     0.000     7.500
6051      0.000     0.000     0.000     0.000     2.000     0.000     0.000     0.000     0.000     5.700
6052      1.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000    17.000     7.000
6053       .400     0.000     0.000     0.000     0.000     0.000     1.700     0.000    17.100     0.000
6055      0.000     0.000     0.000     0.000     1.100     0.000     0.000     0.000     0.000    16.800
6056      0.000     0.000     0.000      .500      .900     0.000     0.000     0.000     1.400      .900
6057      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6058      0.000     0.000     0.000     0.000     3.000     0.000     0.000     0.000     0.000    16.000
6062      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000    14.600      .400
6063      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6064      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000    14.600      .400
6065      1.400     0.000     0.000     0.000     0.000     0.000     0.000     0.000     3.900     0.000
6066      2.700     0.000     0.000     0.000     1.700     0.000     0.000     0.000     1.700     5.400
6068      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     2.700
6069      0.000     0.000     0.000     0.000      .300     0.000     0.000     0.000     0.000     4.600
6070      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     2.900
6071      0.000     0.000     0.000     0.000      .600     0.000     0.000     0.000     0.000     3.400
6072      0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     3.100
6073      0.000     0.000      .600     0.000     0.000     0.000     0.000     0.000     0.000     1.500
6074      0.000     0.000     0.000     0.000     1.600     0.000     0.000     0.000     0.000     7.900
6075      2.400     0.000     0.000     0.000     0.000     3.700     0.000     1.200     1.700     0.000
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1056       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1057       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       2.200
1058       0.000       0.000        .400       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1059       0.000       0.000       0.000       0.000       3.400 20    0.000       0.000       0.000       0.000       2.400
1060       0.000       0.000       0.000        .700       0.000       0.000       0.000       0.000       0.000       0.000
1062       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1063       0.000       0.000       1.200       0.000       0.000       0.000       0.000       0.000       0.000       1.000 .3
1064       0.000       0.000       1.500       1.100       0.000       0.000       0.000       0.000       0.000       0.000
1065       0.000       0.000       0.000       0.000       0.000       0.000      14.500 12    0.000       1.600       0.000
1066       0.000       0.000       0.000       0.000        .600       0.000        .600 3     0.000       0.000       9.000 6
1067       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1068       0.000       0.000       1.900       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1069       0.000       0.000        .500       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1070       0.000       0.000       0.000       0.000       1.800       0.000       0.000       0.000       0.000       5.000
1071       0.000       0.000       0.000       0.000       3.100 10    0.000       0.000       0.000       0.000       5.000
1072       0.000       0.000       0.000       0.000       1.900 1,3   0.000       0.000       0.000       0.000       3.900 1
1073       0.000       0.000       0.000        .500       0.000       0.000       0.000       0.000       0.000       0.000
1074       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1075       3.3003,2    0.000       0.000       0.000       0.000       0.000       0.000       7.400       0.000       1.200
1076       0.000       0.000       0.000       2.000       0.000       0.000       0.000       0.000       0.000       0.000
1077       0.000       0.000       0.000       0.000       1.800       0.000       0.000       0.000       0.000       2.500
1078       0.000       0.000       0.000       0.000       1.000       0.000       0.000       0.000       0.000       7.400
1080       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       1.900       0.000
1081       1.300       0.000       9.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1082       0.000       0.000       0.000       0.000        .300       0.000       0.000       0.000       0.000       9.100
1083       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1084       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       1.500
1085       0.000       0.000       0.000       0.000        .600       0.000       0.000       0.000       0.000       3.800
1086       0.000       0.000        .600       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1087        .300       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1088        .900       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1089       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1090       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1093       0.000       0.000       0.000       1.200       0.000       0.000       0.000       0.000       0.000        .300
1095       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       1.100
1096       0.000       0.000       0.000       0.000       1.200       0.000       0.000       0.000       0.000       0.000
1097       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1099       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1100       0.000       0.000       0.000       1.000       0.000       0.000       0.000       0.000       0.000       0.000
1101       0.000       0.000       0.000        .400       5.200 14    0.000       0.000       0.000       0.000       0.000
1102       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1103       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1104       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1105       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1106       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1107       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1109       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1110       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1111       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000        .800
1112       0.000       0.000       2.900       0.000       0.000       0.000       0.000       0.000       0.000       1.500
1113       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1114       0.000       0.000        .600       0.000       0.000       0.000        .300       0.000       0.000        .600
1115       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1116       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1119       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1120       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1124       0.000       0.000       5.00011     0.000       0.000       0.000       0.000       0.000       0.000       0.000
1125       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1126       0.000       0.000        .600       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1127       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1128       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1130       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       8.900
1131       0.000       0.000       1.100       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1132        .500       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1133       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000      15.000       0.000
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6076    4.300       0.000       0.000       0.000       0.000        .800       0.000       0.000       4.700       9.700
6077    0.000       0.000        .600       0.000        .800        .900       0.000       0.000        .800       3.500
6078    0.000        .700       0.000       0.000       0.000       0.000       5.500       0.000       3.000       2.000
6079    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6080    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000        .800       1.300
6081    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000        .300
6082    0.000       0.000       0.000       0.000       2.700       0.000       0.000       0.000       0.000       3.700
6083    0.000       0.000       0.000       3.400        .500       0.000       0.000       0.000       3.700       3.000
6084    3.200       0.000       0.000        .500       0.000       0.000       0.000       0.000       0.000       0.000
6085    6.300       0.000       0.000       0.000       0.000       0.000       0.000       0.000       4.300       0.000
6086    3.500       0.000       0.000       4.000       0.000       0.000       0.000       0.000       0.000       0.000
6087     .700       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6088    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6089    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000        .600       1.200
6090    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       1.000
6092    2.800       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000        .800
6094    5.100       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6096    3.700       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       4.800 11
6097   14.300 20    0.000        .400       3.000 12    0.000       0.000       0.000       0.000       0.000       0.000
6098     .700       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6099    0.000       0.000       0.000        .900       0.000       0.000       0.000       0.000       0.000       0.000
6100    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6101    3.600       0.000       1.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6102    0.000       0.000       0.000       2.100 2,3   0.000       0.000       0.000       0.000       0.000       0.000
6106    0.000       0.000       0.000       0.000       3.600       0.000       0.000       0.000       0.000       9.400
6108    2.300       0.000       0.000       7.300       0.000       0.000       0.000       0.000       0.000       0.000
6109    1.200       0.000       0.000        .600       0.000       0.000       0.000       0.000       0.000       0.000
6110    0.000       0.000       0.000       3.500       0.000       0.000       0.000       0.000       0.000       0.000
6111     .600       0.000       0.000       0.000       0.000       0.000       0.000       0.000      16.500       2.500
6112    3.600       0.000       0.000       0.000       0.000       0.000       0.000       0.000       1.200       2.400
6113     .600       0.000       0.000       0.000       0.000       0.000       1.400       0.000      10.000       8.200
6114    5.600       0.000       0.000       0.000        .500       0.000       0.000       0.000       1.500       0.000
6115    6.600       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6116    3.900       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6117    0.000       0.000        .700       0.000       0.000       0.000       2.500 5     0.000       4.900       0.000
1008     .700       0.000       0.000       0.000       3.500       0.000       6.400       0.000       0.000      10.800
1009    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       1.900
1010    0.000       0.000        .700       0.000       1.000       0.000       0.000       0.000       0.000       3.200
1011    0.000       0.000       0.000       0.000       1.000       0.000       0.000       0.000       0.000       2.300
1015    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1016    0.000       0.000       0.000       0.000       2.400       0.000       0.000       0.000       0.000       7.500
1017    0.000       0.000       0.000       0.000       8.000       0.000       0.000       0.000       1.000       5.600
1020    0.000       0.000       0.000       0.000       3.300 5,2   5.600       0.000       0.000        .600       5.300 3
1021    1.500       0.000       0.000       0.000       5.200       0.000       7.400       0.000       2.200       3.700
1022    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1026    0.000       0.000       0.000       0.000        .800       0.000       0.000       0.000       0.000        .800
1027    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1029    0.000       0.000       0.000       0.000       2.300 13    0.000       0.000       0.000       0.000       4.300 9
1034    0.000       0.000       0.000       0.000       6.800 22    0.000       0.000       0.000       0.000       3.900
1035    0.000       0.000       0.000       0.000      12.400 90    0.000       0.000       0.000       0.000       2.700
1036    0.000       0.000       0.000       0.000       6.700       0.000      23.300       0.000      13.500       6.700
1037    0.000       0.000       0.000       0.000       2.600       2.600      19.400       0.000       9.200       9.200
1038    1.000       0.000       0.000       0.000       3.200       2.800       6.000        .700       0.000       3.200
1039    0.000       0.000       0.000       0.000        .700       2.600      14.600       1.200       0.000       2.600
1040    5.500       0.000       0.000       0.000       0.000       3.200       9.100        .500       1.300       3.200
1043    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1044    0.000       0.000       0.000       0.000       1.100       0.000       0.000       0.000       0.000       0.000
1045    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1046    0.000       0.000       0.000       0.000       8.900 21    0.000       0.000       0.000       0.000       0.000
1047    1.000       0.000       0.000       0.000       1.300       0.000       3.300       6.000      11.600       4.300
1048    0.000       0.000       0.000       0.000       4.100       0.000      14.400 50    0.000       9.000      12.000 11
1051    0.000       0.000       0.000       0.000       2.500 12    0.000       0.000       0.000       0.000       2.500
1053    0.000       0.000       0.000       0.000       1.000       0.000       0.000       0.000       0.000       3.300
1054    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       1.100
1055    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
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|  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|
| 1134 | 0.000 | 0.000 | 1.200 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 10.400 | 0.000 |
| 1135 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 13.500 | 4.200 |
| 1136 | 2.500 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .300 | 0.000 | 10.900 | 3.000 |
| 1137 | 2.600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1138 | 0.000 | 0.000 | .400 | 3.800 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1139 | 1.500 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.500 | 0.000 |
| 1140 | 1.600 | 0.000 | 1.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 20.300 | 1.000 |
| 1142 | 0.000 | 0.000 | 0.000 | 0.000 | 3.100 6 | 0.000 | 0.000 | 0.000 | 0.000 | 3.900 2 |
| 1143 | 0.000 | 0.000 | 0.000 | 0.000 | 2.500 2 | 0.000 | 0.000 | 0.000 | 0.000 | 8.200 5 |
| 1119 | 0.000 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4003 | 0.000 | 0.000 | 0.000 | 0.000 | .900 | 0.000 | 0.000 | 0.000 | 0.000 | 8.000 |
| 4004 | 0.000 | 0.000 | 0.000 | 0.000 | .500 | 0.000 | 0.000 | 0.000 | 0.000 | 2.200 |
| 4005 | 0.000 | 0.000 | 0.000 | 0.000 | .300 | 0.000 | 0.000 | 0.000 | 0.000 | 2.400 |
| 4006 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .900 |
| 4007 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .900 |

| SAMPLE NAME | 11<br>BRIZSPAT | 12<br>BRIZSUBA | 13<br>CIBILOBA | 14<br>CIBIPSEU | 15<br>CIBIWUEL | 16<br>CASSLAEV | 17<br>CRIBCRAS | 18<br>CRIBJEFF | 19<br>CRIBSUBG | 20<br>CYCLCANC |
|---|---|---|---|---|---|---|---|---|---|---|
| 7902 | 3.500 | 0.000 | 4.500 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7903 | 0.000 | 0.000 | 3.000 | 3.000 | 0.000 | 0.000 | 3.000 | .400 | 0.000 | .900 |
| 7904 | 0.000 | 0.000 | 2.000 | 1.400 | 0.000 | 2.500 | 0.000 | 0.000 | 0.000 | 1.000 |
| 7906 | 0.000 | 0.000 | 4.000 | 6.000 | 0.000 | .500 | 1.300 | 1.700 | 0.000 | .800 |
| 7907 | 0.000 | 0.000 | 6.000 | 5.600 | 0.000 | .300 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7908 | 0.000 | 0.000 | 4.500 | 5.500 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7909 | 0.000 | 0.000 | 0.000 | 3.800 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7910 | 0.000 | 0.000 | 0.000 | 1.300 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | .700 |
| 7911 | .400 | 0.000 | 0.000 | .700 | 0.000 | 0.000 | .400 | 0.000 | 0.000 | 0.000 |
| 7912 | 0.000 | 0.000 | 0.000 | 0.000 | .300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7913 | 0.000 | 0.000 | 0.000 | 0.000 | .400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7914 | 0.000 | 9.600 | 2.800 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7917 | 0.000 | 1.000 | 6.800 | 0.000 | 0.000 | 0.000 | 0.000 | 2.900 | 2.500 | 0.000 |
| 7918 | 0.000 | 5.400 | 7.000 | 0.000 | 0.000 | 0.000 | .400 | 1.600 | 2.000 | 0.000 |
| 7948 | 0.000 | 0.000 | 1.000 | 1.700 | 0.000 | 0.000 | 0.000 | .300 | 0.000 | 0.000 |
| 7949 | 0.000 | 0.000 | 0.000 | 1.600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .800 |
| 7950 | 0.000 | 0.000 | .700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7952 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7953 | 6.000 | .300 | 18.000 18 | 0.000 | 0.000 | .300 | .300 | 0.000 | 0.000 | 0.000 |
| 7955 | 4.000 11 | 0.000 | 18.700 4 | 0.000 | 0.000 | 2.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7956 | 0.000 | 0.000 | 15.200 | 0.000 | 0.000 | .600 6 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7957 | 3.600 10 | 0.000 | 7.000 | 0.000 | 0.000 | 2.400 | .600 | 0.000 | 0.000 | 0.000 |
| 7958 | 0.000 | 2.600 | 12.600 | 0.000 | 0.000 | 0.000 | .600 | 0.000 | 0.000 | 0.000 |
| 7959 | .300 | 1.800 5 | 1.300 | 0.000 | 0.000 | 1.200 5 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7960 | 0.000 | 3.500 | 2.500 | 0.000 | 0.000 | 0.000 | 0.000 | .700 | 0.000 | 0.000 |
| 7947 | 0.000 | 0.000 | 0.000 | 19.000 | 0.000 | .600 | 1.200 | .600 | 0.000 | 1.200 |
| 0802 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0817 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 22.600 | 0.000 | 0.000 | 0.000 |
| 0818 | 0.000 | 0.000 | 77.000 83 | 0.000 | 0.000 | 0.000 | 1.500 | 0.000 | 0.000 | 0.000 |
| 0819 | 0.000 | 0.000 | 1.500 | 0.000 | 0.000 | 0.000 | 12.900 11 | .500 | 0.000 | 0.000 |
| 0820 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 11.200 | 0.000 | 0.000 | 0.000 |
| 0821 | 0.000 | 0.000 | 23.000 | 0.000 | 0.000 | 0.000 | 11.200 16 | 0.000 | 0.000 | 0.000 |
| 0822 | 0.000 | 0.000 | 1.200 | 0.000 | 0.000 | 0.000 | 9.700 | 0.000 | 0.000 | 0.000 |
| 0824 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.700 23 | 0.000 | 0.000 | 0.000 |
| 0825 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0830 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.100 | 0.000 | 0.000 | 0.000 |
| 0832 | 0.000 | 0.000 | 60.000 67 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0833 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 25.500 42 | 0.000 | 0.000 | 0.000 |
| 0835 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 7.700 8 | 0.000 | 0.000 | 0.000 |
| 0838 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.700 7 | 0.000 | 0.000 | 0.000 |
| 0839 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.300 | 0.000 | 0.000 | 0.000 |
| 0841 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 14.800 | 0.000 | 0.000 | 0.000 |
| 0843 | 0.000 | 0.000 | 68.000 50 | 0.000 | 0.000 | 0.000 | 8.200 16 | 0.000 | 0.000 | 0.000 |
| 0844 | 0.000 | 0.000 | .400 | 0.000 | 0.000 | 0.000 | 15.800 | 1.100 | 0.000 | 0.000 |
| 0846 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 14.800 | 0.000 | 0.000 | 0.000 |

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0847      0.000       0.000      41.400 27    0.000       0.000       0.000       2.900        .700       0.000       0.000
0848      0.000       0.000       5.200 12    0.000       0.000       0.000       8.900 8     0.000       0.000       0.000
0849      0.000       7.300       2.200       0.000       0.000       0.000       0.000       1.500 18    0.000       0.000
0851      0.000      16.700       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
0852      0.000      11.200 9      .300       0.000       0.000       0.000       0.000       0.000       0.000       0.000
0856       .300        .600       5.100       0.000       0.000       0.000       0.000       0.000       0.000       0.000
0857      0.000       0.000       4.900       0.000       0.000       0.000       0.000       0.000       0.000       0.000
8002     11.200       9.400       0.000      10.300       0.000       5.400       0.000       0.000       0.000       0.000
8004      2.400       2.000       1.200       0.000       0.000       0.000        .800       0.000       0.000       0.000
8005      3.600       7.000 18    1.800       0.000       0.000       0.000       0.000       0.000        .700       0.000
8006      0.000       4.800       0.000        .700       0.000       0.000       0.000       0.000        .300       0.000
8007      4.400       6.800       0.000       2.300       0.000       0.000       0.000       0.000       0.000       0.000
8010      9.300       0.000       1.300       0.000       0.000        .600       0.000       0.000       0.000       0.000
8011      4.600       5.600       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
8012      1.700 8     3.000       0.000       0.000       0.000       0.000       0.000        .300       0.000       0.000
8013      0.000       0.000       0.000       2.400       1.400       0.000       0.000       0.000       0.000       1.000
8017      1.900 33     .300      13.800        .300       0.000       2.200 33    0.000       0.000       0.000       0.000
8018      6.800 44    3.000 11   11.600       0.000       0.000       5.900 22    0.000       0.000       0.000       0.000
8027      8.500 77    0.000      16.000        .600       0.000       1.200       0.000       0.000       0.000       0.000
8035      0.000       0.000       0.000       0.000       0.000       0.000      25.600 50    0.000       0.000       0.000
8036     11.200 92     .200      19.300       0.000       0.000       1.400       0.000       0.000       0.000       0.000
8037      0.000       0.000       0.000       0.000       0.000       0.000       8.600       0.000       0.000       0.000
8038      0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
8039      0.000       0.000       0.000       0.000       0.000       0.000       8.000       0.000       0.000       0.000
8040      0.000       0.000       0.000       0.000       0.000       0.000      18.800 17    0.000       0.000       0.000
8042      0.000       0.000       0.000       0.000       0.000       0.000       5.800 8     1.000       0.000       0.000
8043      0.000       0.000       0.000       0.000       0.000       0.000      18.200 16    0.000       0.000       0.000
8044      0.000       0.000      53.300       0.000       0.000       0.000        .300       0.000       0.000       0.000
8060      0.000       0.000       6.400       1.000       0.000       0.000       0.000       0.000        .500       0.000
8061      2.000       0.000       4.100       0.000       0.000       1.700        .100       0.000       0.000       0.000
8062      0.000       0.000       0.000       4.300       0.000       1.700       0.000       0.000        .400        .400
8063      0.000       0.000       0.000       7.400       0.000       1.700       0.000       1.800       0.000       1.300
8064      0.000       0.000       0.000       1.100       0.000       0.000       0.000        .800       0.000       0.000
8065      0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
8066      0.000       0.000       0.000       4.400       0.000        .800       0.000       0.000       0.000       0.000
8067      0.000       0.000       1.000       0.000       0.000       1.500       0.000       0.000       0.000       0.000
6003      0.000       5.500       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6005      0.000       4.000       2.500       0.000       0.000       0.000       0.000       4.000       0.000       0.000
6006      1.500       0.000       6.000       0.000       0.000       4.300       0.000        .600       0.000       0.000
6007      6.100       0.000       3.600       0.000       0.000       2.100       0.000       0.000       0.000       0.000
6018     24.500       0.000      20.700       0.000       0.000       2.800       0.000       0.000       0.000       0.000
6032      9.100       0.000       0.000       1.000       0.000       0.000       1.000       1.400       0.000       0.000
6033      4.000       0.000       0.000       7.900       0.000        .400       0.000       1.000       0.000        .700
6034      3.700       0.000       2.700       4.600       0.000       5.000       0.000       0.000       0.000       0.000
6036      0.000       0.000       4.100       0.000       0.000       0.000        .500       0.000       0.000       0.000
6041      2.100       0.000       9.000       0.000       0.000       2.600       0.000       0.000       0.000       0.000
6042     18.200       0.000      16.800       0.000       0.000       1.100       0.000       0.000       0.000       0.000
6050     34.000       0.000       0.000       0.000       0.000       3.300       0.000       0.000       0.000       0.000
6051     41.000       0.000       8.700       0.000       0.000       2.700       0.000       0.000       0.000       0.000
6052      0.000      12.500       0.000       0.000       0.000       0.000        .600       1.900 5     0.000       0.000
6053      0.000      19.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6055      0.000       0.000      40.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6056      0.000       2.700       0.000       0.000       0.000       0.000       0.000       0.000       2.200       0.000
6057      0.000       0.000       0.000       0.000       0.000       0.000      14.700       1.800       0.000       0.000
6058      0.000       0.000      22.000       0.000       0.000       0.000       1.100        .700       0.000       0.000
6062      6.600       0.000       1.800       0.000       0.000        .400       0.000       2.500       0.000       0.000
6063       .700       0.000       0.000       0.000       0.000       0.000      22.800       7.800       0.000       0.000
6064      0.000       8.800       0.000       0.000       0.000       0.000       0.000       3.300       0.000       0.000
6065      0.000       2.900 6     0.000       0.000       0.000       0.000       1.900 6    13.600 16    2.400       0.000
6066       .400       0.000      18.000       0.000       0.000       3.800       0.000       0.000        .700       0.000
6068      0.000        .300      32.300 21    0.000       0.000       0.000       0.000       0.000       0.000       0.000
6069      0.000       0.000      20.600 25    0.000       0.000       0.000       0.000       0.000       0.000       0.000
6070       .900 10    0.000      35.800 35    0.000       0.000       0.000       0.000       0.000        .300 5     0.000
6071      1.300       0.000      23.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6072      1.400       0.000      27.400       0.000       0.000        .800       0.000       0.000       0.000       0.000
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|---|---|---|---|---|---|---|---|---|---|---|
| 6073 | 0.000 | 0.000 | 14.500 | 0.000 | 0.000 | .900 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6074 | 10.200 | 0.000 | 6.800 | 0.000 | 0.000 | 3.400 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6075 | 1.700 | 0.000 | 0.000 | 2.400 | 0.000 | 2.000 | 8.200 | .500 | 0.000 | 0.000 |
| 6076 | 0.000 | 0.000 | 1.500 | 0.000 | 0.000 | 2.300 | 0.000 | 0.000 | 0.000 | .800 |
| 6077 | 2.400 | 0.000 | 1.400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.200 | 0.000 |
| 6078 | 6.500 | 0.000 | 15.200 | 0.000 | 0.000 | 3.000 | .700 | 1.000 | 0.000 | 0.000 |
| 6079 | 4.800 | 0.000 | 21.000 | 0.000 | 0.000 | 2.400 | 0.000 | 4.200 | 0.000 | 0.000 |
| 6080 | 1.200 | 0.000 | 38.300 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6081 | 0.000 | 0.000 | 38.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6082 | 0.000 | 0.000 | 31.900 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .800 | 0.000 |
| 6083 | 0.000 | 0.000 | 22.000 | 0.000 | 0.000 | 1.400 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6084 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.600 | 0.000 | 0.000 |
| 6085 | 0.000 | 4.700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .800 | 0.000 |
| 6086 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 5.300 | .700 | 0.000 |
| 6087 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.600 | .400 | 0.000 |
| 6088 | 0.000 | 0.000 | .900 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.300 |
| 6089 | 0.000 | 0.000 | 50.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.700 | 0.000 | 0.000 |
| 6090 | 0.000 | 0.000 | 45.300 **23** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6092 | 0.000 | 1.200 | 0.000 | 0.000 | 0.000 | 0.000 | 1.600 | 4.000 | 1.600 | 0.000 |
| 6094 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6096 | 0.000 | 1.400 **11** | 0.000 | 0.000 | 0.000 | 0.000 | 1.900 | 1.900 | 0.000 | 0.000 |
| 6097 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.300 | 12.600 **32** | .800 | 0.000 |
| 6098 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.600 **33** | 1.400 | 0.000 |
| 6099 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.600 | 0.000 | 0.000 | 0.000 |
| 6100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.800 | 1.300 | 0.000 | 0.000 |
| 6101 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6102 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.400 **9** | .800 | 0.000 | 0.000 |
| 6106 | 0.000 | 0.000 | 22.000 | 0.000 | 0.000 | 0.000 | .200 | 0.000 | 0.000 | 0.000 |
| 6108 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.500 | 9.500 | 0.000 | 0.000 |
| 6109 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.700 | 0.000 | 0.000 |
| 6110 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 11.600 | 0.000 | 0.000 |
| 6111 | 0.000 | 1.600 **20** | 1.700 | 0.000 | 0.000 | 0.000 | 4.100 **13** | 5.700 **27** | 0.000 | 0.000 |
| 6112 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .300 | 14.800 **100** | .600 | 0.000 |
| 6113 | 0.000 | 8.200 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.600 **10** | .600 | 0.000 |
| 6114 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 10.700 | .500 | 0.000 |
| 6115 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.100 | 3.300 | 0.000 |
| 6116 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.100 | 5.400 | .800 | 0.000 |
| 6117 | 0.000 | 6.700 **18** | .700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1008 | 5.900 | 0.000 | 5.600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1009 | 0.000 | 0.000 | 9.500 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1010 | 4.300 | 0.000 | 7.900 | 0.000 | 0.000 | 1.800 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1011 | 0.000 | 0.000 | 5.900 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1015 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1016 | 1.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 |
| 1017 | 3.800 | .700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1020 | 4.300 | 0.000 | 7.900 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1021 | 2.700 | 0.000 | 7.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1022 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.600 | 2.600 | 0.000 | 0.000 |
| 1026 | 0.000 | 1.700 **100** | 47.800 | 0.000 | 0.000 | 0.000 | 2.100 | 0.000 | 0.000 | 0.000 |
| 1027 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.700 | 0.000 | 0.000 | 0.000 |
| 1029 | 0.000 | 0.000 | 5.600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .700 | 0.000 |
| 1034 | 1.300 | 0.000 | 6.100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1035 | 6.900 | 1.300 | 7.300 | 0.000 | 0.000 | 0.000 | 0.000 | 1.800 | 0.000 | 0.000 |
| 1036 | 1.600 | 0.000 | 8.100 | 0.000 | 0.000 | 2.600 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1037 | 0.000 | 0.000 | 5.200 | 0.000 | 0.000 | 5.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1038 | 0.000 | 0.000 | 1.400 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1039 | 0.000 | 0.000 | .800 | 0.000 | 4.200 | 7.900 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1040 | 0.000 | 0.000 | 0.000 | 0.000 | .900 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1043 | 0.000 | 0.000 | 81.200 | 0.000 | 0.000 | 0.000 | 0.000 | 6.800 **13** | 0.000 | 0.000 |
| 1044 | 0.000 | 0.000 | 79.700 **74** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1045 | 0.000 | 0.000 | 44.800 **80** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1046 | 5.600 **28** | 6.300 **28** | 23.200 **25** | 0.000 | 0.000 | .900 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1047 | 0.000 | 23.000 **40** | 9.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.300 | 0.000 |
| 1048 | 1.100 | 2.600 | 5.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1051 | 0.000 | 0.000 | 6.300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 1053 | 0.000 | 0.000 | 88.400 **100** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1054 | 0.000 | 0.000 | 74.100 **85** | 0.000 | 0.000 | 0.000 | 0.000 | 5.700 **8** | 0.000 | 0.000 |
| 1055 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 7.600 | 0.000 | 0.000 | 0.000 |
| 1056 | 0.000 | 0.000 | 42.400 **11** | 0.000 | 0.000 | 0.000 | 1.500 | 7.100 | 0.000 | 0.000 |
| 1057 | 0.000 | 1.500 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 5.500 **20** | 0.000 | 0.000 |
| 1058 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 13.700 **6** | 0.000 | 0.000 | 0.000 |
| 1059 | 0.000 | 0.000 | 26.000 | 0.000 | 0.000 | 0.000 | 2.100 | 6.500 | 0.000 | 0.000 |
| 1060 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 20.600 **13** | 2.400 | 0.000 | 0.000 |
| 1062 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.200 | 6.400 | 0.000 | 0.000 |
| 1063 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1064 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 14.000 **11** | 0.000 | 0.000 | 0.000 |
| 1065 | 0.000 | 6.100 **4** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.500 | 0.000 | 0.000 |
| 1066 | 0.000 | 0.000 | 30.000 **10** | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 |
| 1067 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1068 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.200 | 0.000 | 0.000 | 0.000 |
| 1069 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.200 **1** | 2.000 | 0.000 | 0.000 |
| 1070 | 0.000 | 0.000 | 1.600 | 0.000 | 0.000 | 0.000 | 3.400 **6** | 0.000 | 0.000 | 0.000 |
| 1071 | 0.000 | 0.000 | 74.100 **71** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1072 | 0.000 | 0.000 | 70.000 **86** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1073 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 17.800 **8** | 0.000 | 0.000 | 0.000 |
| 1074 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.600 | 0.000 | 0.000 | 0.000 |
| 1075 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.900 **3** | 0.000 | 0.000 | 0.000 |
| 1076 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.200 **7** | .800 | 0.000 | 0.000 |
| 1077 | 0.000 | 0.000 | 42.100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1078 | 0.000 | 0.000 | 38.200 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 |
| 1080 | 0.000 | 0.000 | 64.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1081 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.900 | 0.000 | 0.000 | 0.000 |
| 1082 | 0.000 | 0.000 | 20.000 | 0.000 | 0.000 | 0.000 | .900 | 2.600 | 0.000 | 0.000 |
| 1083 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.400 | 0.000 | 0.000 | 0.000 |
| 1084 | 0.000 | 0.000 | 1.300 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 |
| 1085 | 0.000 | 0.000 | 43.400 **62** | 0.000 | 0.000 | 0.000 | .900 | 3.800 | 0.000 | 0.000 |
| 1086 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 9.100 | 5.300 **6** | 0.000 | 0.000 |
| 1087 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 13.700 | 1.300 | 0.000 | 0.000 |
| 1088 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 5.400 | 0.000 | 0.000 | 0.000 |
| 1089 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.200 | 0.000 | 0.000 | 0.000 |
| 1090 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.200 | 0.000 | 0.000 | 0.000 |
| 1093 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 11.700 | 1.900 | 0.000 | 0.000 |
| 1095 | 0.000 | 0.000 | 1.700 | 0.000 | 0.000 | 0.000 | 23.300 | 20.400 **29** | 0.000 | 0.000 |
| 1096 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.400 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1097 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.900 | 0.000 | 0.000 | 0.000 |
| 1099 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 13.600 | 0.000 | 0.000 |
| 1100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 9.700 | 1.700 | 0.000 | 0.000 |
| 1101 | 0.000 | 0.000 | 13.500 **25** | 0.000 | 0.000 | 0.000 | 1.000 | 5.400 **3** | .400 | 0.000 |
| 1102 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 10.200 | 0.000 | 0.000 | 0.000 |
| 1103 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.800 | 4.700 | 0.000 | 0.000 |
| 1104 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.200 | 0.000 | 0.000 | 0.000 |
| 1105 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.000 | 1.600 | 0.000 | 0.000 |
| 1106 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 2.400 | 0.000 | 0.000 |
| 1107 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 15.700 | .900 | 0.000 | 0.000 |
| 1109 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 2.400 **2** | 7.900 **12** | 0.000 | 0.000 |
| 1110 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 9.200 | 0.000 | 0.000 |
| 1111 | 0.000 | 0.000 | .800 **2** | 0.000 | 0.000 | 0.000 | 4.300 **2** | 5.100 **13** | 0.000 | 0.000 |
| 1112 | 0.000 | 0.000 | .900 | 0.000 | 0.000 | 0.000 | .900 | 7.400 | 0.000 | 0.000 |
| 1113 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.400 **9** | 0.000 | 0.000 |
| 1114 | 0.000 | 2.400 | 0.000 | 0.000 | 0.000 | 0.000 | 1.800 | 0.000 | 4.200 | 0.000 |
| 1115 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.800 | 0.000 | 0.000 |
| 1116 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 7.300 **4** | 0.000 | 0.000 |
| 1119 | 0.000 | 0.000 | .800 | 0.000 | 0.000 | 0.000 | 9.200 | 0.000 | 0.000 | 0.000 |
| 1120 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.400 | 2.700 **6** | 0.000 | 0.000 |
| 1124 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.300 | 0.000 | 0.000 |
| 1125 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.500 **20** | 0.000 | 0.000 |
| 1126 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.200 | 9.200 **22** | 0.000 | 0.000 | 0.000 |
| 1127 | 0.000 | 0.000 | .700 | 0.000 | 0.000 | 0.000 | 0.000 | 6.500 **9** | 0.000 | 0.000 |
| 1128 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.700 | 4.500 **2** | 0.000 | 0.000 |
| 1130 | 0.000 | 0.000 | 5.300 | 0.000 | 0.000 | 0.000 | 2.100 **1** | 8.000 **8** | 0.000 | 0.000 |

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1131            0.000     0.000     0.000     0.000     0.000     0.000     1.100    12.800 27  0.000     0.000
1132            0.000     0.000     0.000     0.000     0.000     0.000     0.000      .600 10  0.000     0.000
1133            0.000    12.600 26  1.200     0.000     0.000      .600     0.000     0.000     0.000     0.000
1134            0.000    10.400      .800     0.000     0.000     0.000     3.100     3.100     0.000     0.000
1135            0.000     4.200      .800     0.000     0.000     1.800     1.600     1.200     0.000     0.000
1136            0.000    10.500 100 0.000     0.000     0.000      .700     0.000     6.700     0.000     0.000
1137            0.000     0.000     0.000     0.000     0.000     0.000      .500     8.200     0.000     0.000
1138            0.000     0.000     0.000     0.000     0.000     0.000     5.000     0.000     0.000     0.000
1139            0.000     0.000     0.000     0.000     0.000     0.000     1.200     3.000     0.000     0.000
1140            7.600     0.000     0.000     2.600     0.000     1.200     2.300     1.600     0.000     0.000
1142            0.000     0.000    41.000 47  0.000     0.000     1.200      .700     1.200  4  0.000     0.000
1143            0.000     0.000    23.200 32  0.000     0.000      .900     0.000     6.400 62  0.000     0.000
1119            0.000     0.000     0.000     0.000     0.000     0.000     0.000     4.100  3  0.000     0.000
4003            0.000     0.000    25.000     0.000     0.000     0.000     3.000     0.000     0.000     0.000
4004            0.000     0.000    45.800 48  0.000     0.000     0.000     1.100      .800     0.000     0.000
4005            0.000     0.000    48.300     0.000     0.000     0.000     2.100     0.000     0.000     0.000
4006            0.000     0.000    66.600 100 0.000     0.000     0.000     0.000      .900     0.000     0.000
4007            0.000     0.000    73.700     0.000     0.000     0.000     0.000     0.000     0.000     0.000

SAMPLE  NAME    21        22        23        24        25        26        27        28        29        30

                ELPHEXCL  ELPHBART  ELPHSUBA  EGGLADVA  EPONUMBR  FISSERAT  FURSLOEB  FURSFUSI  GLANLAEV  GYROSOLD

7902           11.000     1.700     1.000      .300     0.000     0.000     0.000     1.000 11  1.400     1.000
7903            9.500     2.600     0.000      .900     0.000     0.000     0.000     0.000      .900     2.600
7904           18.600     0.000     0.000     2.900     0.000     0.000     0.000     0.000     0.000     1.000
7906           24.700      .800     0.000      .400     0.000     0.000     0.000     0.000      .800      .800
7907           35.800     0.000     0.000     1.500     0.000     0.000     0.000     0.000      .300     1.000
7908           38.500     0.000     0.000      .600     2.000     0.000      .600     0.000     0.000     0.000
7909           47.500     0.000     0.000      .400     0.000     0.000     1.000     0.000     0.000     1.000
7910           42.300     0.000     0.000     1.000     0.000     0.000     0.000     0.000     0.000     0.000
7911           60.600     0.000     0.000      .400     0.000     0.000     0.000     0.000     0.000      .400
7912           63.700     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000      .600
7913           56.500     0.000     0.000      .700     0.000     0.000      .700     0.000     0.000      .700
7914           42.200     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
7917           19.500     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
7918           26.500     0.000     0.000     0.000     0.000     0.000     0.000      .700     0.000     0.000
7948           27.000     0.000     0.000     0.000      .300      .400     0.000     0.000     0.000     0.000
7949           28.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
7950           37.300     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     1.700
7952           26.400     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     1.600
7953           18.200     4.700     1.400     0.000     0.000      .300     0.000      .300      .300     1.200
7955           30.700     3.700      .700  4  0.000     0.000     0.000     0.000     1.000     0.000      .300
7956           37.500     6.600     1.600     0.000     0.000     0.000     0.000     0.000     0.000     0.000
7957           40.500     8.200 10   .600     0.000     0.000     0.000     0.000      .900     0.000     0.000
7958           30.400     2.200     0.000     0.000     0.000     0.000     0.000      .600 11  0.000     0.000
7959           13.300     0.000     0.000     0.000     0.000      .300     0.000     1.200     0.000     0.000
7960            6.300     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
7947           25.200     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
0802            0.000     0.000     0.000    63.600 92  0.000     0.000     0.000     0.000     0.000     0.000
0817            0.000     0.000     0.000    18.500     0.000     0.000     0.000     0.000     0.000     0.000
0818            1.700     1.000     4.300      .900     0.000     0.000     0.000     0.000     0.000     0.000
0819            0.000     0.000     0.000     1.300     0.000     0.000     0.000     0.000     0.000     0.000
0820            0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
0821            0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
0822            0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
0824            0.000     0.000     0.000     1.400     0.000     0.000     0.000     0.000     0.000     0.000
0825            0.000     0.000     0.000    82.000 100 0.000     0.000     0.000     0.000     0.000     0.000
0830            0.000     0.000     0.000    58.000 91  0.000     0.000     0.000     0.000     0.000     0.000
0832           20.000     3.400     0.000     4.400     0.000      .300     0.000     0.000     0.000     0.000
0833            0.000     0.000     0.000    25.500 20  0.000     0.000     0.000     0.000     0.000     0.000
0835            0.000     0.000     0.000    36.800 38  0.000     0.000     0.000     0.000     0.000     0.000
0838            0.000     0.000     0.000    56.000 71  0.000     0.000     0.000     0.000     0.000     0.000
0839            0.000     0.000     0.000    34.600     0.000     0.000     0.000     0.000     0.000     0.000
0841            0.000     0.000     0.000    27.500     0.000     0.000     0.000     0.000     0.000     0.000
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0843   1.400    .400       0.000   0.000       0.000   0.000   0.000   0.000       0.000   0.000
0844   0.000   0.000       0.000   1.500       0.000   0.000   0.000   0.000       0.000   0.000
0846   0.000   0.000       0.000   0.000       0.000   0.000   0.000   0.000       0.000   0.000
0847   0.000   0.000       0.000   1.400       0.000   0.000   0.000   0.000         .400   0.000
0848   0.000   0.000       0.000   0.000       0.000   0.000   1.000   0.000       0.000   0.000
0849   0.000   0.000       0.000   0.000       0.000   0.000   0.000   0.000         .400   0.000
0851   0.000   0.000       0.000   0.000       0.000   0.000   1.600   0.000       0.000   0.000
0852    .600   0.000       0.000   0.000       0.000   0.000    .900   0.000       0.000   0.000
0856   8.700  13.200       0.000    .300       0.000   0.000   0.000   4.800 30     .300   0.000
0857   0.000   0.000       0.000   3.500       0.000   0.000   0.000   0.000       0.000   0.000
8002   8.100   0.000         .300   0.000       0.000   0.000   0.000   6.000       0.000    .600
8004  13.600   1.200         .200   0.000       0.000   0.000   0.000  21.600 100   0.000   0.000
8005  16.600   1.800         .700   0.000       0.000   0.000   0.000  10.000 59    0.000   0.000
8006  23.200   1.000       0.000   0.000       0.000   0.000  -0.000  19.700 100   0.000   0.000
8007  24.000   4.700       0.000   0.000         .600   0.000   0.000   8.200 75    0.000   0.000
8010  24.200   7.300       1.600   0.000       0.000    .600   0.000  12.000 100   0.000   0.000
8011  23.400   4.600       0.000   0.000       0.000   0.000   0.000  14.800 100   0.000   0.000
8012  21.900   2.700       1.000   0.000       0.000   0.000   0.000  21.000 80    0.000   0.000
8013  49.400   0.000       0.000   0.000       0.000   0.000   0.000   0.000       0.000    .500
8017  11.500  10.700       0.000   0.000       0.000   0.000   0.000    .600       0.000   1.600
8018  17.800   4.300       0.000   0.000       0.000   0.000   0.000   1.300         .300   4.700
8027   9.500   7.300       0.000   0.000       0.000    .300   0.000    .700 11    0.000   1.200
8035   0.000   0.000       0.000   0.000       0.000   0.000   0.000   0.000       0.000   0.000
8036  10.100   3.600       0.000   0.000       0.000   0.000    .200   0.000       1.400   0.000
8037   0.000   0.000       0.000   1.500       0.000   0.000   0.000   0.000       0.000   0.000
8038   0.000   0.000       0.000   0.000       0.000   0.000   0.000   0.000       0.000   0.000
8039   0.000   0.000       0.000   0.000       0.000   0.000   0.000   0.000       0.000   0.000
8040   0.000   0.000       0.000   0.000       0.000   0.000   0.000   0.000       0.000   0.000
8042   0.000   0.000       0.000  10.500 4     0.000   0.000   0.000   0.000       0.000   0.000
8043   0.000   0.000       0.000   2.600       0.000   0.000   0.000   0.000       0.000   0.000
8044   4.200   1.000       0.000   0.000       0.000    .600   0.000   0.000       0.000   0.000
8060   3.500   6.000       0.000   0.000       0.000   0.000   0.000   4.000       0.000   1.500
8061   8.500   1.000       0.000   0.000       0.000   0.000   0.000   8.000         .300   1.300
8062   8.600   1.300       0.000   0.000       0.000   0.000   0.000   5.600       2.100   0.000
8063  11.400   0.000       0.000   0.000       0.000    .900   0.000   2.200       0.000   3.900
8064  26.200   0.000       0.000   0.000       1.900   1.900  11.800   2.700       0.000    .400
8065  32.000   0.000       0.000    .400         .400   0.000   6.800   1.400       0.000   1.100
8066  34.400   0.000       0.000   0.000       0.000   0.000   0.000   3.900       0.000   0.000
8067  17.700    .800       0.000   0.000       0.000   0.000   0.000   7.000       3.000    .800
6003   3.200   0.000       0.000   0.000       0.000   0.000   1.600   4.500       0.000   0.000
6005   0.000   0.000       0.000   0.000       0.000   0.000   0.000   0.000       0.000   0.000
6006  22.800   3.100       0.000    .600       0.000   0.000   0.000   6.200       0.000    .900
6007  33.100   9.000       0.000   0.000       1.200   0.000    .800   8.300       0.000    .900
6018   9.700   3.500       0.000   0.000       0.000   0.000   0.000   0.000       0.000   1.500
6032  11.000   1.000       0.000   0.000       0.000   0.000   0.000   8.000       0.000    .400
6033  22.600   0.000       0.000   0.000       0.000    .400   0.000   1.400       0.000   0.000
6034  18.900   0.000       0.000   3.200       0.000   0.000   0.000  10.400         .500   0.000
6036  40.000   1.800       0.000   0.000       0.000   0.000   0.000   8.000       0.000   0.000
6041  12.600   1.500       0.000   0.000       0.000   0.000   0.000   0.000       0.000   2.100
6042   9.800   2.600       0.000   0.000       0.000   0.000   0.000   2.000       0.000   0.000
6050   8.700   3.000       0.000   0.000       0.000   0.000    .800   3.700       0.000    .400
6051   4.300   1.300       0.000   0.000       0.000   0.000   0.000   4.200       0.000    .600
6052   2.500   0.000       0.000   0.000       0.000   0.000   0.000  28.200 83    0.000   0.000
6053   0.000   0.000       0.000   0.000       0.000   0.000   1.700   2.100       0.000   0.000
6055    .900   3.100       0.000   0.000       0.000   0.000   0.000   0.000       0.000   0.000
6056    .900   0.000       0.000   0.000       0.000   0.000   0.000   2.200       0.000   0.000
6057   0.000   0.000       0.000   4.400       0.000   0.000   0.000   0.000       0.000   0.000
6058    .700   5.200       0.000   3.500       0.000    .700   0.000   0.000       0.000   0.000
6062    .800   0.000       0.000   0.000       0.000   0.000   2.500   2.900       0.000   0.000
6063   0.000   0.000       0.000   0.000       0.000   0.000   0.000   0.000       0.000   0.000
6064   1.600   0.000       0.000   0.000       0.000   0.000   0.000   0.000         .800   0.000
6065   2.400   0.000       0.000   0.000       0.000   0.000   0.000   0.000       0.000   0.000
6066  10.600   7.500       0.000   0.000       0.000   0.000   0.000   2.000       0.000    .700
6068   0.000   3.200 14     .300   1.600       0.000   0.000   0.000    .600 7     0.000   0.000
6069   0.000   0.000       0.000   4.600 15    0.000   0.000   0.000   0.000       0.000   0.000
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6070          2.700    5.000    0.000    1.500        0.000    0.000    0.000     .300 10     0.000    0.000
6071          9.600    8.300    0.000     .400        0.000    0.000    0.000    0.000        0.000    0.000
6072         13.800    7.900    0.000    0.000        0.000    0.000    0.000    0.000        0.000     .600
6073          4.600    1.800    0.000    0.000        0.000    0.000    0.000    0.000        0.000    2.400
6074         17.600    3.100    0.000    0.000        0.000    0.000    0.000     .500        0.000    1.300
6075         16.500     .800    0.000    0.000        0.000    0.000    0.000    4.500         .800    0.000
6076          7.500    0.000    0.000    0.000        1.200    0.000    0.000    1.500        0.000    0.000
6077         25.600    1.700    0.000    0.000        0.000    2.400    2.900    1.200        0.000     .800
6078          9.800    1.000    0.000    0.000        0.000    0.000    0.000    0.000        0.000    1.000
6079          6.700    5.500    0.000    0.000        0.000    0.000    0.000    0.000        1.800    0.000
6080         13.600   10.700    0.000    0.000        0.000     .800     .500    3.400        0.000    0.000
6081          2.100    4.100    0.000    0.000        0.000    0.000    0.000    1.400        0.000    0.000
6082         10.000    0.000    0.000    3.700        0.000    0.000    0.000   11.600        0.000    0.000
6083         15.000    2.300    0.000    0.000        0.000     .500     .500    0.000        0.000    0.000
6084          0.000    0.000    0.000    2.700        0.000    0.000    0.000    0.000        0.000    1.000
6085          0.000    0.000    0.000    0.000        0.000    0.000    1.000    1.500 4      0.000    0.000
6086          0.000    0.000    0.000    0.000        0.000    0.000    0.000    0.000        0.000    0.000
6087          0.000    0.000    0.000    4.200        0.000    0.000    0.000    0.000        0.000    0.000
6088          0.000    0.000    0.000   13.500 24     0.000    0.000    0.000    0.000        0.000    0.000
6089          1.200    1.400    0.000    2.800        0.000    0.000    0.000     .900        0.000    0.000
6090          0.000    0.000    0.000    0.000        0.000    0.000    0.000    0.000        0.000    0.000
6092          0.000    0.000    0.000    0.000        0.000    0.000    0.000    3.200        0.000    0.000
6094          0.000    0.000    0.000    1.000        0.000    0.000    0.000    0.000        0.000    0.000
6096          0.000    0.000    0.000    0.000        0.000    0.000    0.000    1.100        0.000    0.000
6097          0.000    0.000    0.000    0.000        0.000    0.000    0.000    0.000        0.000    0.000
6098          0.000    0.000    0.000     .500        0.000    0.000    0.000    0.000        0.000    0.000
6099          0.000    0.000    0.000    3.000        0.000    0.000    0.000    0.000        0.000    0.000
6100          0.000    0.000    0.000    3.000 6      0.000    0.000    0.000    0.000        0.000    0.000
6101           .400    0.000    0.000    3.600 7      0.000    0.000    0.000    0.000        0.000    0.000
6102          0.000    0.000    0.000    4.900 2      0.000    0.000    0.000    0.000        0.000    0.000
6106         15.000    5.000     .900    2.500        0.000    0.000    0.000    3.200        0.000    0.000
6108          0.000    0.000    0.000    0.000        0.000    0.000    0.000    0.000        0.000    0.000
6109          0.000    0.000    0.000    0.000        0.000    0.000    0.000    0.000        0.000    0.000
6110          0.000    0.000    0.000    0.000        0.000    0.000    0.000    0.000        0.000    0.000
6111           .600    0.000    0.000    0.000        0.000    0.000    1.800    6.600 8      0.000    0.000
6112          0.000    0.000    0.000    0.000        0.000    0.000    1.200    0.000        0.000    0.000
6113           .500    0.000    0.000    0.000        0.000    0.000    3.200    1.200        0.000    0.000
6114          0.000    0.000    0.000    1.000        0.000    0.000    0.000    1.500        0.000    0.000
6115          0.000    0.000    0.000    0.000        0.000    0.000    0.000    0.000        0.000    0.000
6116          0.000    0.000    0.000    0.000        0.000    0.000    0.000    0.000        0.000    0.000
6117          0.000    0.000    0.000    0.000        0.000    0.000     .400    5.300        0.000    0.000
1006          7.400    1.600    0.000    0.000        0.000    1.000    0.000   10.000        0.000     .700
1009          2.100    1.400    0.000    1.400        0.000    0.000    0.000    3.800        0.000    0.000
1010           .700    0.000    0.000    0.000        0.000    0.000    1.800    0.000        4.700    0.000
1011          0.000    0.000    0.000    5.600        0.000    0.000    0.000    1.000        0.000    0.000
1015          0.000    0.000    0.000   88.300 94     0.000    0.000    0.000    0.000        0.000    0.000
1016          0.000    0.000    0.000   33.500 50     0.000    0.000    0.000   25.000 50     0.000    0.000
1017          0.000    0.000    0.000   12.200        0.000    0.000    0.000    7.700 100    0.000    0.000
1020          3.300    0.000    0.000    1.600        0.000    1.000    0.000    7.000 6      0.000     .600
1021          1.800    0.000    0.000    0.000        0.000    0.000    0.000    9.700        0.000    0.000
1022          0.000    0.000    0.000   56.500 87     0.000    0.000    0.000    0.000        0.000    0.000
1026          3.000    2.600    0.000    8.600        0.000    0.000    0.000    0.000        0.000    0.000
1027          0.000    0.000    0.000   29.500        0.000    0.000    0.000    0.000        0.000    0.000
1029          0.000    0.000    0.000    9.000 22     0.000    0.000    0.000    3.500 22     0.000    0.000
1034           .300    0.000    0.000   36.800        0.000    0.000    0.000    3.900        0.000    0.000
1035          0.000    0.000    0.000   13.000        0.000    0.000    0.000    8.300 29     0.000    0.000
1036          5.500    4.000    0.000    1.000        0.000    1.300    0.000    1.000        0.000    1.300
1037          8.500    3.600    0.000    1.200        0.000    1.000    0.000    4.600        0.000     .600
1038          3.600    0.000    0.000     .700        0.000    0.000    0.000    1.400         .700    3.800
1039         15.300    0.000    0.000    0.000        1.900    0.000    0.000    1.500        0.000    1.500
1040          1.300    0.000    0.000    0.000        0.000    0.000    0.000     .600        0.000    0.000
1043          0.000    0.000    0.000    6.900 13     0.000    0.000    0.000    0.000        0.000    0.000
1044          0.000    0.000    0.000    0.000        0.000    0.000    0.000    0.000        0.000    0.000
1045          0.000    0.000    0.000    1.400        0.000    0.000    0.000    0.000        0.000    0.000
1046           .300    0.000    0.000    4.600        0.000    0.000    0.000    3.000        0.000    0.000
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1047       0.000     3.300     0.000     0.000        0.000     0.000     5.000 10     0.000     0.000     0.000
1048      12.000     2.300     0.000     0.000        0.000     0.000     0.000        1.700     0.000      .600
1051       0.000     2.500     0.000     3.700 12     0.000     0.000     0.000        0.000     0.000     0.000
1053       0.000     0.000      .700     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1054       0.000     0.000     5.100     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1055       0.000     0.000     0.000     8.200        0.000     0.000     0.000        0.000     0.000     0.000
1056        .700     0.000     0.000    17.200 59     0.000     0.000     0.000        0.000     0.000     0.000
1057       0.000     0.000     0.000     2.000        0.000     0.000     0.000        0.000     0.000     0.000
1058       0.000     0.000     0.000     1.600        0.000     0.000     0.000        0.000     0.000     0.000
1059       0.000     1.000     0.000     6.800        0.000     0.000     0.000        0.000     0.000     0.000
1060       0.000     0.000     0.000      .700        0.000     0.000     0.000        0.000     0.000     0.000
1062       0.000     0.000     0.000     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1063       0.000     0.000     0.000     8.000  7     0.000     0.000     0.000        0.000     0.000     0.000
1064       0.000     0.000     0.000     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1065       0.000     0.000     0.000     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1066       1.700     2.400     2.700     0.000        0.000      .300     0.000        0.000     0.000     0.000
1067       0.000     0.000     0.000     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1068       0.000     0.000     0.000     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1069       0.000     0.000     0.000     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1070       0.000     1.000     0.000     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1071       1.500     0.000     4.400     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1072       0.000     0.000     3.900     3.000        0.000      .600     0.000        0.000     0.000     0.000
1073       0.000     0.000     0.000     4.600        0.000     0.000     0.000        0.000     0.000     0.000
1074       0.000     0.000     0.000     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1075       0.000     0.000     0.000     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1076       0.000     0.000     0.000     2.900        0.000     0.000     0.000        0.000     0.000     0.000
1077       5.900     0.000     4.600     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1078       0.000     0.000      .500     1.300        0.000     0.000     0.000        0.000     0.000     0.000
1080       2.800     0.000     1.600     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1081       0.000     0.000     0.000     1.800  3     0.000     0.000     0.000        0.000     0.000     0.000
1082       0.000     0.000     1.200     0.000        0.000      .300      .600        0.000     0.000     0.000
1083       0.000     0.000     0.000     4.400        0.000     0.000     0.000        0.000     0.000     0.000
1084       0.000     1.600     0.000     1.300        0.000     0.000     0.000        0.000     0.000     0.000
1085       0.000     2.500     0.000      .900        0.000     0.000     0.000        0.000     0.000     0.000
1086       0.000     0.000     0.000     1.800        0.000     0.000     0.000        0.000     0.000     0.000
1087       0.000     0.000     0.000     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1088       0.000     0.000     0.000     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1089       0.000     0.000     0.000     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1090       0.000     0.000     0.000     3.800        0.000     0.000     0.000        0.000     0.000     0.000
1093       0.000     0.000     0.000     1.300        0.000     0.000     0.000        0.000     0.000     0.000
1095       0.000     0.000     0.000     3.500        0.000     0.000     0.000        0.000     0.000     0.000
1098       0.000     0.000     0.000     5.500        0.000     0.000     0.000        0.000     0.000     0.000
1097       0.000     0.000     0.000     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1099       0.000     0.000     0.000     1.900        0.000     0.000     0.000        0.000     0.000     0.000
1100       0.000     0.000     0.000     3.400        0.000     0.000     0.000        0.000     0.000     0.000
1101       0.000     0.000      .800     6.600  8     0.000      .400     0.000        0.000     0.000     0.000
1102       0.000     0.000     0.000     3.100        0.000     0.000     0.000        0.000     0.000     0.000
1103       0.000     0.000     0.000     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1104       0.000     0.000     0.000     0.000        0.000     0.000     0.000        0.000     0.000     0.000
1105       0.000     0.000     0.000      .800        0.000     0.000     0.000        0.000     0.000     0.000
1106       0.000     0.000     0.000     1.000        0.000     0.000     0.000        0.000     0.000     0.000
1107       0.000     0.000     0.000     1.200        0.000     0.000     0.000        0.000     0.000     0.000
1109       0.000     0.000     0.000    11.800 11     0.000     0.000     0.000        0.000     0.000     0.000
1110       0.000     0.000     0.000    22.500        0.000     0.000     0.000        0.000     0.000     0.000
1111       0.000     0.000     0.000     6.300  8     0.000     0.000     0.000        0.000      .800     0.000
1112       0.000     0.000     0.000     1.900        0.000     0.000     0.000        0.000     1.200     0.000
1113       0.000     0.000     0.000     4.200  2     0.000     0.000     0.000        0.000     0.000     0.000
1114       0.000     0.000     0.000     9.500        0.000     0.000     0.000        0.000     0.000     0.000
1115       0.000     0.000     0.000     5.000  3     0.000     0.000     0.000        0.000     0.000     0.000
1116       0.000     0.000     0.000     5.600  4     0.000     0.000     0.000        0.000     0.000     0.000
1119       0.000     0.000     0.000     1.600        0.000     0.000     0.000        0.000     0.000     0.000
1120       0.000     0.000     0.000    14.500 16     0.000     0.000     0.000        0.000     0.000     0.000
1124       0.000     0.000     0.000    42.600 47     0.000     0.000     0.000        0.000     0.000     0.000
1125       0.000     0.000     0.000     3.800        0.000     0.000     0.000        0.000     0.000     0.000
1126       0.000     0.000     0.000     6.800        0.000     0.000     0.000        0.000     0.000     0.000
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1127                  0.000        0.000        0.000        3.200        0.000        0.000        0.000        0.000        0.000        0.000
1128                  0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
1130                  0.000        0.000        0.000         .700 1      0.000        0.000        0.000        0.000        0.000        0.000
1131                  0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
1132                  0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
1133                  0.000        0.000        0.000         .600        0.000        0.000        1.200        5.100        0.000        0.000
1134                  0.000        0.000        0.000        0.000        0.000        0.000        3.100        0.000        0.000        0.000
1135                  2.400        0.000        0.000        0.000        0.000        0.000         .800        6.700        0.000        0.000
1136                   .700        0.000        0.000        0.000        2.200        0.000        0.000        4.500        0.000        0.000
1137                  0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
1138                  0.000        0.000        0.000         .800        0.000        0.000        0.000        0.000        0.000        0.000
1139                  0.000        0.000        0.000        0.000        2.700        0.000        1.500        1.900         .800        0.000
1140                  2.000        0.000        0.000         .600        1.000        0.000        1.600       23.300 77     .600        0.000
1142                  0.000        5.800 2      0.000        0.000        0.000        0.000        0.000        5.900 7      .900        0.000
1143                  0.000        6.400        0.000        0.000        0.000        0.000        1.800        4.100 5      .900        0.000
1118                  0.000        0.000        0.000        7.700        0.000        0.000        0.000        0.000        0.000        0.000
4003                  3.000        0.000        1.200        1.500        0.000        0.000        0.000        0.000        0.000        0.000
4004                   .800        0.000        0.000        3.600 5      0.000        2.800        0.000        0.000        0.000        0.000
4005                  3.900         .900        1.500         .600        0.000         .600        0.000        0.000        0.000        0.000
4006                  7.400        0.000         .900        1.500        0.000        0.000        0.000        0.000        0.000        0.000
4007                  8.100        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000

SAMPLE   NAME         31           32           33           34           35           36           37           38           39           40

                    GLOBAURC     GLOBTURG     HOEGELGS     HYPEELON     HAPLCARE     ISLIISLD     ISLITERE     KARFINFL     LAGEMOLL     LENTSPCA

7902                  4.500 10     0.000        0.000        1.000        1.000 22     1.000        2.400        1.700        0.000        0.000
7903                   .900        0.000        0.000        0.000         .900        0.000        5.600        3.800        0.000        0.000
7904                  0.000        0.000        0.000         .500        1.400        0.000        2.000        2.900        0.000        0.000
7906                  0.000        1.300        0.000        7.400         .800        0.000        3.000        1.300        0.000        0.000
7907                  0.000        0.000        0.000        4.800        0.000        0.000        0.000        3.000        0.000         .300
7908                  0.000         .600        0.000        2.200        0.000        0.000        0.000        1.500        0.000        0.000
7909                  1.000        0.000        0.000        0.000        0.000        0.000        0.000         .300        0.000        0.000
7910                  0.000        2.900         .400        1.300        0.000        0.000        0.000         .700        0.000         .400
7911                  0.000         .300        6.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
7912                  0.000        2.000        1.300        0.000        0.000        0.000        0.000        0.000        0.000        0.000
7913                  0.000        1.400         .700        2.500        0.000        0.000        0.000        0.000        0.000        0.000
7914                 12.300        0.000         .400        0.000         .400        0.000        3.200        0.000        0.000        0.000
7917                  9.400        0.000        0.000        0.000        0.000        0.000        0.000        0.000        1.000        0.000
7918                  7.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
7948                  0.000        1.000        0.000         .300         .300        0.000        0.000         .700        0.000        0.000
7949                  0.000        1.200        0.000        2.000        0.000        0.000        0.000        0.000        0.000        0.000
7950                  0.000        2.400        0.000        1.000        0.000        0.000        0.000        0.000        0.000        0.000
7952                  0.000        5.000       17.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
7953                   .300        0.000         .600        0.000        0.000        8.700        5.700 9      0.000        0.000        0.000
7955                  0.000         .300        0.000        0.000        0.000        5.700 4      2.700 4      0.000        0.000         .300
7956                   .300        0.000        0.000        0.000        0.000        2.900        2.200        0.000        0.000        1.200
7957                  2.400        0.000        0.000        0.000         .300         .300         .600 7      0.000        0.000         .300
7958                  7.400        0.000         .300         .600 11     0.000        3.800        2.600 11     0.000         .300        0.000
7959                 11.400 24     0.000        1.000        0.000        0.000        6.100        3.400        0.000        1.000        2.400
7960                 21.700 33     0.000        0.000        0.000        0.000        0.000        4.600        0.000         .300        0.000
7947                  1.200        0.000         .600        5.000        0.000        0.000        0.000        5.000        0.000        0.000
0802                  0.000        0.000        0.000        0.000         .400        0.000        0.000        0.000        0.000        0.000
0817                  0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
0818                  0.000        0.000        0.000        0.000        0.000        1.000        3.000        0.000        0.000        0.000
0819                  0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
0820                  0.000        0.000        0.000        0.000        4.200        0.000        0.000        0.000        0.000        0.000
0821                   .300 8      0.000        0.000        0.000        0.000        5.100        9.000        0.000        0.000        0.000
0822                  0.000        0.000        0.000        0.000        0.000         .600 17     0.000        0.000        0.000        0.000
0824                  0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
0825                  0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
0830                  0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
0832                  0.000        0.000        0.000        0.000        0.000        1.200        5.100 9      0.000        0.000        0.000
0833                  0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
0835                  0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000        0.000
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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0838 | 0.000 | 0.000 | 0.000 | .300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0839 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0841 | 0.000 | 0.000 | 0.000 | 0.000 | .400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0843 | 0.000 | 0.000 | 0.000 | 0.000 | 2.800 | 1.400 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0844 | 0.000 | 0.000 | 0.000 | .400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0846 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0847 | 0.000 | 0.000 | 0.000 | .700 | 2.800 | 8.600 **5** | .400 | 0.000 | 0.000 | 0.000 |
| 0848 | 0.000 | 0.000 | 0.000 | 3.100 | 3.100 | 0.000 | 2.600 **8** | 0.000 | 0.000 | 0.000 |
| 0849 | 11.000 **18** | 0.000 | 0.000 | 0.000 | 0.000 | .400 | 4.000 | 0.000 | 0.000 | 0.000 |
| 0851 | 26.800 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 13.500 | 0.000 | 0.000 | 0.000 |
| 0852 | 16.900 **31** | 0.000 | 0.000 | 1.200 | 5.000 | 0.000 | 24.300 **8** | 0.000 | 0.000 | 0.000 |
| 0856 | .600 | 0.000 | 0.000 | 0.000 | 1.300 | 12.000 | 19.700 **40** | 0.000 | .300 | .300 |
| 0857 | 0.000 | 0.000 | 0.000 | .400 | 1.800 | 52.300 **13** | 1.400 **4** | 0.000 | 0.000 | 0.000 |
| 6002 | 1.500 | 0.000 | 5.700 | 0.000 | 0.000 | 0.000 | 4.800 | 0.000 | 0.000 | 1.200 |
| 8004 | 6.400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.800 | 0.000 | 0.000 | 1.200 |
| 8005 | 8.000 | 0.000 | 0.000 | 0.000 | .700 | 0.000 | 0.000 | 0.000 | .700 | 0.000 |
| 8006 | 5.100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.700 | 0.000 |
| 8007 | 8.200 | 0.000 | .300 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 1.000 | 0.000 |
| 8010 | 2.600 | 0.000 | 0.000 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | .600 | 0.000 |
| 8011 | 2.600 | 0.000 | 0.000 | 1.600 | 0.000 | 0.000 | 3.900 | 0.000 | 0.000 | 0.000 |
| 8012 | 3.400 | 0.000 | 0.000 | 0.000 | .700 **4** | .300 | 1.000 | 0.000 | 0.000 | 0.000 |
| 8013 | 0.000 | 2.000 | 1.400 | 1.400 | 0.000 | 0.000 | 0.000 | 2.000 | 0.000 | 0.000 |
| 8017 | 0.000 | 1.000 | .300 | 0.000 | 0.000 | 6.900 | 1.600 **16** | 0.000 | 0.000 | 1.600 |
| 8018 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.300 | 2.500 **22** | 0.000 | 0.000 | 0.000 |
| 8027 | 0.000 | 0.000 | 0.000 | 0.000 | .300 | 6.600 **12** | 2.400 | 0.000 | 0.000 | 3.000 |
| 8035 | 0.000 | 0.000 | 0.000 | .700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8036 | 0.000 | .200 | .400 | 0.000 | .200 | 7.600 | 6.000 | 0.000 | 0.000 | 0.000 |
| 8037 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8038 | 0.000 | 0.000 | 0.000 | 0.000 | 2.700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8039 | 0.000 | 0.000 | 0.000 | .900 | .900 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8040 | 0.000 | 0.000 | 0.000 | 0.000 | 1.800 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8042 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8043 | 0.000 | 0.000 | 0.000 | 0.000 | 8.300 **12** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8044 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 11.300 | 2.800 **33** | 0.000 | 0.000 | 0.000 |
| 8060 | 1.500 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 12.800 | 0.000 | 0.000 | 0.000 |
| 8061 | 2.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .300 | 0.000 |
| 8062 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.600 | 0.000 | 0.000 |
| 8063 | .900 | 0.000 | 0.000 | .800 | 0.000 | 0.000 | 0.000 | .900 | 0.000 | 0.000 |
| 8064 | .400 | .800 | 0.000 | 1.600 | 0.000 | 0.000 | 1.200 | .800 | 0.000 | 0.000 |
| 8065 | 0.000 | 14.000 **90** | 0.000 | .400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8066 | .900 | 4.400 | 0.000 | 1.300 | 0.000 | 0.000 | 0.000 | 1.700 | 0.000 | 0.000 |
| 8067 | 0.000 | 1.900 | 0.000 | .400 | 0.000 | 0.000 | 1.500 | 2.300 | 0.000 | 0.000 |
| 6003 | 14.700 | 0.000 | 0.000 | .400 | 1.300 | 0.000 | 12.800 | 0.000 | 1.800 | .900 |
| 6005 | 5.300 | 0.000 | 0.000 | .900 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6006 | 1.800 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.100 | 0.000 | .600 | .300 |
| 6007 | 6.100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.600 | 0.000 | 0.000 | 0.000 |
| 6018 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.500 | 0.000 | 0.000 | 0.000 |
| 6032 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.800 | 1.000 | 0.000 | 1.000 |
| 6033 | .700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .700 | .700 | 0.000 |
| 6034 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .500 | 1.300 | 0.000 |
| 6036 | 11.000 | 0.000 | .500 | 0.000 | 0.000 | 0.000 | 4.100 | 0.000 | 4.100 | 0.000 |
| 6041 | 7.600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.700 |
| 6042 | .900 | 0.000 | 0.000 | 0.000 | 0.000 | 4.000 | 3.100 | 0.000 | 0.000 | .900 |
| 6050 | 0.000 | .400 | 0.000 | 0.000 | 0.000 | 0.000 | 3.300 | 0.000 | 0.000 | .400 |
| 6051 | 0.000 | 1.200 | 0.000 | 0.000 | 0.000 | 0.000 | 3.300 | 0.000 | 0.000 | 1.000 |
| 6052 | 10.500 | 0.000 | 0.000 | 1.000 | 2.500 | 0.000 | 3.300 | 0.000 | 1.000 | 0.000 |
| 6053 | 19.700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 9.800 | 0.000 | 0.000 | 0.000 |
| 6055 | .600 | 0.000 | 0.000 | 0.000 | 1.400 | 8.800 | 5.100 | 0.000 | 0.000 | 0.000 |
| 6056 | 28.300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 7.600 | 0.000 | 0.000 | 0.000 |
| 6057 | 0.000 | 0.000 | 0.000 | 1.100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6058 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 11.200 | 0.000 | .700 | 0.000 |
| 6062 | 32.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 9.000 | 0.000 | 0.000 | 0.000 |
| 6063 | 0.000 | 0.000 | 0.000 | .700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6064 | 27.000 | 0.000 | 0.000 | 1.100 | 0.000 | 0.000 | 2.000 | 0.000 | 0.000 | 0.000 |
| 6065 | 30.700 **32** | 0.000 | 0.000 | 1.400 | 7.800 **32** | 1.000 | 1.000 | 0.000 | 1.000 | 0.000 |

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6066        2.400       0.000       0.000       0.000       2.700       0.000       3.000       0.000       0.000       0.000
6068         .600       0.000       0.000       0.000        .300      50.000 14    0.000       0.000       0.000       0.000
6069        0.000       0.000       0.000       0.000        .800      64.600 44    0.000       0.000       0.000       0.000
6070        0.000        .300       0.000       0.000        .600      37.700 30    0.000       0.000       0.000       0.000
6071        0.000       0.000       0.000       0.000        .600      20.000       0.000       0.000       0.000       0.000
6072        0.000       0.000       0.000       0.000       0.000       0.000        .800       0.000       0.000        .600
6073        0.000       0.000       0.000       0.000        .900        .500       0.000       0.000       0.000       1.500
6074        0.000       0.000       0.000       0.000       0.000        .800       4.700       0.000       0.000        .800
6075        0.000       0.000        .800       0.000       0.000       0.000       3.700       0.000       0.000       0.000
6076        0.000       0.000       0.000       0.000       0.000       0.000       0.000       2.000       0.000       0.000
6077       13.200       0.000       0.000       0.000       0.000       3.800      10.000        .800        .600       0.000
6078        0.000       0.000       0.000       0.000        .700       0.000       5.500       0.000       0.000       3.600
6079        0.000       0.000       0.000       0.000       4.800       1.200       0.000       0.000       0.000       1.200
6080        0.000       0.000       0.000       0.000        .800        .800       1.800       0.000       0.000       0.000
6081        0.000       0.000       0.000        .300        .800      45.500       0.000       0.000       0.000       0.000
6082        1.000       0.000       0.000       2.500       5.300       3.300       0.000       0.000       0.000       0.000
6083        1.100       0.000       0.000       0.000       0.000       2.000       4.800       0.000       0.000       0.000
6084        0.000       0.000       0.000        .400       0.000       0.000       0.000       0.000       0.000       0.000
6085       30.000 70    0.000       0.000        .800       3.100 6     9.100       0.000       0.000       0.000       0.000
6086        0.000       0.000       0.000       0.000       1.200       0.000       0.000       0.000       0.000       0.000
6087        0.000       0.000       0.000       0.000        .400       0.000       0.000       0.000       0.000       0.000
6088        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6089        0.000       0.000       0.000       0.000        .900      36.400       0.000       0.000       0.000       0.000
6090        0.000       0.000       0.000       0.000       0.000      53.700 77    0.000       0.000       0.000       0.000
6092       17.300 100   0.000       0.000       0.000       0.000       0.000       2.800       0.000       0.000       0.000
6094        0.000       0.000       0.000        .400       3.700       0.000       0.000       0.000       0.000       0.000
6096       18.200 33    0.000       0.000       0.000       0.000       0.000      11.600 4     0.000       0.000       0.000
6097        0.000       0.000       0.000       0.000       2.700 16    0.000       0.000       0.000       0.000       0.000
6098         .500       0.000       0.000       1.400 4    11.200 36    0.000       0.000       0.000       0.000       0.000
6099        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6100        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6101        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6102        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6106        0.000       0.000       0.000       0.000       0.000      15.600      10.300       0.000       0.000       0.000
6108        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6109        0.000       0.000       0.000       0.000       1.200       0.000       0.000       0.000       0.000       0.000
6110        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6111       30.700       0.000       0.000        .300       0.000       0.000       1.900       0.000       1.600       0.000
6112       15.400 45    0.000       0.000       1.200       0.000       0.000       2.400       0.000       0.000       0.000
6113       20.000 50    0.000       0.000        .200        .700       9.000       0.000       0.000       0.000       0.000
6114        7.500       0.000       0.000       1.500       3.200       0.000       3.700       0.000       0.000       0.000
6115        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6116        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6117       17.400 25    0.000       0.000       1.700       9.600 23    0.000      13.500       0.000       0.000       0.000
1008        1.000       0.000       0.000       0.000       0.000       0.000       5.200       1.000       0.000       0.000
1009        0.000       0.000       0.000       0.000       0.000      57.800       0.000       0.000       0.000       0.000
1010        0.000       0.000       0.000        .400       0.000       0.000       0.000       0.000       0.000       1.000
1011        0.000       0.000       0.000       0.000       0.000      78.400       0.000       0.000       0.000       0.000
1015        0.000       0.000       0.000       0.000       1.300 .6    0.000       0.000       0.000       0.000       0.000
1016         .500       0.000       0.000       0.000       0.000       0.000       0.000       0.000        .500       0.000
1017        4.000       0.000       0.000       0.000       0.000       0.000       1.000       0.000       0.000       0.000
1020        4.600 20    0.000       0.000       1.200       1.200       7.300       0.000        .600       0.000        .600
1021       13.400       0.000       0.000       0.000       0.000       0.000       0.000       6.700       0.000       0.000
1022        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1026         .800       0.000       0.000       0.000       0.000       6.900       1.700       0.000       0.000       0.000
1027        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1029        0.000       0.000       0.000       0.000        .500      32.400       0.000       0.000       0.000       0.000
1034        0.000       0.000       0.000       0.000       0.000      14.900 11    0.000       0.000       0.000       0.000
1035        0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1036        3.700       0.000       0.000       0.000       0.000       0.000       2.600       0.000       1.300       0.000
1037        2.600       0.000       0.000       0.000       0.000        .600       0.000       0.000       0.000       0.000
1038        0.000       0.000       0.000       0.000       0.000       0.000       0.000        .300        .300        .700
1039        3.400       0.000       0.000       0.000       0.000       0.000       0.000        .700       1.500       0.000
1040        0.000       4.200       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1043        0.000       0.000       0.000       1.800       0.000       1.800 3     0.000       0.000       0.000       0.000
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1044     0.000       0.000    0.000    0.000    1.600    11.000 20   5.600     0.000    0.000    0.000
1045     0.000       0.000    0.000    0.000     .700    30.900 20   0.000     0.000    0.000    0.000
1046     1.300       0.000    0.000    0.000     .900      .500      1.300     0.000    0.000    0.000
1047    10.300 30    0.000    0.000    0.000    0.000     0.000      4.300     0.000    0.000    0.000
1048     5.100 25    0.000    0.000    0.000    0.000    12.600      0.000     0.000    0.000    0.000
1051     1.200 12    0.000    0.000    0.000    2.500    33.200      1.500     0.000    0.000    0.000
1053     0.000       0.000    0.000    0.000    0.000     3.100      0.000     0.000    0.000    0.000
1054     0.000       0.000    0.000    0.000    0.000     8.600 3    2.300 2   0.000    0.000    0.000
1055     0.000       0.000    0.000    1.900    0.000     0.000      0.000     0.000    0.000    0.000
1056     0.000       0.000    0.000    0.000    0.000    23.800 8    0.000     0.000    0.000    0.000
1057    12.300 15    0.000    0.000    0.000    0.000     0.000      3.600     0.000    0.000    0.000
1058     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1059     0.000       0.000    0.000    0.000    0.000    33.500 33   0.000     0.000    0.000    0.000
1060     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1062     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1063     0.000       0.000    0.000    0.000    0.000    21.000 27   0.000     0.000    0.000    0.000
1064     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1065    11.300 6     0.000    0.000    0.000    0.000     9.300      0.000     0.000    0.000    0.000
1066     0.000       0.000    0.000    0.000    0.000    35.400 48   0.000     0.000    0.000    0.000
1067     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1068     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1069     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1070     0.000       0.000    0.000    0.000    2.300    13.200      6.400     0.000    0.000    0.000
1071     0.000       0.000    0.000    0.000    0.000    10.200 10   0.000     0.000    0.000    0.000
1072     0.000       0.000    0.000    0.000    2.400 1   7.500 4    0.000     0.000    0.000    0.000
1073     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1074     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1075    13.800 27    0.000    0.000    0.000    0.000     0.000      4.100     0.000    0.000    0.000
1076     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1077     0.000       0.000    0.000    0.000    0.000    37.100      0.000     0.000    0.000    0.000
1078     0.000       0.000    0.000    0.000    0.000    42.200      0.000     0.000    0.000    0.000
1080     0.000       0.000    0.000    0.000    0.000    29.500      0.000     0.000    0.000    0.000
1081     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1082     0.000       0.000    0.000     .300    0.000    35.500      0.000     0.000    0.000    0.000
1083     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1084     0.000       0.000    0.000    2.500    0.000     5.000      0.000     0.000    0.000    0.000
1085     0.000       0.000    0.000    0.000    0.000    23.400 19   0.000     0.000    0.000    0.000
1086     0.000       0.000     .900     .900    0.000     0.000      0.000     0.000    0.000    0.000
1087     0.000       0.000    0.000     .800    0.000     0.000      0.000     0.000    0.000    0.000
1088     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1089     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1090     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1093     0.000       0.000    0.000    0.000    0.000     0.000      2.000     0.000    0.000    0.000
1095     0.000       0.000    0.000    0.000    0.000     4.600      0.000     0.000    0.000    0.000
1096     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1097     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1099     0.000       0.000    0.000     .600    0.000     0.000      0.000     0.000    0.000    0.000
1100     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1101     0.000       0.000    0.000    0.000     .500    14.500 15   0.000     0.000    0.000    0.000
1102     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1103     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1104     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1105     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1106     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1107     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1108     0.000       0.000    0.000    7.900 16 0.000     0.000      0.000     0.000    0.000    0.000
1110     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1111     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1112     0.000       0.000    0.000    0.000    0.000     1.200      0.000     0.000    0.000    0.000
1113     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1114     1.500       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1115     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1116     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1119     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
1120     0.000       0.000    0.000    0.000    0.000     0.000      0.000     0.000    0.000    0.000
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1124          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
1125          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
1126          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
1127          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
1128          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
1130          0.000      0.000      0.000      0.000       .700      2.900      0.000      0.000      0.000      0.000
1131          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
1132          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
1133         19.200 26   0.000      0.000       .300      0.000     18.600 47   0.000      0.000       .900      0.000
1134         24.200      0.000      0.000       .800      2.300      0.000      0.000      0.000      0.000      0.000
1135         20.600      0.000      0.000      0.000      0.000      8.800      0.000       .800      1.200      0.000
1136         18.600      0.000      0.000      0.000      0.000      0.000      5.600       .700      0.000      0.000
1137          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
1138          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
1139          3.900      0.000      0.000      0.000      0.000      0.000      9.000      0.000      0.000      0.000
1140         10.300 8    0.000      0.000      0.000      0.000      0.000      1.600      0.000      0.000       .600
1142          0.000      0.000      0.000      0.000      0.000     26.500 18   0.000      0.000      0.000      0.000
1143          0.000      0.000      0.000      0.000      0.000     10.500 11   0.000      0.000      0.000      0.000
1118          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
4003          0.000      0.000      0.000      0.000      0.000     40.100      4.000      0.000      0.000      0.000
4004          0.000      0.000      0.000      0.000      0.000     21.700      0.000      0.000      0.000      0.000
4005          0.000      0.000      0.000      0.000      0.000     30.900      0.000      0.000      0.000      0.000
4006          0.000      0.000      0.000      0.000      0.000     13.600      0.000      0.000      0.000      0.000
4007          0.000      0.000      0.000      0.000      0.000      6.900      0.000      0.000      0.000      0.000

SAMPLE  NAME   41         42         43         44         45         46         47         48         49         50

              NONILABR   NONITURG   MELJPOMP   PATEHAUR   PULEQUIN   QUICSEMI   REOPSCOR   REOPGUTT   REOPNODU   REOPARCT

7902          6.500 33   1.000 22   0.000       .700      0.000      0.000      3.500      1.000      0.000      0.000
7903          4.300      0.000      0.000      0.000      2.600      0.000      5.100      0.000       .400      0.000
7904          6.800      0.000      0.000      0.000      3.900      0.000      7.400       .500       .500      0.000
7905          0.000       .800      0.000      0.000      4.300      0.000      3.000      0.000      0.000      0.000
7907           .700       .700      0.000      0.000      4.500      0.000      3.700      0.000      0.000      0.000
7908          0.000       .900      0.000      0.000      1.900      0.000      2.200      0.000      0.000      0.000
7909          0.000      0.000      0.000      0.000       .400      0.000       .700      0.000      0.000      0.000
7910          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
7911          0.000      0.000       .700      0.000       .700      0.000      0.000      0.000      0.000      0.000
7912          0.000      0.000      0.000      0.000       .600      0.000      0.000      0.000      0.000      0.000
7913          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000       .400      0.000
7914         20.900      0.000      0.000      0.000      0.000      0.000       .400      0.000      0.000      0.000
7917          8.000      0.000      0.000      0.000      0.000      0.000      4.700       .300      0.000      0.000
7918          3.900      0.000      0.000      0.000      0.000      0.000      6.200       .400      0.000      0.000
7948          0.000      0.000      0.000      0.000      1.400      0.000      1.400      0.000      0.000      0.000
7942          0.000      0.000      0.000      0.000      1.200      0.000       .400       .400      0.000      0.000
7950          0.000       .700       .400      0.000      0.000      0.000      0.000      0.000      0.000      0.000
7952          0.000      0.000       .800      0.000      2.500      0.000      0.000      0.000      0.000      0.000
7953          0.000      0.000      0.000      0.000      0.000       .300      1.300      0.000      0.000      0.000
7955          0.000      0.000      0.000       .300      0.000      0.000      0.000      0.000      0.000      0.000
7956           .900      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
7957           .900      0.000      0.000      0.000      0.000      0.000      1.000       .900 3    0.000      0.000
7958          4.500 11   0.000      0.000      0.000      0.000      0.000      1.300       .600      0.000      0.000
7959         10.200 14   0.000      0.000      0.000      0.000      0.000      1.800      5.800 14   0.000      0.000
7960         27.700      0.000      0.000      0.000      0.000      0.000      9.100 66   0.000      0.000      0.000
7947          1.200      0.000      0.000      0.000      1.800      0.000      1.800      0.000      1.200      0.000
0802          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      3.100      0.000
0817          0.000      0.000      0.000      0.000      0.000      0.000      2.200      0.000      0.000      4.900
0818           .500      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
0819          0.000      0.000      0.000      0.000      0.000      0.000       .500      0.000      0.000      0.000
0820          0.000      0.000      0.000      0.000      0.000      0.000      4.200      0.000      0.000      0.000
0821           .900      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
0822          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
0824          0.000      0.000      0.000      0.000      0.000      0.000      1.400      0.000      0.000      0.000
0825          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
0830          0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
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0832     0.000      .300     0.000     0.000     1.000     0.000     0.000     0.000     0.000     0.000
0833     0.000     0.000     0.000     0.000     0.000     0.000     4.500     0.000     0.000     9.000
0835     0.000     0.000     0.000     0.000     0.000     0.000      .700     0.000     0.000     9.700 11
0838     0.000     0.000     0.000     0.000     0.000     0.000     9.100     0.000     0.000      .300
0839     0.000     0.000     0.000     0.000     0.000     0.000    17.000     0.000     0.000    22.000
0841     0.000     0.000     0.000     0.000     0.000     0.000     0.000     3.000     0.000    11.000
0843     0.000     0.000     0.000     1.400 2   0.000     0.000      .700 2   0.000     0.000     0.000
0844     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
0846     0.000     0.000     0.000     0.000     0.000     0.000     4.900     0.000     0.000     0.000
0847     0.000     0.000     0.000     0.000     0.000     0.000     1.800     0.000      .400     0.000
0848     0.000     0.000     0.000     0.000     0.000     1.600 6   0.000     0.000     0.000     0.000
0849    19.000 18  0.000     0.000     0.000     0.000     0.000      .400     0.000     0.000     0.000
0851    11.400     0.000     0.000     0.000     0.000     0.000     1.600     0.000     0.000     0.000
0852     8.600     0.000     0.000     0.000     0.000     1.200     5.000     1.800     0.000     0.000
0856     0.000     1.600     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
0857     0.000     0.000     0.000     0.000     0.000      .400     2.100     0.000     0.000     0.000
8002     3.300     0.000     0.000     0.000     2.100     0.000     0.000     0.000     0.000     0.000
8004     8.000     0.000     0.000     0.000     0.000     0.000     1.600     0.000     0.000     0.000
8005     5.000     0.000     0.000     0.000      .700     0.000     0.000     0.000      .700     0.000
8006     5.800      .700     0.000     0.000     0.000     0.000     3.400     1.000     0.000     0.000
8007     6.500     0.000     0.000     0.000     0.000     0.000     0.000      .600     0.000     0.000
8010     4.300     1.300     0.000     0.000     0.000     0.000     1.300     0.000     0.000     0.000
8011     4.000     0.000     0.000     0.000     0.000     0.000     1.000     0.000     0.000     0.000
8012     3.700     0.000     0.000     0.000     0.000     0.000     1.300     1.700     0.000     0.000
8013     0.000     0.000     0.000     0.000     1.000     0.000     0.000     0.000     0.000     0.000
8017     1.200     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
8018     2.200     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
8027     0.000     0.000     0.000     0.000     0.000     0.000      .300     0.000     0.000     0.000
8035     0.000     0.000     0.000     0.000     0.000     0.000    18.400     0.000     0.000     0.000
8036      .400     0.000     0.000     0.000     0.000     0.000      .600     0.000     0.000     0.000
8037     0.000     0.000     0.000     0.000     0.000     0.000     9.000     0.000     0.000     1.500
8038     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
8039     0.000     0.000     0.000     0.000     0.000     0.000     1.200     0.000     0.000     0.000
8040     0.000     0.000     0.000     0.000     0.000     0.000     1.300     0.000     0.000     0.000
8042     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000    11.000 8
8043     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
8044      .600     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
8060     7.400 80  2.000 10  0.000     0.000     0.000     0.000     0.000      .500      .500     0.000
8061     1.000     1.300     0.000     0.000     0.000     0.000     4.100     3.800     1.700      .700
8062     3.400     0.000     0.000      .400     3.400     0.000     8.200     6.000     0.000     0.000
8063     0.000     6.100     0.000     0.000     4.400     0.000     6.600     0.000     2.200     0.000
8064      .800     1.600     0.000     0.000      .800     0.000     0.000     2.700      .400     0.000
8065      .700     1.400     0.000      .700     0.000     0.000     0.000     0.000      .700     0.000
8066     0.000     3.900     0.000     0.000     1.700     0.000     4.800     0.000      .800     0.000
8067     1.000     1.300     0.000     0.000     0.000     0.000     4.700     0.000     0.000     0.000
6003    15.100     0.000     0.000     0.000     0.000     0.000     1.800      .900     0.000     0.000
6005     2.800     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6006     2.500     0.000     0.000     0.000     0.000     0.000      .300     4.600     0.000     0.000
6007     7.500     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6018      .900     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6032     0.000     2.800     0.000     0.000     1.400     0.000     1.600     0.000     0.000     0.000
6033     4.000     4.600     0.000     0.000     2.000     0.000     0.000     0.000     1.400     0.000
6034     0.000     8.700     0.000     0.000     1.000     0.000     0.000     0.000     0.000     0.000
6036     3.700     0.000     0.000     0.000     0.000     0.000     8.300      .900      .900     0.000
6041     2.100     0.000     0.000     0.000     0.000     0.000     2.600     1.500     0.000     0.000
6042     1.400     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6050     0.000     2.800     0.000     0.000     0.000     0.000      .800      .800     0.000     0.000
6051      .600     1.600     0.000     0.000     0.000     0.000     0.000      .600     0.000     0.000
6052     4.600     0.000     0.000     0.000     0.000     0.000     2.200     0.000     0.000     0.000
6053    14.000     0.000     0.000     0.000     0.000     0.000     2.100     0.000     0.000     0.000
6055     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6056    10.800     0.000     0.000     0.000     0.000     0.000    11.700     0.000     0.000     0.000
6057     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000    11.900
6058     4.200     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     1.500
6062     6.600     0.000     0.000     0.000     0.000     0.000     3.000     0.000     0.000     0.000
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|  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|
| 6063 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 28.100 | 1.400 | 0.000 | 0.000 |
| 6064 | 24.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.100 | .800 | 0.000 | 0.000 |
| 6065 | 6.300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.400 | 2.400 | 0.000 | 0.000 |
| 6066 | 3.800 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.700 | 0.000 | 0.000 |
| 6068 | 2.700 **71** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6069 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6070 | 0.000 | .300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6071 | 0.000 | .400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6072 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6073 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6074 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6075 | 1.700 | 2.900 | 0.000 | 0.000 | 5.000 | 0.000 | 7.000 | 1.600 | 0.000 | 0.000 |
| 6076 | 1.200 **10** | 0.000 | 0.000 | 0.000 | 3.600 | 0.000 | 2.300 | .200 | 0.000 | 0.000 |
| 6077 | 4.400 | 4.100 | .800 | 0.000 | 0.000 | 0.000 | 0.000 | .800 | 0.000 | 0.000 |
| 6078 | 1.800 | 0.000 | 0.000 | .700 | 0.000 | 0.000 | 4.700 | .700 | 0.000 | 0.000 |
| 6079 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6080 | 0.000 | .800 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6081 | 0.000 | 0.000 | 0.000 | .300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6082 | 1.200 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6083 | 2.300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.100 | 0.000 | 0.000 |
| 6084 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.700 | 1.000 | 0.000 | 0.000 |
| 6085 | 16.000 **16** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.800 | .800 | 1.200 | 0.000 |
| 6086 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.600 | 1.400 | 0.000 | 0.000 |
| 6087 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.200 | 0.000 | 0.000 | 0.000 |
| 6088 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6089 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6090 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6092 | 15.700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.800 | .400 | 0.000 | 0.000 |
| 6094 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 5.400 | 3.000 | 0.000 | 0.000 |
| 6096 | 17.000 **40** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.800 | .900 | 0.000 | 0.000 |
| 6097 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.000 | .800 | 0.000 | 0.000 |
| 6098 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 5.600 | 0.000 | 0.000 | 0.000 |
| 6099 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.300 | 0.000 | 0.000 | 0.000 |
| 6100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.300 | 0.000 | 0.000 | 6.000 |
| 6101 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.100 | 0.000 | 0.000 | 15.300 **26** |
| 6102 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.700 | 0.000 | 0.000 | 7.500 |
| 6106 | .900 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .400 |
| 6108 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 11.800 | 1.200 | 4.500 | .800 |
| 6109 | .800 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 17.400 | 0.000 | 0.000 | 0.000 |
| 6110 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 17.200 | 0.000 | 0.000 | 0.000 |
| 6111 | 11.100 **6** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .900 | 0.000 | 0.000 | 0.000 |
| 6112 | 7.400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 12.900 | 1.200 | 0.000 | 0.000 |
| 6113 | 16.200 **5** | 1.800 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .700 | 0.000 | .700 |
| 6114 | 4.200 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.500 | 8.400 | 0.000 | .800 |
| 6115 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 13.900 | 4.000 | 0.000 | 0.000 |
| 6116 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 12.500 | 1.500 | 0.000 | 0.000 |
| 6117 | 13.500 **5** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.200 | 2.800 | 0.000 | 0.000 |
| 1008 | 4.500 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.400 | 0.000 | 0.000 | 0.000 |
| 1009 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.500 | .500 | 0.000 | 0.000 | 0.000 |
| 1010 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1011 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1015 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .400 | .400 | 4.000 | 0.000 | 0.000 |
| 1016 | .800 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .800 |
| 1017 | 8.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1020 | 6.600 | 3.600 **6** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .300 | 0.000 | 0.000 |
| 1021 | 7.000 | 4.400 | 0.000 | 0.000 | 0.000 | 0.000 | 3.000 | 3.400 | 0.000 | 0.000 |
| 1022 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .300 | 0.000 | 0.000 | 1.300 |
| 1026 | 3.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1027 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.000 | 0.000 | 0.000 | 0.000 |
| 1029 | .500 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 |
| 1034 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1035 | 1.800 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1036 | 5.400 | 4.700 | 0.000 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1037 | 2.300 | 4.200 | 0.000 | 0.000 | 1.600 | 0.000 | 1.200 | 1.000 | 0.000 | 0.000 |
| 1038 | 2.800 | 1.800 | 0.000 | 0.000 | 2.100 **14** | 0.000 | 3.200 **20** | 1.000 | .700 | 0.000 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1039 | 1.500 | 15.000 100 | 0.000 | 0.000 | 0.000 | 0.000 | 3.900 | 0.000 | 0.000 | 0.000 |
| 1040 | 0.000 | 7.500 | 0.000 | 0.000 | 2.200 | 0.000 | 3.800 | .600 | 0.000 | 0.000 |
| 1043 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .900 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1044 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1045 | 0.000 | 0.000 | 0.000 | .700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1046 | 3.300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1047 | 7.600 | 3.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1049 | 5.500 | 4.700 12 | 0.000 | 0.000 | 1.100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1051 | 0.000 | 1.200 12 | 0.000 | 0.000 | 0.000 | 0.000 | .600 | 0.000 | 2.200 | 0.000 |
| 1053 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1054 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1055 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 15.900 |
| 1056 | 0.000 | .700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1057 | 3.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 5.000 |
| 1058 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .800 | 9.000 12 |
| 1059 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.000 |
| 1060 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .700 | 0.000 | 0.000 | 0.000 |
| 1062 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.700 |
| 1063 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 3.000 |
| 1064 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 13.000 3 | 0.000 | 0.000 | 2.000 |
| 1065 | 6.100 7 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 |
| 1066 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1067 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1068 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.400 |
| 1069 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.800 1 | 0.000 | 1.800 |
| 1070 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 7.400 13 |
| 1071 | .300 | 0.000 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1072 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.800 2 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1073 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 |
| 1074 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .800 | 0.000 | 0.000 | 3.600 |
| 1075 | 2.900 2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.400 | 3.700 2 | .400 | 0.000 |
| 1076 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 7.000 28 | 0.000 | 0.000 | 0.000 |
| 1077 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1079 | .600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .800 |
| 1080 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1081 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.700 | 0.000 | 0.000 | 15.400 9 |
| 1082 | 3.900 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1083 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.900 | 0.000 | 0.000 | 12.900 18 |
| 1084 | .600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.800 | 0.000 | 0.000 | 15.700 6 |
| 1085 | .600 | 0.000 | 0.000 | .900 | 0.000 | 0.000 | 1.900 | 0.000 | 0.000 | 0.000 |
| 1086 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.800 | 0.000 | 0.000 | 1.800 |
| 1087 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.400 | 0.000 | 0.000 | 4.400 6 |
| 1088 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.700 | 0.000 | 0.000 | 3.100 |
| 1089 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.800 | 0.000 | 0.000 | 7.900 |
| 1090 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.700 |
| 1093 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.300 | 0.000 | 0.000 | 7.900 |
| 1095 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.900 |
| 1096 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 28.600 |
| 1097 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.900 | 0.000 | 0.000 | 1.900 |
| 1099 | .300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.800 |
| 1100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.800 | .700 | 0.000 | 2.700 |
| 1101 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1102 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.900 | 0.000 | 0.000 | 4.200 |
| 1103 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.900 1 | .700 | 0.000 | 4.000 4 |
| 1104 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.200 | 0.000 | 0.000 | 1.200 2 |
| 1105 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.100 | 0.000 | 0.000 | 2.100 |
| 1106 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.400 | 0.000 | 0.000 | 11.300 20 |
| 1107 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1109 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1110 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.600 | 0.000 | 0.000 | 1.900 |
| 1111 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1112 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .600 | 3.100 | 0.000 | 0.000 |
| 1113 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1114 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.700 | 1.200 | 0.000 | 1.900 |
| 1115 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.800 | .800 | 0.000 | 0.000 |

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1116          0.000     0.000     0.000     0.000     0.000     0.000     4.200  5  0.000     0.000     2.800
1119          0.000     0.000     0.000     0.000     0.000     0.000    15.600 25  0.000     0.000     0.000
1120          0.000     0.000     0.000     0.000     0.000     0.000     2.700     0.000     1.600     0.000
1124          0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
1125          0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
1126          0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     6.600
1127          0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     8.300
1128          0.000     0.000     0.000     0.000     0.000     0.000     2.100     0.000     0.000    13.500
1130          1.000     0.000     0.000     0.000     0.000     0.000     1.200  3  0.000     0.000     6.300
1131          0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     1.100
1132          0.000     0.000     0.000     0.000     0.000     0.000    30.000 36  0.000     0.000      .800
1133          9.900     0.000     0.000     0.000     0.000     0.000     2.700     0.000     0.000     0.000
1134          9.100     0.000     0.000     0.000     0.000     0.000     5.900     0.000     0.000     0.000
1135         12.200     0.000     0.000     0.000     0.000     0.000     1.200     1.200     0.000     0.000
1136         11.300     0.000     0.000     0.000     0.000     0.000     1.100     0.000     0.000     0.000
1137          0.000     0.000     0.000     0.000     0.000     0.000     9.100  3  1.100     0.000     0.000
1138          0.000     0.000     0.000     0.000     0.000     0.000     4.200     0.000     0.000     1.100
1139          2.300     0.000     0.000     0.000     0.000     0.000    12.900      .800     0.000     0.000
1140          2.600  3  0.000     0.000     0.000     0.000     0.000     1.200     0.000     0.000     0.000
1142          0.000     0.000     0.000     0.000     0.000      .700     0.000     0.000     0.000     0.000
1143          0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
1118          0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     5.400
4003          0.000     0.000     0.000     0.000     0.000     0.000      .900     0.000     0.000     1.200
4004          0.000     0.000     0.000     0.000     0.000    11.400     0.000     0.000     0.000     0.000
4005          0.000     0.000     0.000     0.000     0.000     0.000      .900     0.000     0.000     0.000
4006          0.000     0.000     0.000     0.000     0.000     1.500     0.000     0.000     0.000     0.000
4007          0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

SAMPLE  NAME  51        52        53        54        55        56        57        58        59        60

              REOPSCOT  PAROSEMI  SACCATLA  SACCDIFF  SACCSPHA  STAINAPT  TROCHINF  TROCHLOB  TROCHGLO  TRIFANGU

7902          0.000     0.000     0.000     3.500      .300      .300     0.000     0.000     2.400     3.400
7903          0.000     0.000     0.000     7.700      .400     0.000     0.000     0.000      .400      .900
7904          0.000     0.000     3.400     6.300     1.400     0.000     0.000     0.000      .500     1.000
7906          0.000      .400     0.000     4.000     3.400     0.000     0.000     0.000     4.800     1.300
7907          0.000     0.000     0.000     3.800      .800     0.000     0.000     0.000     0.000      .300
7908          0.000     0.000     0.000     1.300     0.000     0.000     0.000     0.000     0.000      .300
7909          0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
7910          0.000     0.000     0.000     0.000     0.000      .400     0.000     0.000     0.000     0.000
7911          0.000     0.000     0.000     0.000      .300      .300     0.000     0.000     0.000     0.000
7912          0.000     0.000     0.000      .600      .300     0.000     0.000     0.000     0.000     0.000
7913          0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
7914          0.000     0.000      .300     0.000     0.000     0.000     0.000      .400     0.000     0.000
7917          0.000     0.000     0.000     5.700     0.000     1.100     0.000     0.000     0.000     0.000
7918          0.000     0.000     0.000     3.500     0.000     0.000     0.000     0.000     0.000     1.500
7948          0.000     0.000      .300      .300     0.000     0.000     1.000     0.000     0.000      .300
7949          0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
7950          0.000     0.000      .400     0.000     0.000     1.300     0.000     0.000     0.000     0.000
7952          0.000     0.000     0.000     0.000     0.000     1.200     0.000     0.000     0.000     0.000
7953          0.000     2.600     0.000     0.000     0.000     0.000     0.000     0.000     0.000    21.800
7955          0.000     0.000     0.000     0.000     0.000      .300     0.000     0.000     0.000    22.700 14
7956          0.000     0.000      .300     0.000     0.000     0.000     0.000     0.000     0.000    22.400
7957          0.000      .300      .600     0.000     0.000     0.000     0.000     0.000     0.000    11.800  7
7958          0.000     0.000     1.900 22  0.000     0.000     0.000     0.000     1.300     0.000     1.900
7959          0.000     0.000     2.400 14  1.200     0.000     0.000     0.000     1.300     0.000     2.400
7960          0.000     0.000      .700     6.600     0.000     0.000     0.000     0.000     0.000     0.000
7947          0.000     0.000     1.200     1.800     1.200     0.000     0.000     0.000     1.200     0.000
0802          0.000     0.000     4.700     0.000     0.000     0.000     0.000     0.000     0.000     0.000
0817          0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
0818          0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000      .500
0819          4.400     0.000     3.400     0.000     0.000     0.000     0.000     0.000     0.000     0.000
0820          0.000     0.000     2.300     0.000     0.000     0.000     0.000     0.000     0.000     0.000
0821          4.800     0.000     1.600     0.000     0.000     0.000     0.000     0.000     0.000    14.600 25
0822          1.200     0.000     8.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
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0824    8.400       0.000       8.400       0.000       0.000       0.000       0.000        .700       0.000       0.000
0825    0.000       0.000       6.000       0.000       0.000       0.000       0.000      10.800       0.000       0.000
0829    3.000       0.000      21.000       0.000       0.000       0.000       0.000       1.500       0.000       0.000
0832    0.000       0.000        .600       0.000       0.000       0.000       0.000        .300       0.000       0.000
0833    0.000       0.000       2.800       0.000       0.000       0.000       0.000       0.000       0.000       0.000
0835    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
0838    0.000       0.000      15.000       0.000       0.000       0.000       0.000        .600       0.000       0.000
0839    0.000       0.000       6.600       0.000       0.000       0.000       0.000       0.000       0.000       0.000
0841    0.000       0.000      12.300       0.000       0.000       0.000       0.000       0.000       0.000       0.000
0843    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       1.000
0844    0.000       0.000      23.200        .700       0.000       0.000       0.000       1.500       0.000       0.000
0846    0.000       0.000       2.300 21    0.000       0.000       0.000       0.000       0.000       0.000       0.000
0847    0.000       0.000       1.000       0.000       0.000       0.000       0.000       4.100       0.000       2.100 4
0848    0.000       0.000      20.400 6     0.000       0.000        .500       0.000       4.100       0.000       6.300 12
0849    0.000       0.000      44.000 45    0.000       0.000        .700       0.000       4.000       0.000       1.100
0851    0.000       0.000       0.000       5.000       0.000       0.000       0.000       0.000       0.000       0.000
0852    0.000       0.000       1.000       0.000       0.000       0.000       0.000       0.000       0.000        .300
0856    0.000       0.000       7.100       0.000       0.000       0.000       0.000       1.300       0.000      14.200
0857    0.000       0.000      12.700 20    0.000       0.000       0.000       0.000       2.100 9     0.000       8.800 39
8002    0.000       0.000       0.000        .600       0.000       0.000       0.000       0.000       0.000       4.200
8004    0.000       0.000       0.000        .400       0.000       2.000       0.000       0.000       1.200       0.000
8005    0.000       0.000        .700       1.800       0.000       1.000       0.000       0.000       0.000       0.000
8006    0.000       0.000       0.000       0.000       0.000       1.000        .700       0.000       0.000       0.000
8007    0.000       0.000       0.000       0.000       0.000       1.300       0.000       0.000       1.200       3.000
8010    0.000       0.000       1.600       0.000       0.000       0.000       0.000       0.000       0.000       0.000
8011    0.000       0.000       0.000       0.000       0.000       2.000       0.000       0.000       1.000       0.000
8012    0.000       0.000       1.600       0.000       0.000       2.700       0.000       0.000       2.300       0.000
8013    0.000       0.000       0.000       0.000       1.000       4.800       0.000       0.000       0.000       0.000
8017    0.000        .900       0.000       0.000       0.000       0.000       0.000       0.000       0.000      34.000
8018    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000      25.000
8027    0.000       1.200       0.000        .600       0.000       0.000       0.000       0.000       0.000      30.800
8035    0.000       0.000       8.500       0.000       0.000       0.000       0.000       0.000       0.000       0.000
8036    0.000        .200        .600       0.000       0.000       0.000       0.000       0.000       0.000      32.500
8037    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
8038    0.000       0.000        .300       0.000       0.000       0.000       0.000       1.400       0.000       0.000
8039    0.000       0.000      16.000       3.000       0.000       0.000       0.000       2.000 6     0.000       0.000
8040    0.000       0.000       3.000       0.000       0.000       0.000       0.000        .900       0.000        .300
8042    0.000       0.000       1.700       0.000       0.000       0.000       0.000       0.000       0.000       0.000
8043    5.200       0.000       1.600       0.000       0.000       0.000       0.000       4.100       0.000       0.000
8044    0.000       0.000        .200       0.000       0.000       0.000       0.000       0.000       0.000        .600
8060    0.000       0.000       2.500       0.000        .500       0.000       0.000       0.000       0.000       2.000
8061    0.000       0.000       7.600       0.000       0.000       0.000       0.000       0.000       0.000       6.200
8062    0.000       0.000       2.600       0.000       1.700       0.000       0.000        .800       3.400      15.200
8063    0.000       0.000       6.400       2.200       1.300       1.300       0.000       0.000       3.000       5.200
8064    0.000       0.000       1.200       1.400       0.000       0.000       0.000       0.000       1.900       1.100
8065    0.000       0.000       0.000        .400       0.000       0.000       0.000       0.000       0.000       0.000
8066    0.000       0.000       1.700       0.000        .900       1.700       0.000       0.000       0.000       2.200
8067    0.000       0.000       7.300       4.000        .800       0.000       0.000       0.000       0.000       5.400
6003    0.000       0.000        .500       1.300       0.000       0.000       0.000       0.000       0.000       0.000
6005    0.000       0.000      30.000       0.000       0.000       0.000       0.000       2.500       0.000       1.300
6006    0.000       0.000       0.000       0.000       0.000       0.000       0.000       3.000       0.000      11.000
6007    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       3.200
6018    0.000        .600       0.000       0.000       0.000       0.000       0.000       0.000       0.000      25.500
6032    0.000       0.000       4.800       0.000       0.000       0.000       0.000       0.000       0.000       0.000
6033    0.000       3.200       0.000       3.200       0.000       0.000        .700       0.000       0.000       0.000
6034    0.000       0.000       0.000       3.200       0.000       0.000       0.000       0.000       0.000       0.000
6036    0.000       0.000       5.000       0.000       0.000       1.800       0.000       0.000       0.000       0.000
6041    0.000        .500       1.000       0.000       1.000       0.000       0.000       1.000       0.000      29.600
6042    0.000        .300        .900       0.000       0.000       0.000       0.000       0.000       0.000      29.500
6050    0.000       0.000        .800       0.000       0.000       0.000       0.000       0.000       0.000      19.000
6051    0.000       0.000        .300       0.000       0.000       0.000       0.000       0.000       0.000      11.800
6052    0.000       0.000       0.000       1.200       0.000        .600       1.200       0.000       0.000       0.000
6053    0.000       0.000       1.700       6.800       0.000        .400       0.000       0.000        .900       0.000
6055    0.000       0.000       1.200       0.000       0.000       0.000       0.000        .900       0.000      14.200
6056    0.000       0.000       3.100      23.800       0.000       0.000       0.000       0.000       0.000        .500
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6057       0.000     0.000     4.000     0.000     0.000     0.000     0.000     5.900     0.000     0.000
6058       0.000     0.000     0.000     0.000     0.000     0.000     0.000     2.000     0.000    13.600
6062       0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000      .400     0.000
6063       0.000     0.000     8.500    13.000     0.000     0.000     6.500     0.000     0.000     0.000
6064       0.000     0.000     0.000     8.000      .400     0.000     0.000     0.000     1.100     0.000
6065       0.000     0.000     2.900     0.000     8.300     0.000     2.900     0.000     0.000     0.000
6066       0.000     1.000      .700     0.000     0.000      .700     0.000     3.000     0.000     6.800
6068       0.000     0.000     0.000     0.000     0.000     0.000     0.000      .300     0.000     4.100
6069       0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     3.000
6070       0.000     0.000      .500     0.000     0.000     0.000     0.000     0.000     0.000     8.600
6071       0.000      .200     2.300     0.000     0.000     0.000     0.000     2.100     0.000    23.200
6072       0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000    39.000
6073       0.000    14.700     0.000     0.000     0.000     0.000     0.000     0.000     0.000    51.500
6074       0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000    39.000
6075       0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     9.500
6076       0.000     0.000     2.400     1.900     0.000     0.000     4.800     0.000     0.000     0.000
6077       0.000     0.000     0.000     0.000     0.000     0.000     1.200     0.000     0.000     5.000
6078       0.000     0.000    11.200     0.000     0.000     0.000     1.000     2.900     0.000    10.100
6079       0.000     0.000     0.000     1.800     0.000     0.000     0.000     0.000     0.000    34.700
6080       0.000     0.000      .800     0.000     0.000     0.000     0.000     0.000     0.000    21.600
6081       0.000     0.000     2.500     0.000     0.000     0.000     1.200     0.000     0.000      .300
6082       0.000     0.000     1.500     0.000     0.000     0.000     3.500     0.000     0.000     3.300
6083       0.000      .500     9.900     0.000     0.000     0.000     0.000     1.100     0.000     9.000
6084       0.000     0.000    47.500 60  0.000     0.000     0.000     0.000     0.000     0.000     0.000
6085       0.000     0.000    11.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6086       0.000     0.000    52.100     2.400     0.000     0.000     1.000     0.000     0.000     0.000
6087       0.000     0.000    40.400     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6088       2.000     0.000    30.200 15  0.000     0.000     0.000     0.000     3.500     0.000     0.000
6089       0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6090       0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6092       0.000     0.000    20.100     3.200     0.000     0.000     0.000     0.000     0.000      .800
6094       0.000     0.000    48.600     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6096       0.000     0.000    18.800     3.100     0.000     0.000     0.000     0.000     0.000     1.400
6097       4.400     0.000    36.800 20 14.300     0.000     0.000     0.000     1.000     0.000     0.000
6098       0.000     0.000    27.200     2.800    14.400     0.000     4.600     0.000     0.000     0.000
6099       4.300     0.000     6.400 12  0.000     0.000     0.000     1.700     0.000     1.300     0.000
6100       0.000     0.000    10.400     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6101       0.000     0.000     2.700     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6102       0.000     0.000     1.900     0.000     0.000     0.000     0.000     2.600     0.000     0.000
6106       0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     4.300
6108       0.000     0.000    18.300    13.900     0.000     0.000     7.300     0.000     0.000     0.000
6109        .800     0.000    48.100    14.900     0.000     0.000     0.000     3.300     0.000     0.000
6110       0.000     0.000    12.100    15.700     1.500     0.000     0.000     9.000     0.000     0.000
6111       0.000     0.000      .600     3.500     0.000     0.000     1.600     0.000     0.000     0.000
6112       6.000     0.000    12.300     2.400     0.000     0.000     9.200     0.000     0.000      .600
6113       0.000     0.000     2.100     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6114       0.000     0.000    17.800     0.000     0.000     0.000     0.000     3.000     0.000      .500
6115       0.000     0.000    26.600    20.500     0.000     0.000     0.000     1.600     0.000     0.000
6116       0.000     0.000    51.500     9.300     0.000     0.000     0.000     3.900     0.000     0.000
6117       4.000     0.000     9.600     0.000      .700     0.000     0.000      .700     0.000      .400
1008       0.000     0.000     7.000     0.000     0.000     0.000     0.000     1.400     0.000    12.600
1009       0.000     0.000     1.000     0.000     0.000     0.000     0.000     2.100     0.000    15.200
1010       0.000     0.000     5.700     0.000     0.000     0.000     0.000     0.000     0.000    63.800
1011       0.000     0.000     2.600     0.000     0.000     0.000     0.000     0.000     0.000     0.000
1015       0.000     0.000     1.800     0.000     0.000     0.000     0.000     0.000     0.000     0.000
1016       0.000     0.000     9.500      .500     0.000     0.000     0.000     5.900     0.000     3.200
1017       0.000     0.000    14.300     0.000     0.000     0.000     0.000     5.900     0.000    26.000
1020       0.000     0.000    17.200     0.000     0.000     0.000     0.000     3.300 5   0.000     3.300
1021       0.000     0.000    10.400     0.000     0.000     0.000     0.000     2.200     0.000     1.500
1022       0.000     0.000    15.000     0.000     0.000     0.000     0.000     4.900     2.600     0.000
1026       0.000     0.000     1.300     0.000     0.000     0.000     0.000     2.100     0.000    12.000
1027       0.000     0.000    23.000     0.000     0.000     0.000      .800     9.300     3.400     0.000
1029       0.000     0.000    11.500     0.000     0.000     0.000     0.000     2.000     2.500     6.100
1034       0.000     0.000      .900     0.000     0.000     0.000     0.000     1.300     0.000    14.000 16
1035       0.000     0.000     4.100     0.000     0.000     0.000     0.000      .900     0.000    29.500
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|---|---|---|---|---|---|---|---|---|---|---|
| 1036 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | .300 | 0.000 | 1.300 |
| 1037 | 0.000 | 0.000 | 2.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 |
| 1038 | 0.000 | 0.000 | 2.100 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | .700 |
| 1039 | 0.000 | 0.000 | 3.800 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1040 | 0.000 | 0.000 | 1.300 | .600 | 5.500 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1043 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1044 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1045 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 20.000 |
| 1046 | 0.000 | 0.000 | .900 | 0.000 | 0.000 | 0.000 | 0.000 | 1.300 | 0.000 | 31.500 |
| 1047 | 0.000 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.000 |
| 1048 | 0.000 | 0.000 | 1.400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.100 |
| 1051 | 0.000 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | 0.000 | 4.700 | 0.000 | 25.000 |
| 1053 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.600 |
| 1054 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1055 | 0.000 | 0.000 | 19.700 | 0.000 | 0.000 | 0.000 | 0.000 | 5.700 | 0.000 | 0.000 |
| 1056 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.700 **5** |
| 1057 | 0.000 | 0.000 | 20.000 | 0.000 | 0.000 | 0.000 | 0.000 | 11.400 **25** | 0.000 | 17.300 **25** |
| 1058 | 0.000 | 0.000 | 11.500 | 0.000 | 0.000 | 0.000 | 0.000 | 11.100 **9** | 0.000 | 0.000 |
| 1059 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.700 | 0.000 | 2.000 |
| 1060 | 0.000 | 0.000 | 3.400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1062 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 14.500 | 0.000 | 0.000 |
| 1063 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.200 | 0.000 | 0.000 |
| 1064 | 0.000 | 0.000 | 13.000 **3** | 0.000 | 0.000 | 0.000 | 0.000 | 3.000 | 0.000 | 0.000 |
| 1065 | 0.000 | 0.000 | 1.300 | 0.000 | 0.000 | 0.000 | 0.000 | 5.800 **8** | 0.000 | 7.700 **3** |
| 1066 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.000 | 0.000 | 4.000 **9** |
| 1067 | 0.000 | 0.000 | 10.100 **7** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1068 | 0.000 | 0.000 | 7.000 **16** | 0.000 | 0.000 | 0.000 | 0.000 | 11.500 **12** | 0.000 | 0.000 |
| 1069 | 0.000 | 0.000 | 24.300 **14** | 0.000 | 0.000 | 0.000 | 0.000 | 4.500 **3** | 0.000 | 0.000 |
| 1070 | 0.000 | 0.000 | 1.100 | 0.000 | 0.000 | 0.000 | 0.000 | 3.400 **5** | 0.000 | 8.500 **5** |
| 1071 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .600 **4** |
| 1072 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1073 | 0.000 | 0.000 | 5.200 | 0.000 | 0.000 | 0.000 | 0.000 | .600 | 0.000 | 0.000 |
| 1074 | 0.000 | 0.000 | 12.900 **8** | 0.000 | 0.000 | 0.000 | 0.000 | 4.800 | 0.000 | 0.000 |
| 1075 | 0.000 | 0.000 | 3.700 | 0.000 | 0.000 | 0.000 | 0.000 | 7.400 **3** | 0.000 | 3.300 **3** |
| 1076 | 0.000 | 0.000 | 12.000 **5** | 0.000 | 0.000 | 0.000 | 0.000 | 1.600 | 0.000 | 0.000 |
| 1077 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.600 |
| 1078 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.200 |
| 1080 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1081 | 0.000 | 0.000 | 8.100 **7** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1082 | 0.000 | 0.000 | 14.300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 9.100 |
| 1083 | 0.000 | 0.000 | 5.800 | 0.000 | 0.000 | 0.000 | 0.000 | 2.500 | 0.000 | 0.000 |
| 1084 | 0.000 | 0.000 | 6.700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.000 |
| 1085 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.800 |
| 1086 | .900 | 0.000 | 6.000 **4** | 0.000 | 0.000 | 0.000 | 0.000 | 6.300 | 0.000 | 0.000 |
| 1087 | 0.000 | 0.000 | 9.200 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1088 | 0.000 | 0.000 | 6.700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1089 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1090 | 0.000 | 0.000 | 3.800 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1093 | 0.000 | 0.000 | 6.700 **3** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1095 | 0.000 | 0.000 | 2.900 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1096 | 0.000 | 0.000 | 1.800 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1097 | 0.000 | 0.000 | 9.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1099 | 0.000 | 0.000 | 5.200 | 0.000 | 0.000 | 0.000 | 0.000 | 3.200 | 0.000 | 0.000 |
| 1100 | 0.000 | 0.000 | 13.900 **8** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1101 | 0.000 | 0.000 | 3.300 **3** | 0.000 | 0.000 | 0.000 | 0.000 | 4.700 **3** | 0.000 | 3.100 |
| 1102 | 0.000 | 0.000 | 12.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.700 | 0.000 | 0.000 |
| 1103 | 0.000 | 0.000 | 26.200 | 0.000 | 0.000 | 0.000 | 0.000 | 2.900 **2** | 0.000 | 0.000 |
| 1104 | 0.000 | 0.000 | 17.600 **9** | 0.000 | 0.000 | 0.000 | 0.000 | 5.600 **9** | 0.000 | 0.000 |
| 1105 | 0.000 | 0.000 | 1.600 | 0.000 | 0.000 | 0.000 | 0.000 | .500 | 0.000 | 0.000 |
| 1106 | 0.000 | 0.000 | 15.500 **5** | 0.000 | 0.000 | 0.000 | 0.000 | 1.700 | 0.000 | 0.000 |
| 1107 | 0.000 | 0.000 | 4.900 | 0.000 | 0.000 | 0.000 | 0.000 | 7.000 **10** | 0.000 | 0.000 |
| 1109 | 0.000 | 0.000 | 19.300 **5** | 0.000 | 0.000 | 0.000 | 0.000 | 7.900 **11** | 0.000 | 0.000 |
| 1110 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 13.200 | 0.000 | 0.000 |
| 1111 | 0.000 | 0.000 | 30.800 **16** | 7.900 **5** | 0.000 | 0.000 | 0.000 | 3.500 **7** | 0.000 | 0.000 |
| 1112 | 0.000 | 0.000 | 19.000 **4** | .600 | 0.000 | 0.000 | 0.000 | 9.600 **22** | 0.000 | 3.400 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1113 | 0.000 | 0.000 | 12.600 2 | 9.800 | 0.000 | 0.000 | 0.000 | 4.200 4 | 0.000 | 0.000 |
| 1114 | 0.000 | 0.000 | 20.300 3 | 0.000 | 0.000 | 0.000 | 0.000 | 7.900 | 0.000 | 1.200 |
| 1115 | 2.200 | 0.000 | 22.300 18 | 0.000 | 0.000 | 0.000 | 0.000 | 7.300 3 | 0.000 | 0.000 |
| 1116 | 2.100 2 | 0.000 | 4.900 | 0.000 | 0.000 | 0.000 | 0.000 | 10.500 5 | 0.000 | 0.000 |
| 1119 | 0.000 | 0.000 | 30.000 28 | 0.000 | 0.000 | 0.000 | 0.000 | .900 | 0.000 | 0.000 |
| 1120 | 0.000 | 0.000 | 13.800 8 | 0.000 | 0.000 | 0.000 | 0.000 | 2.700 | 0.000 | 0.000 |
| 1124 | .600 | 0.000 | 24.000 21 | 0.000 | 0.000 | 0.000 | 0.000 | 3.900 4 | 0.000 | 0.000 |
| 1125 | 0.000 | 0.000 | 32.900 20 | 0.000 | 0.000 | 0.000 | 0.000 | 8.000 | 0.000 | 1.900 |
| 1126 | 0.000 | 0.000 | 12.300 10 | 0.000 | 0.000 | 0.000 | 0.000 | 4.400 | 0.000 | 0.000 |
| 1127 | 1.000 | 0.000 | 5.400 9 | 0.000 | 0.000 | 0.000 | 0.000 | 4.300 5 | 0.000 | 0.000 |
| 1128 | 0.000 | 0.000 | 4.200 6 | 2.200 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1130 | 0.000 | 0.000 | 3.600 2 | 0.000 | 0.000 | 0.000 | 0.000 | 3.100 2 | 0.000 | 2.000 |
| 1131 | 0.000 | 0.000 | 28.200 22 | 0.000 | 0.000 | 0.000 | 0.000 | 3.100 | 0.000 | 0.000 |
| 1132 | 0.000 | 0.000 | 34.500 42 | 3.400 | 1.000 | 0.000 | 6.600 | 0.000 | 0.000 | 0.000 |
| 1133 | 0.000 | 0.000 | 3.900 | 2.700 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | 3.000 |
| 1134 | 0.000 | 0.000 | 11.100 | 7.900 | 0.000 | 4.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1135 | 0.000 | 0.000 | 5.900 | 0.000 | 1.200 | 4.600 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1136 | 0.000 | 0.000 | 16.200 | 0.000 | .700 | 0.000 | .700 | 0.000 | 0.000 | 0.000 |
| 1137 | 0.000 | 0.000 | 33.600 39 | 5.400 | 0.000 | 0.000 | 7.100 | 0.000 | 0.000 | 0.000 |
| 1138 | 0.000 | 0.000 | 28.800 14 | 0.000 | 0.000 | 0.000 | .800 | .800 | 0.000 | 0.000 |
| 1139 | 0.000 | 0.000 | 27.100 | 0.000 | 0.000 | 0.000 | 4.300 | 0.000 | 0.000 | 0.000 |
| 1140 | 0.000 | 0.000 | 0.000 | 2.600 | 0.000 | 0.000 | 1.200 | 0.000 | 0.000 | 1.000 |
| 1142 | 0.000 | 0.000 | .700 | 0.000 | 0.000 | 0.000 | 0.000 | .700 | 0.000 | 5.400 7 |
| 1143 | 0.000 | 0.000 | 2.700 2 | 0.000 | 0.000 | .900 | 0.000 | 4.600 3 | 0.000 | 12.900 22 |
| 1118 | 2.500 | 0.000 | 12.900 | 0.000 | 0.000 | 0.000 | 0.000 | 6.700 8 | 0.000 | 0.000 |
| 4003 | 0.000 | 0.000 | .900 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 5.500 |
| 4004 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.100 | 0.000 | 0.000 |
| 4005 | 0.000 | 0.000 | 6.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.200 |
| 4006 | 0.000 | 0.000 | .900 | 0.000 | 0.000 | 0.000 | 0.000 | .600 | 0.000 | 3.400 |
| 4007 | 0.000 | 0.000 | 1.200 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.100 |

| SAMPLE NAME | 61<br>TRITCONI | 62<br>TEXTTORQ | 63<br>UVIGPERF | 64<br>ORIDTENR | 65<br>VALVLAEV | 66<br>RECUTURB | 67<br>ADERGLOM | 68<br>SPIROBIF | 69<br>TRILOCSP | 70<br>ELPHACTT |
|---|---|---|---|---|---|---|---|---|---|---|
| 7902 | 2.700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7903 | 2.100 | 0.000 | 0.000 | 0.000 | 0.000 | 1.300 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7904 | 2.000 | 0.000 | 0.000 | .500 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7906 | .800 | 0.000 | 3.900 | 1.300 | 3.000 | .400 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7907 | 0.000 | 0.000 | 17.500 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7908 | 0.000 | 0.000 | 24.900 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7909 | 0.000 | 0.000 | 35.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7910 | 0.000 | 0.000 | 37.000 | 3.600 | .400 | .700 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7911 | 0.000 | 0.000 | 23.400 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7912 | 0.000 | 0.000 | 25.600 | .600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7913 | 0.000 | 0.000 | 32.300 | .400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7914 | 0.000 | 0.000 | 0.000 | .400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7917 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7918 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7948 | 0.000 | 0.000 | 53.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7949 | 0.000 | 0.000 | 54.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7950 | 0.000 | 0.000 | 52.000 | 0.000 | 0.000 | .700 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7952 | 0.000 | 0.000 | 27.800 | .400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7953 | 0.000 | 0.000 | 0.000 | .300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7955 | 0.000 | 0.000 | 0.000 | 1.700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7956 | 0.000 | 0.000 | 0.000 | .900 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7957 | .300 | 0.000 | 0.000 | 1.500 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7958 | 1.600 | .300 | 0.000 | .900 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .600 |
| 7959 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7960 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7947 | .600 | 0.000 | 12.400 | 0.000 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0802 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 9.000 | 0.000 | 0.000 |
| 0817 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 10.000 | 22.600 | 17.100 | 0.000 | 0.000 |
| 0818 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .900 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0819 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 16.000 14 | 46.200 74 | 12.400 | 0.000 | 0.000 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0820 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.200 | 59.000 100 | 8.400 | 0.000 | 0.000 |
| 0821 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.800 | 22.700 50 | 4.500 | 0.000 | 0.000 |
| 0822 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.000 | 67.600 83 | 4.000 | 0.000 | 0.000 |
| 0824 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.100 5 | 56.800 70 | 7.700 | 0.000 | 0.000 |
| 0825 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0830 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.100 | 2.600 | 6.300 | 0.000 | 0.000 |
| 0832 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0833 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.000 21 | 7.300 7 | 11.300 8 | 0.000 | 0.000 |
| 0835 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.800 | 2.700 | 24.800 | 0.000 | 0.000 |
| 0838 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 12.100 11' | 0.000 | 0.000 |
| 0839 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 10.600 100 | 0.000 | 0.000 |
| 0841 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.200 | 26.700 | 0.000 | 0.000 |
| 0843 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .700 | 0.000 | 0.000 | 0.000 | 5.700 |
| 0844 | 0.000 | 4.800 17 | 0.000 | 0.000 | 0.000 | 2.200 12 | 46.300 41 | 0.000 | 0.000 | 0.000 |
| 0846 | 1.300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 61.000 60 | 0.000 | 0.000 | .400 |
| 0847 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.800 9 | 20.900 32 | 0.000 | 0.000 | .400 |
| 0848 | 0.000 | 2.000 | 0.000 | 0.000 | 0.000 | 4.100 4 | 31.900 13 | 0.000 | 0.000 | 0.000 |
| 0849 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0851 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0852 | .300 | 0.000 | 0.000 | 2.400 | 0.000 | 1.200 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0856 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 |
| 0857 | 5.700 13 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 1.000 | 0.000 |
| 8002 | .600 | 0.000 | 0.000 | 1.500 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8004 | .400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8005 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 |
| 8006 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 | 0.000 | 0.000 |
| 8007 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8010 | 0.000 | 0.000 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8011 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8012 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .700 | 0.000 | 0.000 |
| 8013 | 0.000 | 0.000 | 12.000 | 2.400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8017 | 0.000 | 0.000 | 0.000 | .300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8019 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8027 | 0.000 | 0.000 | 0.000 | .300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8035 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.600 12 | 40.000 31 | 0.000 | 0.000 | 0.000 |
| 8036 | .200 | 0.000 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8037 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.700 | 67.400 76 | 4.500 9 | 0.000 | 0.000 |
| 8038 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.100 | 72.000 50 | 6.300 | 0.000 | 0.000 |
| 8039 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 9.200 13 | 64.000 43 | 2.000 2 | 0.000 | 0.000 |
| 8040 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 10.500 -9 | 57.000 53 | 1.300 | 0.000 | 0.000 |
| 8042 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 14.200 10 | 36.000 44 | 16.600 16 | 0.000 | 0.000 |
| 8043 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 9.300 24 | 34.000 32 | 14.600 16 | 0.000 | 0.000 |
| 8044 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | .300 | .300 | 0.000 | 7.000 |
| 8060 | 1.500 | 0.000 | 0.000 | 0.000 | 5.400 80 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8061 | 0.000 | 0.000 | 0.000 | 0.000 | 2.700 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8062 | 0.000 | 0.000 | 0.000 | 0.000 | 5.200 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8063 | .900 | 0.000 | 1.300 | 0.000 | 8.300 100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8064 | 0.000 | 0.000 | 58.000 | 0.000 | 1.600 | 3.200 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8065 | 0.000 | 0.000 | 28.600 | 0.000 | 1.000 | 1.400 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8066 | 0.000 | 0.000 | 3.500 | 0.000 | 4.400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8067 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6003 | 0.000 | 1.800 | 0.000 | 0.000 | 0.000 | 0.000 | .400 | 0.000 | 0.000 | 0.000 |
| 6005 | .800 | 0.000 | 0.000 | 0.000 | 0.000 | 10.000 | 30.000 | 0.000 | 0.000 | 0.000 |
| 6006 | 1.500 | 0.000 | 0.000 | .900 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6007 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6018 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6032 | .400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6033 | 0.000 | 0.000 | 0.000 | 0.000 | 3.200 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6034 | 0.000 | 0.000 | 2.700 | 0.000 | 4.600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6036 | .900 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6041 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.500 | 0.000 |
| 6042 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6050 | 1.600 | 0.000 | 0.000 | 0.000 | 3.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6051 | .200 | 0.000 | 0.000 | 0.000 | .600 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6052 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

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6053       0.000      .400     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6055        .900     0.000     0.000     0.000     0.000     0.000      .900     0.000     0.000     0.000
6056       0.000     0.000     0.000     0.000     0.000     0.000      .900     0.000     0.000     0.000
6057       0.000     0.000     0.000     0.000     0.000    11.000    29.000    15.800     0.000     0.000
6058       0.000     0.000     0.000     0.000     0.000     1.500     2.300     3.000     0.000     0.000
6062        .700     0.000     0.000     0.000     0.000     0.000     3.000     0.000     0.000     0.000
6063       7.100     0.000     0.000     0.000     0.000     0.000     3.200     0.000     0.000     0.000
6064       0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6065       0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6066       9.500     0.000     0.000     3.000     0.000     0.000     0.000     0.000     0.000     0.000
6068       0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6069       0.000     0.000     0.000     0.000     0.000     0.000     1.300 10   .300     0.000     0.000
6070       0.000     0.000     0.000     0.000     0.000      .700     1.800 10  0.000     0.000     0.000
6071       1.700     0.000     0.000     0.000     0.000      .400     1.200     0.000     0.000     0.000
6072       0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6073       1.800     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6074        .300     0.000     0.000      .800     0.000     0.000     0.000     0.000     0.000     0.000
6075       1.200     0.000     0.000     0.000     3.300     0.000     0.000     0.000     0.000     0.000
6076       1.500     0.000     0.000     0.000     2.000     0.000     0.000     0.000     0.000     0.000
6077       0.000     0.000     0.000     0.000     4.400     0.000     0.000     0.000     0.000     0.000
6078       1.000     0.000     0.000     1.400     0.000      .700      .700     0.000     0.000     0.000
6079       5.500     0.000     0.000     0.000     0.000     0.000     0.000     3.000     0.000     0.000
6080        .500     0.000     0.000     0.000     0.000     0.000      .500     0.000     0.000     0.000
6081       1.400     0.000     0.000     0.000     0.000     0.000      .600     0.000     0.000     0.000
6082       1.000     0.000     0.000     0.000     0.000     0.000      .800     0.000     0.000     0.000
6083       7.400     0.000     0.000     1.100     0.000      .900     3.400     0.000     0.000     0.000
6084       0.000     0.000     0.000     0.000     0.000     4.300    30.200 40  3.100     0.000     0.000
6085        .800     0.000     0.000     0.000     0.000     0.000     2.000     1.200     0.000     0.000
6086        .700     3.100     0.000     0.000     0.000     9.500    13.000     1.400     0.000     0.000
6087        .700     4.600     0.000     0.000     0.000    10.200    29.200     0.000     0.000     0.000
6088        .800     0.000     0.000     0.000     0.000    14.700 24 27.000 30   .800     0.000     0.000
6089       0.000     0.000     0.000     0.000     0.000     0.000     1.400     0.000     0.000     0.000
6090       0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
6092       1.600     4.800     0.000     0.000     0.000     4.400     4.400     0.000     0.000     0.000
6094       6.800      .700     0.000     0.000     0.000     8.500    15.600     1.000     0.000     0.000
6096       1.100      .900     0.000     0.000     0.000     1.700     6.800     0.000     0.000     0.000
6097       0.000     0.000     0.000     0.000     0.000     0.000     1.000     2.300     0.000     0.000
6098       1.000    12.600     0.000     0.000     0.000     0.000     6.500  7  1.000     0.000     0.000
6099       0.000     0.000     0.000     0.000     0.000     7.700    43.000 60 21.400 28  0.000     0.000
6100       0.000     0.000     0.000     0.000     0.000    13.200 18 45.000 60 10.400 15  0.000     0.000
6101       0.000     0.000     0.000     0.000     0.000      .700 16 32.800 33 20.200 16  0.000     0.000
6102       0.000     3.700     0.000     0.000     0.000    15.500 31 36.700 55 13.600     0.000     0.000
6106       0.000     0.000     0.000     0.000     0.000     0.000     0.000      .900     0.000     0.000
6108       0.000     0.000     0.000     0.000     0.000     9.800     5.700     1.600     0.000     0.000
6109       1.200     0.000     0.000     0.000     0.000     0.000     0.000     1.200     0.000     0.000
6110       2.000     9.600     0.000     0.000     0.000     2.000     9.100     5.000     0.000     0.000
6111       0.000     0.000     0.000     0.000     0.000     0.000     1.600     0.000     0.000     0.000
6112       0.000     0.000     0.000     0.000     0.000     1.200     4.300     0.000     0.000     0.000
6113       0.000     1.000     0.000     0.000     0.000     0.000     1.000     0.000     0.000     0.000
6114       5.600     0.000     0.000     0.000     0.000     0.000    18.300     1.400     0.000     0.000
6115       0.000     0.000     0.000     0.000     0.000     0.000    15.500     0.000     0.000     0.000
6116       0.000     3.500     0.000     0.000     0.000      .800     5.400     0.000     0.000     0.000
6117       1.000     1.400     0.000     0.000     0.000     0.000     2.100     0.000     0.000     0.000
1008       0.000     0.000     0.000      .700     0.000     0.000     0.000     0.000     0.000     0.000
1009       0.000     0.000     0.000     0.000     0.000     0.000      .800     0.000     0.000     0.000
1010       1.400     0.000     0.000      .700     0.000     0.000     0.000     0.000     0.000     0.000
1011       0.000     0.000     0.000     0.000     0.000     0.000     0.000     1.000     0.000     0.000
1015       0.000     0.000     0.000     0.000     0.000     0.000     1.800  2  1.800  2  0.000     0.000
1016       0.000     0.000     0.000     0.000     0.000     0.000     6.200     0.000     0.000     0.000
1017       0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
1020       1.900     0.000     0.000     1.000     1.200     0.000     0.000     0.000     0.000     0.000
1021       0.000     0.000     0.000     2.200     2.600     0.000     0.000     0.000     0.000     0.000
1022        .700     0.000     0.000     0.000     0.000     0.000    12.400 10  1.900     0.000     0.000
1026       2.600     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
1027       6.700     0.000     0.000     0.000     0.000     0.000    16.700     0.000     0.000     0.000
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| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1029 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 1.000 | | 16.100 | 18 | 0.000 | | 0.000 | 0.000 |
| 1034 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | .300 | | 2.200 | 5 | 0.000 | | 0.000 | 0.000 |
| 1035 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1036 | .300 | 0.000 | | 0.000 | .600 | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1037 | 0.000 | 0.000 | | 0.000 | 0.000 | .600 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1038 | 0.000 | 0.000 | | 0.000 | 0.000 | .700 | 7 | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1039 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1040 | 0.000 | 0.000 | | 1.600 | 0.000 | 5.400 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1043 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 0.000 | | 0.000 | | 0.000 | | .900 | 0.000 |
| 1044 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1045 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1046 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1047 | 1.000 | 0.000 | | 0.000 | 1.300 | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1048 | 1.400 | 0.000 | | 0.000 | 0.000 | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1051 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 1.500 | | 6.900 | 30 | 0.000 | | 0.000 | 0.000 |
| 1053 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1054 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1055 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 3.800 | | 26.100 | 100 | 10.800 | | 0.000 | 0.000 |
| 1056 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 0.000 | | 1.900 | | 0.000 | | 0.000 | 0.000 |
| 1057 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 2.000 | | 11.400 | 40 | 2.000 | | 0.000 | 0.000 |
| 1058 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 4.700 | | 41.200 | 80 | 5.500 | | 0.000 | 0.000 |
| 1059 | 0.000 | 1.200 | | 0.000 | 0.000 | 0.000 | | 1.500 | | 2.100 | 8 | 4.900 | | 0.000 | 0.000 |
| 1060 | 0.000 | 1.400 | | 0.000 | 0.000 | 0.000 | | 22.500 | 20 | 46.700 | 67 | .700 | | 0.000 | 0.000 |
| 1062 | 0.000 | 5.200 | 3 | 0.000 | 0.000 | 0.000 | | 5.900 | 5 | 33.500 | 41 | 1.600 | 1 | 0.000 | 0.000 |
| 1063 | 0.000 | .600 | | 0.000 | 0.000 | 0.000 | | 11.000 | 11 | 45.400 | 56 | 6.300 | 2 | 0.000 | 0.000 |
| 1064 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 9.500 | 15 | 41.000 | 62 | 0.000 | | 0.000 | 0.000 |
| 1065 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 3.200 | | 26.000 | 56 | 1.600 | | 0.000 | 0.000 |
| 1066 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 1.100 | | 6.100 | 22 | 0.000 | | 0.000 | 0.000 |
| 1067 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 11.400 | 4 | 78.800 | 87 | 5.700 | 2 | 0.000 | 0.000 |
| 1068 | 1.900 | 3.800 | | 0.000 | 0.000 | 0.000 | | 5.100 | | 62.800 | 75 | 0.000 | | 0.000 | 0.000 |
| 1069 | 1.100 | 3.500 | 3 | 0.000 | 0.000 | 0.000 | | 4.000 | | 42.900 | 67 | 2.900 | 5 | 0.000 | 0.000 |
| 1070 | 0.000 | 5.700 | 13 | 0.000 | 0.000 | 0.000 | | 3.200 | 3 | 23.800 | 41 | 7.000 | 13 | 0.000 | 0.000 |
| 1071 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1072 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 1.800 | 1 | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1073 | 0.000 | 2.400 | | 0.000 | 0.000 | 0.000 | | 8.900 | 11 | 37.200 | 64 | 11.200 | 17 | 0.000 | 0.000 |
| 1074 | 0.000 | 4.800 | | 0.000 | 0.000 | 0.000 | | 5.600 | | 52.200 | 78 | 11.300 | 12 | 0.000 | 0.000 |
| 1075 | 2.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 0.000 | | 16.100 | 9 | .900 | | 0.000 | 0.000 |
| 1076 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 17.000 | 19 | 38.500 | 62 | 9.500 | 4 | 0.000 | 0.000 |
| 1077 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1078 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 0.000 | | 0.000 | | 1.000 | | 0.000 | 0.000 |
| 1080 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | 0.000 |
| 1081 | 0.000 | 1.300 | | 0.000 | 0.000 | 0.000 | | 9.900 | 7 | 46.600 | 74 | 5.800 | | 0.000 | 0.000 |
| 1082 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | .600 | | 11.700 | | .900 | | 0.000 | 0.000 |
| 1083 | 0.000 | 5.300 | 10 | 0.000 | 0.000 | 0.000 | | 11.500 | 25 | 43.300 | 45 | 9.700 | | 0.000 | 0.000 |
| 1084 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 10.700 | 14 | 33.800 | 80 | 8.000 | | 0.000 | 0.000 |
| 1085 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 2.800 | | 7.600 | 19 | 0.000 | | 0.000 | 0.000 |
| 1086 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 6.600 | 7 | 50.600 | 84 | 9.100 | | 0.000 | 0.000 |
| 1087 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 13.200 | 9 | 50.400 | 85 | 1.300 | | 0.000 | 0.000 |
| 1088 | 0.000 | 7.000 | | 0.000 | 0.000 | 0.000 | | 13.400 | 12 | 50.000 | 87 | 5.100 | | 0.000 | 0.000 |
| 1089 | 0.000 | 1.800 | | 0.000 | 0.000 | 0.000 | | 22.000 | 40 | 53.600 | 60 | 8.400 | | 0.000 | 0.000 |
| 1090 | 0.000 | 3.400 | | 0.000 | 0.000 | 0.000 | | 18.400 | 32 | 53.300 | 68 | 3.000 | | 0.000 | 0.000 |
| 1093 | 0.000 | 3.500 | | 0.000 | 0.000 | 0.000 | | 16.000 | | 37.000 | | 4.400 | | 0.000 | 0.000 |
| 1095 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 8.100 | | 30.900 | 71 | 0.000 | | 0.000 | 0.000 |
| 1098 | 0.000 | 7.900 | | 0.000 | 0.000 | 0.000 | | 6.100 | | 34.400 | | 11.600 | | 0.000 | 0.000 |
| 1097 | 0.000 | 10.800 | 6 | 0.000 | 0.000 | 0.000 | | 13.800 | 23 | 56.500 | 70 | 4.900 | | 0.000 | 0.000 |
| 1099 | 0.000 | 2.200 | | 0.000 | 0.000 | 0.000 | | 8.000 | | 59.600 | | 0.000 | | 0.000 | 0.000 |
| 1100 | 0.000 | .700 | | 0.000 | 0.000 | 0.000 | | 17.800 | 20 | 38.800 | 71 | 4.100 | | 0.000 | 0.000 |
| 1101 | 0.000 | 0.000 | | 0.000 | 0.000 | 0.000 | | 2.700 | 3 | 14.100 | 23 | 1.000 | | 0.000 | 0.000 |
| 1102 | 0.000 | 2.100 | | 0.000 | 0.000 | 0.000 | | 15.900 | 30 | 37.900 | 56 | 7.400 | | 0.000 | 0.000 |
| 1103 | 0.000 | 1.800 | | 0.000 | 0.000 | 0.000 | | 11.600 | 13 | 38.600 | 61 | 4.300 | 1 | 0.000 | 0.000 |
| 1104 | 0.000 | 2.000 | 4 | 0.000 | 0.000 | 0.000 | | 9.600 | 11 | 51.800 | 57 | 0.000 | | 0.000 | 0.000 |
| 1105 | .500 | 1.900 | | 0.000 | 0.000 | 0.000 | | 12.300 | 9 | 62.700 | 43 | 10.400 | 9 | 0.000 | 0.000 |
| 1106 | 0.000 | 2.000 | | 0.000 | 0.000 | 0.000 | | 10.000 | 8 | 46.800 | 67 | 5.500 | | 0.000 | 0.000 |
| 1107 | 3.300 | .900 | | 0.000 | 0.000 | 0.000 | | 15.700 | 13 | 45.600 | 76 | 4.500 | | 0.000 | 0.000 |
| 1109 | 0.000 | 3.900 | 5 | 0.000 | 0.000 | 0.000 | | 2.400 | 2 | 35.600 | 35 | 0.000 | | 0.000 | 0.000 |

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1110    0.000       0.000       0.000       0.000       0.000       0.000      46.300       3.800       0.000       0.000
1111    5.500       0.000       0.000       0.000       0.000       3.500 8    30.400 36    0.000       0.000       0.000
1112   14.000       2.400 29    0.000       0.000       0.000       2.400      50.000 25    1.200       0.000       0.000
1113   24.500       1.600       0.000       0.000       0.000       2.600 3    29.700 56    1.200       0.000       0.000
1114    9.200       1.200       0.000       0.000       0.000       4.700 6    25.000 82    2.100       0.000       0.000
1115    4.800       5.000       0.000       0.000       0.000       2.300      34.400 67    5.600 5     0.000       0.000
1116    1.400       3.100 8     0.000       0.000       0.000       5.200 7    43.500 67    5.200       0.000       0.000
1119    1.200       0.000       0.000       0.000       0.000       6.400 5    32.400 42    2.000       0.000       0.000
1120    0.000       0.000       0.000       0.000       0.000      11.800 6    37.100 60    4.400       0.000       0.000
1124    0.000        .900       0.000       0.000       0.000       0.000      12.700 14    3.300       0.000       0.000
1125    0.000       1.100       0.000       0.000       0.000       6.900      34.800 60    3.800       0.000       0.000
1126    0.000       5.700       0.000       0.000       0.000       4.100 7    39.000 52    9.500       0.000       0.000
1127    0.000       2.800 6     0.000       0.000       0.000      13.700      38.000      14.400       0.000       0.000
1128    0.000      11.400       0.000       0.000       0.000      14.700 20   36.600 50    8.700 5     0.000       0.000
1130    0.000       3.100       0.000       0.000       0.000      11.800      37.100       4.400       0.000       0.000
1131   13.100       0.000       0.000       0.000       0.000       6.600 5    26.800 38    3.900       0.000       0.000
1132    1.600       3.700       0.000       0.000       0.000       3.400 6     6.000 6      .800       0.000       0.000
1133     .600       0.000       0.000       0.000       0.000       1.400       0.000       0.000       0.000       0.000
1134    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
1135    0.000       0.000       0.000       0.000       0.000       0.000       1.600       0.000       0.000       0.000
1136    0.000       0.000       0.000       0.000       0.000       0.000       3.000       0.000       0.000       0.000
1137    3.100       0.000       0.000       0.000       0.000       8.200      17.300 34    1.100       0.000       0.000
1138    1.100       2.500       0.000       0.000       0.000      13.500      32.700 56    4.600       0.000       0.000
1139    2.300       2.600       0.000       0.000       0.000       0.000      16.900       1.900       0.000       0.000
1140     .600        .300       0.000       0.000       0.000       0.000        .300       0.000       0.000       0.000
1142    0.000       0.000       0.000       0.000       0.000       0.000       2.400 4      .700       0.000       0.000
1143    0.000       2.300       0.000       0.000       0.000       0.000       9.600 3     0.000       0.000       0.000
1118     .600       1.600       0.000       0.000       0.000       7.000      41.200 55    8.000 11    0.000       0.000
4003    0.000       0.000       0.000       0.000       0.000       0.000       2.400       0.000       0.000       0.000
4004    0.000       0.000       0.000       0.000       0.000       0.000       2.700 3     0.000       0.000       0.000
4005    0.000       0.000       0.000       0.000       0.000       0.000       2.400       0.000       0.000       0.000
4006    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
4007    0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000

SAMPLE  NAME    71          72          73          74          75

             SIGMSCHL    OSANGSPA    TRIFOCCI    TROCHSQA    MBULIMAR

7902    0.000       0.000       0.000       0.000       4.000
7903    0.000       0.000       0.000       0.000       0.000
7904    0.000       0.000       0.000       0.000       1.000
7906    0.000       0.000       0.000       0.000       0.000
7907    0.000       0.000       0.000       0.000       0.000
7908    0.000       0.000       0.000       0.000       0.000
7909    0.000       0.000       0.000       0.000       0.000
7910    0.000       0.000       0.000       0.000       0.000
7911    0.000       0.000       0.000       0.000       0.000
7912    0.000       0.000       0.000       0.000       0.000
7913    0.000       0.000       0.000       0.000       0.000
7914    0.000       0.000       0.000       0.000       2.000
7917    0.000       0.000       0.000       0.000       0.000
7918    0.000       0.000       0.000       0.000       0.000
7948    0.000       0.000       0.000       0.000       0.000
7949    0.000       0.000       0.000       0.000       0.000
7950    0.000       0.000       0.000       0.000       0.000
7952    5.000       0.000       0.000       0.000       0.000
7953    0.000       0.000       0.000       0.000       0.000
7955    0.000       0.000       0.000       0.000       0.000
7956    0.000       0.000       0.000       0.000        .600
7957    0.000       0.000       0.000       0.000        .900
7958    0.000       0.000       0.000       0.000       2.600
7959    0.000       0.000       0.000       0.000       8.000
7960    0.000       0.000       0.000       0.000       1.000
7947    0.000       0.000       0.000       0.000       0.000
0802    0.000       0.000       0.000       1.000       0.000
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0817          0.000     0.000     0.000     0.000     0.000
0818          0.000     0.000     0.000     0.000     0.000
0819          0.000     0.000     0.000     0.000     0.000
0820          0.000     0.000     0.000     0.000     0.000
0821          0.000     0.000     0.000     0.000     0.000
0822          0.000     0.000     0.000     0.000     0.000
0824          0.000     0.000     0.000     0.000     0.000
0825          0.000     0.000     0.000     0.000     0.000
0830          0.000     0.000     0.000     0.000     0.000
0832          0.000     0.000     0.000     0.000     0.000
0833          0.000     0.000     0.000     1.700     0.000
0835          0.000     0.000     0.000     1.400     0.000
0838          0.000     0.000     0.000     0.000     0.000
0839          0.000     0.000     0.000     0.000     0.000
0841          0.000     0.000     0.000     0.000     0.000
0843          0.000     0.000     0.000     0.000     0.000
0844          0.000     0.000     0.000     0.000     0.000
0845          0.000     0.000     0.000     0.000     0.000
0847          0.000     0.000     0.000     0.000     0.000
0848          0.000     0.000     0.000     0.000     0.000
0849          0.000     0.000     0.000     0.000      .400
0851          0.000     0.000     0.000     0.000     0.000
0852          0.000     0.000     0.000     0.000     0.000
0856          0.000     0.000     0.000     0.000     0.000
0857          0.000     0.000     0.000     0.000     0.000
8002          0.000     0.000     0.000     0.000    12.100
8004          0.000     0.000     0.000     0.000     0.000
8005          0.000     0.000     0.000     0.000     0.000
8006          0.000     0.000     0.000     0.000     0.000
8007          0.000     0.000     0.000     0.000     0.000
8010          0.000     0.000     0.000     0.000     0.000
8011          0.000     0.000     0.000     0.000     0.000
8012          0.000     0.000     0.000     0.000     0.000
8013          3.900     0.000     0.000     0.000     0.000
8017          0.000     0.000     0.000     0.000     0.000
8018          0.000     0.000     0.000     0.000     0.000
8027          0.000     0.000     0.000     0.000     0.000
8035          0.000     0.000     0.000     0.000     0.000
8036          0.000     0.000     0.000     0.000     0.000
8037          0.000     0.000     0.000     0.000     0.000
8038          0.000     0.000     0.000     0.000     0.000
8039          0.000     0.000     0.000     0.000     0.000
8040          0.000     0.000     0.000     0.000     0.000
8042          0.000     0.000     0.000     0.000     0.000
8043          0.000     0.000     0.000     0.000     0.000
8044          0.000     0.000     0.000     0.000     0.000
8060          0.000     0.000     0.000     0.000     7.400
8061          0.000     0.000     0.000     0.000     1.700
8062          0.000     0.000     0.000     0.000     0.000
8063          0.000     0.000     0.000     0.000     0.000
8064          0.000     0.000     0.000     0.000     0.000
8065          0.000     0.000     0.000     0.000     0.000
8066          0.000     0.000     0.000     0.000     0.000
8067          0.000     0.000     0.000     0.000     0.000
6003          0.000     0.000     0.000     0.000     0.000
6005          0.000     0.000     0.000     0.000     0.000
6006          0.000     0.000     0.000     0.000      .600
6007          0.000     0.000     0.000     0.000     0.000
6019          0.000     0.000     0.000     0.000     0.000
6032          0.000     0.000    30.700     0.000     0.000
6033          0.000     0.000     2.100     0.000     0.000
6034          0.000     0.000    12.000     0.000     0.000
6036          0.000     0.000     0.000     0.000     1.800
6041          0.000    11.600     0.000     0.000     0.000
6042          0.000      .900     0.000     0.000     0.000
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6050          0.000     1.600     0.000     0.000     0.000
6051          0.000     4.700     0.000     0.000     0.000
6052          0.000     0.000     0.000     0.000     0.000
6053          0.000     0.000     0.000     0.000     0.000
6055          0.000     0.000     0.000     0.000     0.000
6056          0.000     0.000     0.000     0.000     0.000
6057          0.000     0.000     0.000     0.000     0.000
6058          0.000     0.000     0.000     0.000     0.000
6062          0.000     0.000     0.000     0.000     1.800
6063          0.000     0.000     0.000     0.000     0.000
6064          0.000     0.000     0.000     0.000     0.000
6065          0.000     0.000     0.000     0.000     0.000
6066          0.000     0.000     0.000     0.000     2.000
6068          0.000     0.000     0.000     0.000     0.000
6069          0.000     0.000     0.000     0.000     0.000
6070          0.000     0.000     0.000     0.000     0.000
6071          0.000     0.000     0.000     0.000     0.000
6072          0.000     0.000     0.000     0.000      .600
6073          0.000     0.000     0.000     0.000     0.000
6074          0.000     0.000     0.000     0.000     0.000
6075          0.000     0.000    11.500     0.000      .800
6076          0.000     0.000    39.300     0.000     1.200
6077          0.000     0.000     0.000     0.000      .800
6078          0.000      .400     3.800     0.000     0.000
6079          0.000     0.000     0.000     0.000     0.000
6080          0.000     0.000     0.000     0.000     0.000
6081          0.000     0.000     0.000     0.000     0.000
6082          0.000     0.000     0.000     0.000     0.000
6083          0.000     0.000     0.000     0.000     0.000
6084          0.000     0.000     0.000     0.000     0.000
6085          0.000     0.000     0.000     0.000     0.000
6086          0.000     0.000     0.000     0.000     0.000
6087          0.000     0.000     0.000     0.000     0.000
6088          0.000     0.000     0.000     0.000     0.000
6089          0.000     0.000     0.000     0.000     0.000
6090          0.000     0.000     0.000     0.000     0.000
6092          0.000     0.000     0.000     0.000     0.000
6094          0.000     0.000     0.000     0.000     0.000
6096          0.000     0.000     0.000     0.000     0.000
6097          0.000     0.000     0.000     0.000     0.000
6098          0.000     0.000     0.000     0.000     0.000
6099          0.000     0.000     0.000     0.000     0.000
6100          0.000     0.000     0.000     0.000     0.000
6101          0.000     0.000     0.000     0.000     0.000
6102          0.000     0.000     0.000     0.000     0.000
6106          0.000     0.000     0.000     0.000     0.000
6108          0.000     0.000     0.000     0.000     0.000
6109          0.000     0.000     0.000     0.000     0.000
6110          0.000     0.000     0.000     0.000     0.000
6111          0.000     0.000     0.000     0.000     1.600
6112          0.000     0.000     0.000     0.000     0.000
6113          0.000     0.000     0.000     0.000     0.000
6114          0.000     0.000     0.000     0.000     0.000
6115          0.000     0.000     0.000     0.000     0.000
6116          0.000     0.000     0.000     0.000     0.000
6117          0.000     0.000     0.000     0.000     0.000
1008          0.000     0.000     0.000     0.000     9.400
1009          0.000     0.000     0.000     0.000     0.000
1010          0.000      .700     0.000     0.000     0.000
1011          0.000     0.000     0.000     0.000     0.000
1015          0.000     0.000     0.000     0.000     0.000
1016          0.000     0.000     0.000     0.000     0.000
1017          0.000     0.000     0.000     0.000     0.000
1020          0.000     0.000     0.000     0.000     1.000
1021          0.000     0.000     0.000     0.000     0.000
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1022      0.000    0.000    0.000    0.000    0.000
1026      0.000    0.000    0.000    0.000    0.000
1027      0.000    0.000    0.000    0.000    0.000
1029      0.000    0.000    0.000    0.000    0.000
1034      0.000    0.000    0.000    6.500    0.000
1035      0.000    0.000    0.000   10.500    0.000
1036       .600    0.000    0.000    2.600    0.000
1037      0.000    0.000    4.200    2.600    0.000
1038      0.000    0.000   38.300 45 1.400    2.100
1039      0.000    0.000   10.700    0.000    2.600
1040      0.000    0.000    6.200    3.700    0.000
1043      0.000    0.000    0.000    0.000    0.000
1044      0.000    0.000    0.000    0.000    0.000
1045      0.000    0.000    0.000    0.000    0.000
1046      0.000    0.000    0.000    0.000    0.000
1047      0.000    0.000    0.000     .300    3.300
1048      0.000    0.000    0.000    0.000    0.000
1051      0.000    0.000    0.000    0.000    0.000
1053      0.000    0.000    0.000    0.000    0.000
1054      0.000    0.000    0.000    0.000    0.000
1055      0.000    0.000    0.000    0.000    0.000
1056      0.000    0.000    0.000    0.000    0.000
1057      0.000    0.000    0.000    0.000    0.000
1058      0.000    0.000    0.000    0.000    0.000
1059      0.000    0.000    0.000    0.000    0.000
1060      0.000    0.000    0.000    0.000    0.000
1062      0.000    0.000    0.000    2.700    0.000
1063      0.000    0.000    0.000    0.000    0.000
1064      0.000    0.000    0.000    0.000    0.000
1065      0.000    0.000    0.000    0.000    0.000
1066      0.000    0.000    0.000    0.000    0.000
1067      0.000    0.000    0.000    0.000    0.000
1068      0.000    0.000    0.000    0.000    0.000
1069      0.000    0.000    0.000    0.000    0.000
1070      0.000    0.000    0.000    0.000    0.000
1071      0.000    0.000    0.000    0.000    0.000
1072      0.000    0.000    0.000    0.000    0.000
1073      0.000    0.000    0.000    0.000    0.000
1074      0.000    0.000    0.000    0.000    0.000
1075      0.000    0.000    0.000    0.000    2.400
1076      0.000    0.000    0.000    0.000    0.000
1077      0.000    0.000    0.000    0.000    0.000
1078      0.000    0.000    0.000    0.000    0.000
1080      0.000    0.000    0.000    0.000    0.000
1081      0.000    0.000    0.000    0.000    0.000
1082      0.000    0.000    0.000     .900    0.000
1083      0.000    0.000    0.000    0.000    0.000
1084      0.000    0.000    0.000    0.000    0.000
1085      0.000    0.000    0.000    0.000    0.000
1086      0.000    0.000    0.000     .900    0.000
1087      0.000    0.000    0.000    0.000    0.000
1088      0.000    0.000    0.000    0.000    0.000
1089      0.000    0.000    0.000    0.000    0.000
1090      0.000    0.000    0.000    0.000    0.000
1093      0.000    0.000    0.000    0.000    0.000
1095      0.000    0.000    0.000    0.000    0.000
1098      0.000    0.000    0.000    0.000    0.000
1097      0.000    0.000    0.000    0.000    0.000
1099      0.000    0.000    0.000    0.000    0.000
1100      0.000    0.000    0.000    0.000    0.000
1101      0.000    0.000    0.000    0.000    0.000
1102      0.000    0.000    0.000    0.000    0.000
1103      0.000    0.000    0.000    0.000    0.000
1104      0.000    0.000    0.000    0.000    0.000
1105      0.000    0.000    0.000    0.000    0.000
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1106              0.000      0.000      0.000      0.000      0.000
1107              0.000      0.000      0.000      0.000      0.000
1109              0.000      0.000      0.000      0.000      0.000
1110              0.000      0.000      0.000      0.000      0.000
1111              0.000      0.000      0.000      0.000      0.000
1112              0.000      0.000      0.000       .600      0.000
1113              0.000      0.000      0.000       .800      0.000
1114              0.000      0.000      0.000       .300      0.000
1115              0.000      0.000      0.000      2.500      0.000
1116              0.000      0.000      0.000      2.800      0.000
1119              0.000      0.000      0.000      0.000      0.000
1120              0.000      0.000      0.000      0.000      0.000
1124              0.000      0.000      0.000      2.600 3    0.000
1125              0.000      0.000      0.000      0.000 -    0.000
1126              0.000      0.000      0.000      0.000      0.000
1127              0.000      0.000      0.000      0.000      0.000
1128              0.000      0.000      0.000      1.500      0.000
1130              0.000      0.000      0.000      0.000      0.000
1131              0.000      0.000      0.000      0.000      0.000
1132              0.000      0.000      0.000      0.000      0.000
1133              0.000      0.000      0.000      0.000      0.000
1134              0.000      0.000      0.000      0.000      0.000
1135              0.000      0.000      0.000      0.000      0.000
1136              0.000      0.000      0.000      0.000      0.000
1137              0.000      0.000      0.000       .900      0.000
1138              0.000      0.000      0.000      0.000      0.000
1139              0.000      0.000      0.000      0.000      0.000
1140              0.000      0.000      0.000      0.000      5.300
1142              0.000      0.000      0.000      0.000      0.000
1143              0.000      0.000      0.000      0.000       .900
1118              0.000      0.000      0.000      0.000      0.000
4003              0.000      0.000      0.000      0.000      0.000
4004              0.000      0.000      0.000      0.000      0.000
4005              0.000      0.000      0.000      0.000      0.000
4006              0.000      0.000      0.000      0.000      0.000
4007              0.000      0.000      0.000      0.000      0.000
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# APPENDIX VIII

Regression statistics produced through applying a 0.001 cut off. (refer to Chapter 6). SEE = Standard Error of Estimate.

| VARIABLE NUMBER | VARIABLE NAME | REGRESSION COEFFICIENT | STD. ERROR OF REG. COEFF. | COMPUTED t VALUE |
|---|---|---|---|---|
| | | DEPTH | | |
| 8 | F2 | -59.90625 | 22.40832 | -2.673 |
| 12 | F6 | -72.93839 | 24.04646 | -3.033 |
| 11 | F5 | 79.36601 | 20.54404 | 3.860 |
| 9 | F3 | 79.02030 | 25.22223 | 3.126 |
| 13 | F7 | -21.67884 | 19.49142 | -1.112 |
| 14 | F8 | -58.46799 | 23.55363 | -2.482 |
| 7 | F1 | 36.88112 | 22.65556 | 1.628 |
| 10 | F4 | 12.55029 | 18.02700 | .696 |
| | | SEE = 54.2m | | |
| | | TEMPERATURE | | |
| 14 | F8 | -5.60670 | .69694 | -8.046 |
| 7 | F1 | -3.77164 | .43887 | -8.594 |
| 8 | F2 | -3.16055 | .50773 | -6.232 |
| 11 | F5 | 1.66009 | .57536 | 2.885 |
| 10 | F4 | 1.44440 | .56352 | 2.563 |
| | | SEE = 1.8 C | | |
| | | SALINITY | | |
| 14 | F8 | -2.48216 | .27198 | -9.126 |
| 11 | F5 | 1.48253 | .25270 | 5.867 |
| 9 | F3 | .51991 | .27033 | 1.997 |
| 13 | F7 | .79693 | .25758 | 3.094 |
| | | SEE = .77 | | |
| | | GRAVEL | | |
| 9 | F2 | 22.89394 | 4.21771 | 5.428 |
| 13 | F7 | 17.83077 | 5.52203 | 3.229 |
| | | SEE = 16 | | |
| | | SAND | | |
| 9 | F3 | -14.27837 | 11.63006 | -1.228 |
| 11 | F5 | 52.30125 | 9.96432 | 5.249 |
| 12 | F6 | 52.04661 | 10.57108 | 4.923 |
| 8 | F2 | 26.75690 | 9.07305 | 2.949 |
| | | SEE = 28 | | |
| | | MUD | | |
| 8 | F2 | -48.74423 | 9.24458 | -5.273 |
| 9 | F3 | 23.07817 | 11.42211 | 2.020 |
| 12 | F6 | -51.72531 | 10.22297 | -5.060 |
| 11 | F5 | -41.47570 | 9.82860 | -4.220 |
| 13 | F7 | -31.18985 | 8.93054 | -3.492 |
| 7 | F1 | -15.51767 | 8.60288 | -1.804 |
| | | SEE = 26 | | |