

## THE MARINE FISHES OF NOVA SCOTIA

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## ABSTRACT.

The present paper describes 151 species, belonging to 134 genera and 82 families, which occur in the Nova Scotian region. Among them, 17 may be found in both fresh and salt water, while the remainder are truly marine fishes. The latter group may be divided into three categories,—permanent residents (76), southern species (46) and northern fishes (12). The explanation of such a mixture of faunistic elements lies in the fact that, during the late summer months (August to October), the temperature of the upper layers of water along our shores increases greatly (up to about 68°F.), while during the early spring (January to April) the temperature drops to almost 30°F. Hence, southern fishes can easily stray to our coast during the warm season and the northern forms do the same during the late winter and early spring. On the whole the Nova Scotian fishes are rather typical species of mid-Atlantic latitudes.

## INTRODUCTION.

The authors, under the Biological Board of Canada, have been engaged in research on certain commercial fishes of the Canadian Atlantic coast during the period 1931-35. Numerous requests to name fishes from various localities, to give suggestions concerning their means of identification, and to estimate the number of species found in Nova Scotian waters have influenced them to prepare this paper on all the marine fishes of this region.

The main object of this work is to give a comprehensive key by means of which anyone may identify the fishes, commercial and non-commercial, of Nova Scotian waters, since no such key exists. It is necessary to treat all species alike since the non-commercial fishes of to-day may be the important ones of to-morrow.

A complete review is given of all the marine and anadromous fishes (151 species) found around the Nova Scotian coast, with the exception of the Gulf of St. Lawrence. The area under consideration is bounded on the northeast by Cabot Strait and the Laurentian Channel, and on the south by the Atlantic Slope and the Fundian Channel. The coastal waters,

about twenty miles in width, along the Nova Scotian coast of the Bay of Fundy have been considered as the western and northwestern boundary of this region. Figure I shows the extent of this region in detail.

In general, this Nova Scotian region, extending from north latitude  $42^{\circ} 15'$  to  $47^{\circ}$  and from west longitude  $57^{\circ}$  to  $66^{\circ} 45'$ , covers approximately fifty thousand square miles of coastal and "bank" waters. The depth of water rarely exceeds two hundred fathoms.

The present paper is based on the personal examination of 120 species collected in the region under survey and completed by the inclusion of 31 additional species described in the literature.

The authors are deeply grateful to all those who have facilitated their task: to the Biological Board of Canada for working facilities; to Doctors A. H. Leim and D. B. Finn for kind permission to examine the museum specimens at the Fisheries Experimental Station, Halifax; to Harry Piers, Esq., Curator of the Provincial Museum, Halifax, for valuable assistance and kind permission to examine Museum specimens. Mention should be made also of the many specimens of rare fishes brought from the "banks" by Captains Frank Tidman and H. S. Hansen, and Mr. J. Mahar, Radio Operator. The inshore fishes were procured through the kindness of Captain A. E. Calder, Research Vessel *Zoarces*, and Mr. C. K. Darrach of the Fisheries Experimental Station.

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#### IDENTIFICATION OF FISHES.

##### REMARKS ON THE KEY.

Due to the fact that the aim of this Key is to facilitate the non-specialist in the identification of native fishes, it has been made in a rather simple way. Hence, as a rule, only external and the more conspicuous characters have been used. In the characteristics of genera and families, only those char-

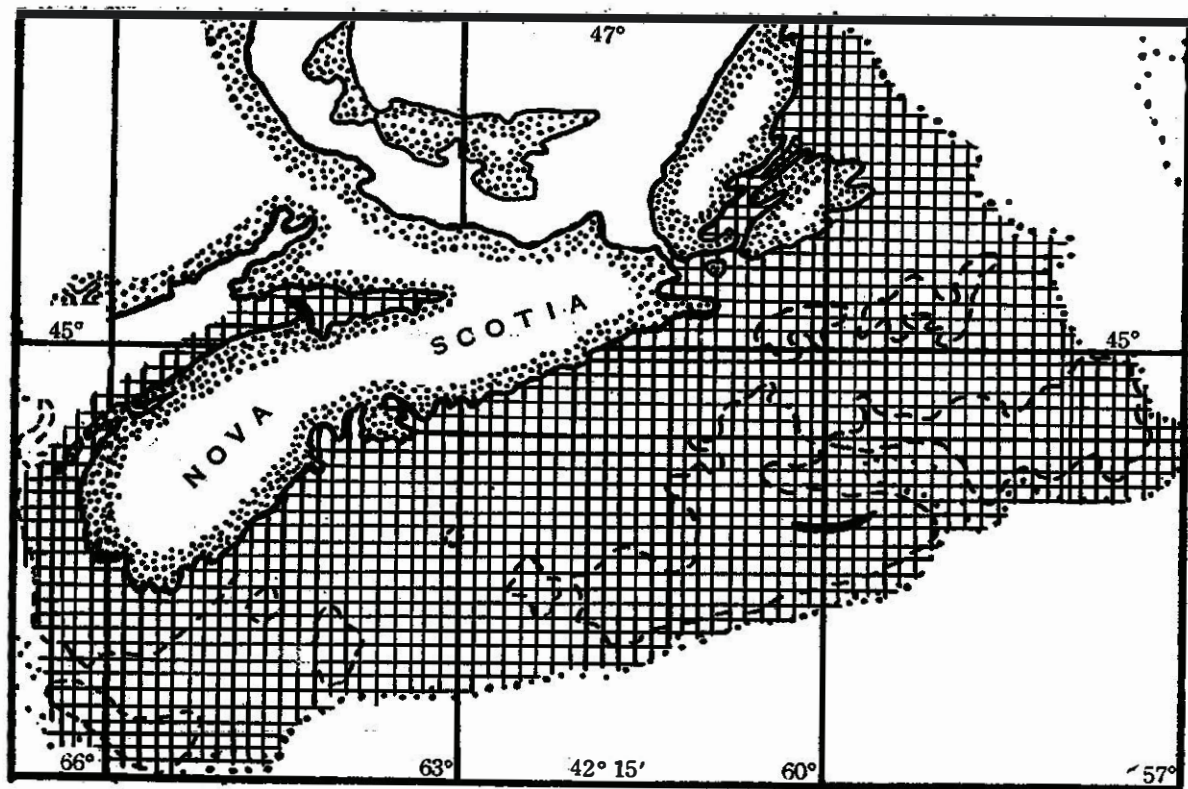


Fig. I—Map of Nova Scotian region. Cross-hatching shows the extent of the area under consideration.

acters, which are typical of the fishes present in our area, have been considered. Because of this, our Key is rather artificial, and is limited in use primarily to the area under consideration. However, it may be used in all the Maritime Provinces of Canada, except for a few species which have not been found in the Nova Scotian region.

The traditional method of making a key has been to use a complex system of letters or numerals in the identification of a specimen. Instead of this, we have used the simpler method of IF and BUT IF which has been applied to good effect by Walford<sup>1</sup> for the fishes of California.

To use this "self-directing" Key, simply read both parts of the first Section where further directions will be found. It is necessary, first of all, to compare the characteristics listed there with those of the fish in hand. Then it must be decided into which part of the Section the specimen in hand belongs. When this is done, follow the instructions given in that part of the Section, continuing this procedure until finally the scientific name of the family to which your specimen belongs, is determined.

If a common name for the fish is mentioned in that Section, then your identification is finished. The scientific name (generic and specific) for your fish is given in the chapter, *Description of Fishes*, under the title of the family to which it belongs. This family may be readily found by reference to the Roman numerals in front of the scientific family names in the Key for Families.

In the case, however, where the common name for the fish is replaced by the statement, "a member of — family," then see the key for the genera or species of this particular family in the Description of Fishes, in order to finally name your fish.

However, it may happen that certain specimens of fishes will not be identifiable as far as the specific name by using this Key. In such a case, the probability is that the fish is a strange and unusual species for the region, and it is urged

<sup>1</sup>Walford. *Div. Fish Game, Calif., Fish. Bull.*, 28, 183 pp. (1931).

that such a specimen (with information on date and place of capture) be sent to the authors at the Fisheries Experimental Station, Halifax, N. S.

In this Key the most important characters are mentioned first in every Section. The numbering of the Sections in each part of the Key is done independently.

The Key for Families has been divided, primarily, into a General Part and a Specific Part. The former is the guide to the three large Divisions treated in the Specific Part. Division I and Division II are not subdivided, but Division III has three smaller Subdivisions.

A brief statement of the main characters in each of these three Divisions is set forth here. The Lamprey and Hag, belonging to the first Division, are easily recognized by the absence of paired fins and by the presence of naked snake-like bodies. The Sharks, Skates and Chimaera are considered in the second Division. The first two groups have at least 5 pairs of gill slits without covering, while the Chimaera have only 1 gill opening on each side of the head, and each opening is enclosed by a flap of skin. All the fishes of this second Division have, in common, a thick leathery skin on body and head which covers the fins also, and the males have the inner part of the ventral fins modified into claspers.

The third Division is the most complicated, embracing Bony Fishes. The Sturgeon with 5 rows of large, bony shields running lengthwise of the body and an elongated, flattened, shovel-like snout cannot be confused with any other fish.

The remaining great majority of fishes are listed in three subsequent Subdivisions. Each Subdivision is characterized by the difference in development, structure and position of the ventral fins. The first Subdivision includes the fishes without ventral fins, such as the Eel group, Catfish, Swordfish, Pipefish, etc., and fishes with ventral fins modified into a sucking disc as Lumpfish and Sea Snail. The second Subdivision embraces fishes with ventral fins in a thoracic and jugular position, Mackerel and Codfish types, respectively. The remaining fishes, which are considered in the third Sub-

division, have the ventral fins in an abdominal position, as in the case of Herring and Salmon.

To facilitate the use of the Key, 129 drawings of various fishes have been included. At least one representative of each of the 82 families mentioned in this paper has been depicted, and in the case of economically important families or curious species, additional drawings have been prepared.

These drawings are semi-schematic, and the more important systematic characters, as, for example, adipose fins, maxillaries, etc., have been shown in solid black to make them more conspicuous. As a rule, the exact number of spines in the first dorsal and anal fins are indicated in the drawings when such characters are of importance in identification. For the same reason, on some occasions, scales and colour patterns are also shown.

The great majority of the drawings are taken from the fourth volume of the celebrated treatise of Jordan and Evermann<sup>2</sup>, while the remaining drawings are taken from other authors as follows: Figs. VI, VII, XXXIX, XLV, LXIII, CXII and CXXIX from Bigelow and Welsh<sup>3</sup>; Figs. XIII, XIV and XVIII from Bigelow and Schroeder<sup>4</sup>; Figs. XLIII, XLIV and LXXXVII from Goode and Bean<sup>5</sup>; Figs. IV, XVI, XVII and XIX-XXIII from Garman<sup>6</sup>; Figs. LXIV and LXVI-LXXI from Huntsman<sup>7</sup>; Figs. CXX-CXXII from Jensen<sup>8</sup>; Figs. XII, LXI and LXXXV from La Gorce<sup>9</sup> and Fig. CXIV from Beebe<sup>10</sup>; Figs. LII and CVII from Knipovich<sup>11</sup>; Figs. XV, XXXIV, XLVI, CXVIII and CXXX from

<sup>2</sup>Jordan and Evermann. *Bull. U. S. Nat. Mus.* No. 47, 3313 pp. (1896-1900).

<sup>3</sup>Bigelow and Welsh. *Bull. U. S. Bur. Fish.*, 40, Pt. I, 567 pp. (1925).

<sup>4</sup>Bigelow and Schroeder. *Can. Atlant. Fauna*, 12, 38 pp. (1934).

<sup>5</sup>Goode and Bean. "Oceanic Ichthyology." *Spec. Bull. U. S. Nat. Mus.*, 1895, 553 pp.

<sup>6</sup>Garman. *Mem. Mus. Comp. Zool. Harvard*, 36, 515 pp. (1913).

<sup>7</sup>Huntsman. *Can. Fisherman*, 5, 788-790 (1918).

<sup>8</sup>Jensen. "*The Danish Ingolf-Expedition*," 2, Pt. 4 (1904).

<sup>9</sup>LaGorce. *Nat. Geog. Mag.*, 44, 567-634 (1923).

<sup>10</sup>Beebe. *Nat. Geog. Mag.*, 61, 87 (1932).

<sup>11</sup>Knipovich. *Trans. Inst. Scient. Explor. North*, No. 27, Moscow (1926).

Gowanloch, Koelz, Parr, Gill and Gregory<sup>12</sup> respectively. Figs. V, XXXI-XXXIII and XXXVIII are original.

A short glossary, which follows, explains the meaning of the technical terms unavoidably used throughout the paper.

#### GLOSSARY OF TECHNICAL TERMS.

**ABDOMINAL POSITION OF VENTRAL FINS.**—Far behind the pectoral fins.

**ADIPOSE FIN.**—A small, soft, fleshy dorsal fin that has no supporting rays, located behind the first dorsal fin and close to the caudal fin.

**AIR BLADDER.**—Commonly known as the "sound." The sack within the body cavity just below the backbone and containing gases.

**ANADROMOUS.**—Fishes which live in salt water but go into fresh water to spawn, e. g. Salmon, Shad, etc.

**ANAL FIN.**—The unpaired fin or fins (two) on the lower surface of the body just behind the vent.

**ANUS.**—The external opening of the intestine located in front of the anal fin.

**ANTERIOR.**—Referring to the front part.

**BASE OF FIN.**—Extent of the fin from the base of the first ray to the base of the last ray. This term applies only to the vertical fins.

**BARBEL.**—A slim, fleshy appendage located on the front of the head around the mouth or nostrils.

**BODY DEPTH.**—The greatest vertical diameter of the fish.

**BODY LENGTH.**—The length of the fish from the foremost part of the head to the end of the backbone. (Caudal fin not included).

**BRANCHIOSTEGAL RAYS.**—The rays supporting the Gill Membrane, the latter being a fleshy extension of the lower part of the gill covers.

**CAUDAL FIN.**—The fin on the rear end of the body, commonly called the "tail fin."

**CLASPERS.**—Semi-tubular, rod-like modifications of the ventral fins in the males of sharks, skates and chimaera, serving for mating purposes.

**DIAMETER OF EYE.**—Only the horizontal diameter is understood.

**DORSAL.**—Referring to the back or upper surface.

**DORSAL FIN.**—The unpaired fin or fins (two or three) on the back of the fish.

**FINLET.**—One or several very small fins possessing rays, located behind the normal dorsal and anal fins, found, for example, in Mackerel.

<sup>12</sup>Gowanloch. *Dept. Conserv. State Louisiana, Bull.* 23, p. 219 (1933); Koelz, *Bull. U. S. Bur. Fish.*, 43, 516-517 (1929); Parr, *Proc. U. S. Nat. Mus.*, 76, Art. 10, p. 43 (1929); Gill, *Proc. U. S. Nat. Mus.*, 39, 157-188 (1911); Gregory, *Nat. History*, 28, p. 9, (1928).

- FIN RAYS.**—The supporting rods of a fin. When they are branched at the top and are quite flexible, they are called Soft Rays, but when they are stiff and usually sharply pointed, they are called Spiny Rays or just Spines. Sometimes certain rays are greatly elongated, “whiplike,” and these are called Filamentous Rays.
- GILL COVERING.**—The bony cover which protects the gills.
- GILL OPENINGS.**—The external openings leading to and from the gills.
- GILLS.**—The respiratory organs of fishes, consisting of numerous, thin, feathery filaments (bright red in a live fish) attached to the supporting arches found within the gill openings.
- GILL RAKERS.**—Short, stiff rods located on the gill arches opposite to the gill filaments.
- HEAD LENGTH.**—Distance between the foremost part of the head and the hindmost part of the gill cover.
- HEIGHT OF FIN.**—The length of the longest ray in the fin; applicable *only* to the *vertical fins*.
- ISTHMUS.**—The narrow, triangular part on the lower surface of the head in front of the pectoral fins, and between the gill clefts.
- JUGULAR POSITION OF THE VENTRAL FINS.**—In front of the pectoral fins close to the isthmus.
- LANDLOCKED.**—Said of certain individuals of anadromous fishes which never descend to the sea but live permanently in fresh water.
- LATERAL.**—Referring to the side.
- LATERAL LINE.**—A line of pores extending along the side of the body giving the impression of a dotted line.
- LENGTH OF FINS.**—The distance from the upper edge of the base to the tip of the fin (not the length of the longest ray) and is applicable *only* to the *paired fins*.
- LUMINOUS ORGANS.**—Organs in some fish (e. g. Lanternfish) which give off light. Those on the front of the head are larger and of various shapes, while those on the sides of the head and on the body are small and round in shape (so-called photophores).
- LUMINOUS SCALES.**—Scales giving off light found on the upper or lower surface of the tail.
- MAXILLARY.**—The outermost bone on each side of the upper jaw joined in front to another bone (*premaxillary*) and extending backwards, the hind ends of which move downwards when the mouth is opened.
- OPERCLE.**—The principal bone in the gill covering, located immediately behind the cheek.
- PAIRED FINS.**—These are the ventral and pectoral fins; one of each pair being located on either side of the fish.
- PALATINES.**—A pair of bones lying in the roof of the mouth; one on each side of the vomer. These palatine bones may possess teeth,—palatine teeth.
- PECTORAL FINS.**—The anterior or uppermost pair of fins, located on the side of the fish immediately behind the head.



**PELAGIC.**—Referring to fishes (or other organisms) usually found in the upper water layers.

**PHOTOPHORES.**—See Luminous Organs.

**POSTERIOR.**—Referring to the rear part.

**SNOUT.**—The front part of the head from the tip of the upper jaw to the eye.

**TOTAL LENGTH.**—The length of the fish from the foremost part of the head to the hindmost part of the caudal fin. (This fin included).

**THORACIC POSITION OF THE VENTRAL FINS.**—Below the pectoral fins.

**VENT.**—Same as Anus.

**VENTRAL.**—Referring to the belly or lower surface.

**VENTRAL FINS.**—The pair of fins located on the lower surface of the fish behind, below or in front of the pectoral fins.

**VERTICAL FINS.**—These are the dorsal, anal and caudal fins.

**VERTEBRAE.**—Joints of the backbone.

**VOMER.**—An unpaired bone, often bearing teeth (vomerine teeth), located between the palatine bones in the middle of the roof of the mouth just behind the middle of the upper jaw.

#### KEY FOR FAMILIES.—GENERAL PART.

##### Section 1.

**IF:** Paired fins absent; body snake-like; head not distinct from body; mouth without jaws (Lamprey type); several small, rounded gill openings along the side or on lower surface of front part of body (Figs. II and XIII):—see Division I, p. 26.

**BUT IF:** At least one pair of paired fins (pectoral) present; body snake-like or of another shape; head distinct from body; mouth with jaws; several slit-like gill openings (Figs. III and V) present or only one gill opening (on each side) covered by a thin bony plate (Fig. X) or flap of skin (operculum):—see Section 2.

##### Section 2.

**IF:** As a rule, 5 to 7 gill slits on each side (Shark type, Fig. III) or on lower surface (Skate type, Fig. V) of the head; inner part of ventral fins in male sex modified into claspers; leathery skin naked or covered with minute bony plates, spines, etc., instead of scales; fins covered with leathery skin through which rays are not or hardly visible; skeleton chiefly cartilaginous, not true bone:—see Division II, p. 26.

**BUT IF:** Only one gill opening covered by thin, bony plates on each side of the head (Bony fish type, e. g. Haddock, Fig. X); ventral fins not modified into claspers; skin covered with scales, bony plates or naked; fins consisting of thin membrane through which fin rays are clearly visible, as a rule; skeleton more often bony than cartilaginous:—see Division III, p. 27.

## KEY FOR FAMILIES.—SPECIFIC PART.

## Division I.

Lampreys and Hags (*Marsipobranchii*).

**IF:** No eyes; front part of head bearing 6 barbels; horny teeth not visible in exterior part of mouth cavity; two gill openings on lower surface slightly in front of middle of body; low undivided finfold on back present only in tail region:—a Hagfish, Fig. XIII (see Fam. I, *Myxidinae*).

**BUT IF:** Small eyes present; barbels absent; numerous horny teeth clearly visible in disc-like mouth; 7 gill openings immediately behind eyes on each side of the head; dorsal finfold divided into 2 relatively high fins:—a Lamprey, Fig. II (see Fam. II, *Petromyzonidae*).

## Division II.

Sharks and Rays (*Elasmobranchii*).

## Section 1.

**IF:** Only 1 gill opening on each side covered with a flap of skin; the two dorsal fins and upper part of caudal fin giving the impression of one long continuous fin along the mid-line of body from head to rear end of fish; caudal fin tapering, ending in a filament; few teeth arranged in 3 pairs of edgewise dental plates:—a Chimæra, Fig. XXIV (see Fam. XII, *Chimaeridae*).

**BUT IF:** 5 to 7 slit-like gill openings without a covering; the two dorsal fins short, never extending over full length of fish; caudal fin not ending in a filament; numerous teeth in jaws:—see Section 2.

## Section 2.

**IF:** Body definitely flattened from top to bottom (Skate type, Figs. IV and V), triangular or roundish in shape; gill slits located on lower surface of head:—see Section 3.

**BUT IF:** Body not flattened from top to bottom; gill slits located on sides of head (Shark type, Fig. III):—see Section 4.

## Section 3.

**IF:** Outline of head and anterior part of body roundish; skin smooth without spines or prickles; caudal fin well developed, large and triangular; fish able to give an electric shock:—an Electric Skate, Fig. XXIII (see Fam. XI, *Torpedinidae*).

**BUT IF:** Outline of head and anterior part of body triangular; skin on upper surface with prickles or spines; caudal fin very small; fish unable to give an electric shock:—a member of the Skate family, Fig. IV (see Fam. X, *Rajidae*).

## Section 4.

**IF:** Head hammer-shaped; eyes at end of lateral projections:—a Hammer-head Shark, Fig. XV (see Fam. IV, *Sphyrnidae*).

**BUT IF:** Head normal (Dogfish type, Fig. XX) without hammer-shaped projections:—see Section 5.

## Section 5.

**IF:** Tail longer than body itself:—a Thresher Shark, Fig. XVI (see Fam. V, *Alopiidae*).

**BUT IF:** Tail less than one-half of body length:—see Section 6.

## Section 6.

**IF:** Anal fin absent:—see Section 7.

**BUT IF:** Anal fin present:—see Section 8.

## Section 7.

**IF:** Spine in front of each dorsal fin:—a member of the Dogfish family, Figs. XX and XXI (see Fam. VIII, *Squalidae*).

**BUT IF:** No spines in front of dorsal fins:—a Greenland Shark, Fig. XXII (see Fam. IX, *Somniosidae*).

## Section 8.

**IF:** Gill slit very long nearly meeting under head; teeth minute (about 200 on each jaw):—a Basking Shark, Fig. XVIII (see Fam. VII, *Cetorhinidae*).

**BUT IF:** Gill slits not long, confined to sides of head only; teeth large (less than 50 on each jaw):—see Section 9.

## Section 9.

**IF:** A strong keel at base of caudal fin; colour grayish:—a member of the Mackerel Shark family, Fig. III (see Fam. VI, *Isuridae*).

**BUT IF:** No keel present at base of caudal fin; colour decidedly bluish:—a Blue Shark, Fig. XIV (see Fam. III, *Carcharidae*).

## Division III.

Bony Fishes (*Teleostei*).

## Section 1.

**IF:** Snout elongated and flattened, shovel-like; 4 barbels present in front of small, round mouth located on lower surface of head; 5 rows of large, bony shields running lengthwise of body; skeleton cartilaginous; caudal fin (shark type) with upper lobe about twice as long as lower:—a Sturgeon, Fig. XXV (see Fam. XIII, *Acipenseridae*).

**BUT IF:** Snout not shovel-like; 4 barbels not present in front of mouth located on lower surface of head; 5 rows of bony shields not present; skeleton more often bony than cartilaginous; caudal fin rounded, forked, etc., not of the shark type:—see Section 2.

## Section 2.

**IF:** Ventral fins absent (Eel type, Fig. XLI) or modified into a kind of sucking disc (Sea Snail type, Fig. VII):—see Subdivision 1, p. 28.

**BUT IF:** Ventral fins present and not modified into a sucking disc:—see Section 3.

## Section 3.

**IF:** Ventral fins in jugular (Tuna type, Fig. VIII) or thoracic position (Haddock type, Fig. X):—see Subdivision 2, p. 30.

**BUT IF:** Ventral fins in abdominal position (Salmon type, Fig. XII):—see Subdivision 3, p. 36.

## Subdivision 1.

Fishes with ventral fins absent (Eel type, Fig. XLI) or modified into a sucking disc (Sea Snail type, Fig. VII).

## Section 1.

**IF:** Ventral fins modified into a sucking disc located immediately behind head on lower surface:—see Section 2.

**BUT IF:** Ventral fins completely absent:—see Section 3.

## Section 2.

**IF:** 1 or 2 dorsal fins present, each of which and anal fin possessing less than 15 rays; second dorsal and anal fins separated by a considerable space from caudal fin; head and body covered with bony shields:—a member of the Lumpfish family, Fig. CVIII (see Fam. LXVII, *Cyclopteridae*).

**BUT IF:** Dorsal and anal fins, each possessing at least 30 rays, extending to or even connecting with caudal fin; head and body covered with a soft, loose, easily torn skin without bony shields:—a member of the Sea Snail family, Figs. VI and CIX (see Fam. LXVIII, *Liparidae*).

## Section 3.

**IF:** Mouth armed, in addition to tusk-like teeth, with several very strong molars:—a member of the Catfish family, Fig. CXIX (see Fam. LXXV, *Anarhichadidae*).

**BUT IF:** Mouth toothless or possessing only small teeth, not molar-like:—see Section 4.

## Section 4.

**IF:** Fish large; upper jaw and snout greatly prolonged into a flat, sharp-edged sword, about one-half as long as the body; a strong keel at base of caudal fin:—a Swordfish, Fig. LXXXV (see Fam. XLIX, *Xiphiidae*).

**BUT IF:** Fish large or small; upper jaw not sword-like; no keel at base of caudal fin:—see Section 5.

## Section 5.

**IF:** Whole body covered with rings of bony plates; small mouth at tip of tube-like snout:—a member of the Pipefish family, Figs. LXXV and LXXXVI (see Fam. XLIII, *Syngnathidae*).

**BUT IF:** Body covered with scales, spines or naked, not with rings of bony plates; snout not tube-like:—see Section 6.

## Section 6.

**IF:** Fish large; roundish, not elongated; body depth not less than one-third of body length:—see Section 7.

**BUT IF:** Fish small; elongated; body depth not more than one-tenth of body length:—see Section 10.

## Section 7.

**IF:** Caudal fin merely a flap of skin extending around the posterior edge of body; pectoral fins very small; dorsal and anal fins very high and opposite each other located close to the posterior end of fish; body having neither scales nor spines:—a Sunfish, Fig. CXXVIII (see Fam. LXXX, *Molidae*).

**BUT IF:** Caudal fin well developed; pectoral either long or short; body covered with scales or spines:—see Section 8.

## Section 8.

**IF:** Body covered with scales; caudal fin deeply forked; dorsal and anal fins with at least 30 rays each:—a Dollarfish, Fig. LXXXVIII (see Fam. LII, *Stromateidae*).

**BUT IF:** Body covered with spines instead of scales; caudal fin rounded; dorsal and anal fins with less than 15 rays each, located close to caudal fin:—see Section 9.

## Section 9.

**IF:** Mouth small; diameter of eye about one-fifth of head length; body covered with large spines; outline of free end of caudal fin uniformly rounded, not notched between rays; no long filamentous rays on head and back in front of dorsal fin:—a Burrfish, Fig. CXXVII (see Fam. LXXIX, *Diodontidae*).

**BUT IF:** Mouth large; diameter of eye not more than one-tenth of head length; body covered with minute spines; outline of free end of caudal fin deeply notched between rays; 2 long filamentous rays in front of dorsal fin (1 on back and 1 on head):—a Sea Devil, Fig. CXXX (see Fam. LXXXII, *Ceratiidae*).

## Section 10.

**IF:** Caudal fin forked; dorsal and anal fins well separated from caudal; lower jaw protruding beyond upper:—a Sand Lance, Fig. CXIII (see Fam. LXXI, *Ammodytidae*).

**BUT IF:** Caudal fin rounded, both dorsal and anal fins connected with it; lower jaw protruding or not:—see Section 11.

## Section 11.

**IF:** Dorsal fin possessing only spiny rays; this and anal fin continuous with caudal fin, but demarcation between all 3 fins clear; gill opening very large, wider than length of pectoral fin; mouth oblique:—a Ghostfish, Fig. CXVII (see Fam. LXXIV, *Cryptacanthodidae*).

**BUT IF:** Dorsal and anal fins, possessing only soft rays, continuous with caudal fin, no line of demarcation discernible; gill opening very small, equal in width to about one-half length of pectoral fin:—see Section 12.

## Section 12.

**IF:** Gill opening situated above base of pectoral fin; both lips very thick; pectoral fin large, longer than one-half length of head; body rather stout, depth not less than one-eleventh of total length:—a Green Eelpout, Fig. CXXIV (see Fam. LXXVI, *Zoarcidae*).

**BUT IF:** Gill opening situated below base of pectoral fin; both lips thin; pectoral fin smaller, less than one-half length of head; body depth usually less than one-eleventh of total length:—see Section 13.

## Section 13.

**IF:** Both jaws very long and bill-like, almost three times as long as head itself; body extremely slender, about seventy-five times longer than deep:—a Thread Eel, Fig. XLV (see Fam. XXVIII, *Nemichthyidae*).

**BUT IF:** Jaws not elongated and bill-like; body not more than twenty times longer than deep:—see Section 14.

## Section 14.

**IF:** Mouth very small, posterior end of maxillary not reaching to below nostril; snout blunt, jaws powerful; 2 separate gill openings located on lower surface of head:—a Snub-nosed Eel, Fig. XLIII (see Fam. XXVI, *Simenchelyidae*).

**BUT IF:** Mouth rather large, posterior end of maxillary reaching at least to middle of eye; snout elongated, jaws weak; gill openings located on side or lower surface of head:—see Section 15.

## Section 15.

**IF:** Posterior end of maxillary extending far behind eye; gill openings located on lower surface, united one with the other:—a Long-nosed Eel, Fig. XLIV (see Fam. XXVII, *Synaphobranchidae*).

**BUT IF:** Maxillary not extending beyond posterior part of eye; gill openings on side of head:—see Section 16.

## Section 16.

**IF:** Dorsal fin beginning just behind pectoral fin, distance from tip of snout to beginning of dorsal fin less than twice length of head; jaws even:—a Conger Eel, Fig. XLII (see Fam. XXV, *Congridae*).

**BUT IF:** Dorsal fin beginning far back from pectoral fin, distance from tip of snout to first dorsal ray almost three times length of head; jaws uneven lower projecting slightly:—a Common Eel, Fig. XLI (see Fam. XXIV *Anguillidae*).

## Subdivision 2.

Fishes with ventral fins in a thoracic (Tuna type, Fig. VIII)  
or jugular position (Haddock type, Fig. X).

## Section 1.

**IF:** Ventral fins situated in thoracic position:—see Section 2.

**BUT IF:** Ventral fins situated in jugular position:—see Section 25.

## Fishes with ventral fins in a thoracic position.

## Section 2.

**IF:** Oval sucking disc on top of head extending onto anterior part of back:— a member of the Sharksucker family, Fig. CXII (see Fam. LXX, *Echeneidae*).

**BUT IF:** No sucking disc on head and back:—see Section 3.

## Section 3.

**IF:** Ventral fin having only 2 rays, first being a strong spine and second soft; 2 to 12 strong, free spines in front of dorsal fin; all of ventral and dorsal spines able to be erected or depressed at will:—a member of the Stickleback family, Figs. LXXII-LXXIV (see Fam. XLII, *Gasterosteidae*).

**BUT IF:** Ventral fin having usually 6 rays (only 4 in the Sculpin family); spines, if present in front of dorsal fin, not able to be erected or depressed at will:—see Section 4.

## Section 4.

**IF:** At least 2 finlets (Tuna type, Fig. VIII) behind both dorsal and anal fins:—see Section 5.

**BUT IF:** No finlets, or only 1, behind dorsal and anal fins:—see Section 6.

## Section 5.

**IF:** At least 4 finlets behind both dorsal and anal fins; jaws about equal and armed with small teeth; keels (2-3) running lengthwise at base of caudal fin:—a member of the Mackerel family, Figs. VIII and LXXX-LXXXIII (see Fam. XLVII, *Scombridae*).

**BUT IF:** Only 2 finlets behind both dorsal and anal fins; lower jaw protruding greatly, both jaws armed with large teeth; keels absent:—an Oilfish, Fig. LXXXIV (see Fam. XLVIII, *Gempyidae*).

## Section 6.

**IF:** Body tapering to a whip-like tail; anal fin as well as second dorsal fin continuous with caudal fin:—a member of the Rat-tail family, Fig. LII (see Fam. XXXIV, *Macrouridae*).

**BUT IF:** Body not tapering to a whip-like tail; anal and dorsal fins separated from caudal fin:—see Section 7.

## Section 7.

**IF:** Thin, high, fleshy fin-like flap (without rays) in front of dorsal fin (shown black in Fig. XCVIII):—a Tilefish (see Fam. LX, *Branchiostegidae*).

**BUT IF:** No flap in front of dorsal fin:—see Section 8.

## Section 8.

**IF:** Elongated body completely armed with several rows of bony plates, not with scales:—see Section 9.

**BUT IF:** Body not completely armed with plates, but naked or covered with scales:—see Section 10.

## Section 9.

**IF:** 2 dorsal fins; at least 5 barbels on each side of head:—a Northern Alligatorfish, Fig. CVII (see Fam. LXVI, *Agonidae*).

**BUT IF:** Only 1 (second) dorsal fin; barbels absent:—a Common Alligatorfish, Fig. CVI (see Fam. LXV, *Aspidophoroididae*).

Section 10.

**IF:** Head and body naked or only partially covered with bony plates, not regularly scaled:—see Section 11.

**BUT IF:** Head, body or both covered with regular scales or partially naked (in the latter case lateral line arched over pectoral fin):—see Section 13.

Section 11.

**IF:** Caudal fin forked; body entirely naked; no spines on head; teeth long and movable:—a Black Swallower, Fig. CXIV (see Fam. LXXII, *Chiasmodontidae*).

**BUT IF:** Caudal fin rounded; body with some bony plates; spines on head present and well developed; teeth small:—see Section 12.

Section 12.

**IF:** Several fleshy flaps on head; membrane between upper parts of rays of first dorsal fin deeply notched; this fin much longer than second dorsal:—a Sea Raven, Fig. CV (see Fam. LXIV, *Hemipteridae*).

**BUT IF:** No fleshy flaps on head; membrane practically unnotched between rays of first dorsal, this fin shorter than second dorsal, or if only 1 dorsal present and spiny part much shorter than soft rayed part:—a member of the Sculpin family, Figs. CI-CIV (see Fam. LXIII, *Cottidae*).

Section 13.

**IF:** Fish of large size; ventral fin possessing 14 to 17 rays; mouth toothless; body deep and covered with minute scales:—an Opah, Fig. LXIII (see Fam. XXXVIII, *Lampridae*).

**BUT IF:** Fish usually of smaller size; ventral fin with no more than 6 (1 spine and 5 soft) rays; mouth with teeth; body of various shapes; scales large, minute or partially wanting:—see Section 14.

Section 14.

**IF:** 2 long barbels on chin; 2 well separated dorsal fins; body and head covered with rather large scales:—a Red Mullet, Fig. XCVII (see Fam. LIX, *Mullidae*).

**BUT IF:** No barbels on chin; 1 or 2 dorsal fins present, (in latter case both fins separated, united or the first reduced to a few spines); scales small or large:—see Section 15.

Section 15.

**IF:** 1 or 3 keels at base of caudal fin (keels absent in *Argyreiosus vomer*, Fam. LIV, *Carangidae*, but body of this fish very thin and deep, lateral line arched, anterior rays of both second dorsal and anal fins pronouncedly elongated, ventral fin shorter than diameter of eye); lateral line usually arched:—see Section 16.

**BUT IF:** No keels at base of caudal fin; lateral line usually straight:—see Section 17.



## Section 16.

**IF:** Pectoral fin much longer than ventral fin; lateral line arched or straight; colour silvery without transverse black bands:—a member of the Hard-tail family, Figs. XC-XCII (see Fam. LIV, *Carangidae*).

**BUT IF:** Pectoral fin slightly shorter than ventral fin; lateral line straight; usually 6 transverse black bands on side:—a member of the Pilotfish family, Fig. XCIII (see Fam. LV, *Seriolidae*).

## Section 17.

**IF:** 2 clearly separated dorsal fins, the first consisting of only a few spines:—see Section 18.

**BUT IF:** Only 1 dorsal fin, anterior part of which may consist of spines:—see Section 19.

## Section 18.

**IF:** First dorsal fin much shorter and lower than second; anal fin long (about 25 rays); mouth large with posterior part of maxillary extending behind eye:—a Bluefish, Fig. XCIV (see Fam. LVI, *Pomatomidae*).

**BUT IF:** 2 dorsal fins practically equal in length and height; anal fin short (about 15 rays); mouth small with posterior end of maxillary scarcely reaching middle of eye:—a member of the White Bass family, Figs. XCV and XCVI (see Fam. LVII, *Moronidae*).

## Section 19.

**IF:** Dorsal fin exceptionally long (55 to 65 rays) extending from immediately behind head nearly to caudal fin; caudal fin deeply forked:—a Dolphin, Fig. LXXXVI (see Fam. L, *Coryphaenidae*).

**BUT IF:** Dorsal fin shorter (less than 40 rays) beginning some distance behind head; caudal fin of different shapes:—see Section 20.

## Section 20.

**IF:** Spines in anterior part of dorsal fin weak, not conspicuously developed and not more than 5 in number; length of pectoral fin much greater than that of head; ventral fin short, being about one-third as long as pectoral fin; caudal fin deeply forked:—a Sea Bream, Fig. LXXXVII (see Fam. LI, *Bramidae*).

**BUT IF:** At least 6 strong, conspicuous spines in anterior part of dorsal fin; length of pectoral fin less than that of head; ventral fin about equal in length to pectoral fin; caudal fin rounded or only slightly forked:—see Section 21.

## Section 21.

**IF:** At least 15 soft rays in anal fin:—see Section 22.

**BUT IF:** Less than 12 soft rays in anal fin:—see Section 23.

## Section 22.

**IF:** 6 to 8 small spines, about one-third height of soft rays, in front of dorsal fin; maxillary reaching to about middle of eye:—a Barrelfish, Fig. LXXXIX (see Fam. LIII, *Centrolophidae*).

**BUT IF:** At least 8 large spines in dorsal fin about equal in height to soft rays; maxillary not reaching to front of eye:—a Common Butterfly Fish, Fig. XCIX (see Fam. LXI, *Chaetodontidae*).

#### Section 23.

**IF:** Mouth small, maxillary not reaching front of eye; spiny part of dorsal fin (14-18 spines) considerably longer than soft ray portion (9-10 rays); caudal fin rounded:—a member of the Cunner family, Figs. CX and CXI (see Fam. LXIX, *Labridae*).

**BUT IF:** Mouth large, maxillary reaching at least to middle of eye; number of spines in dorsal fin less than or equal to number of soft rays; caudal fin slightly forked, squarish or rounded:—see Section 24.

#### Section 24.

**IF:** Eye large, diameter not less than one-quarter of length of head; edge of cheek armed with rather large spines; 14-15 spines in dorsal fin; colour roseate:—a Rosefish, Fig. C (see Fam. LXII, *Scorpaenidae*).

**BUT IF:** Eye small, diameter not more than one-fifth of length of head; edge of cheek with no spines but minutely saw-toothed; 10-11 spines in dorsal fin; colour olive-brown with reddish tinges on lower surface of head and belly:—a Red Grouper, Fig. XCVI (see Fam. LVIII, *Epinephelidae*).

Fishes with fins in a jugular position.

#### Section 25.

**IF:** Head very large, its length more than one-third of total length; mouth very wide, armed with numerous strong teeth; 3 filamentous spines on top of head, the 2 in front of eye being very long; several fleshy flaps around edge of head and on body; pectoral fin flipper-like; general appearance of a large, flat, roundish head with relatively short, narrow body:—a Monkfish, Fig. CXXIX (see Fam. LXXXI, *Lophiidae*).

**BUT IF:** Head not large, its length not more than one-fourth of total length; mouth either large or small; filamentous spines on top of head and fleshy flaps absent; pectoral fin of usual appearance, not flipper-like:—see Section 26.

#### Section 26.

**IF:** Head and body definitely flattened from side to side (Halibut type, Fig. XI, and not top to bottom as in Skate type, Fig. IV); both eyes on pigmented side of head, other side blind; no spiny rays:—see Section 27.

**BUT IF:** Body elongated, not flattened from side to side; one eye on each side of head; spiny rays present or absent:—see Section 29.

#### Section 27.

**IF:** Mouth small; posterior end of maxillary scarcely reaching front of eye; caudal fin rounded:—a member of the Flounder family, Figs. LXVIII-LXXI (see Fam. XLI, *Pleuronectidae*).

**BUT IF:** Mouth large; posterior end of maxillary reaching to posterior edge of eye; caudal fin rounded, forked or of another shape:—see Section 28.

## Section 28.

**IF:** Long ventral fins not symmetrical, that on pigmented side extending from tip of isthmus to beginning of anal fin (giving the impression that these two fins are continuous) while that on white side beginning a short distance back from tip of isthmus; upper part of about 15 of anterior dorsal rays free from membrane and extensively branched (feathery in appearance); gill rakers long and over 30 in number; caudal fin rounded in outline; lateral line well arched over pectoral fin:—a Sand Flounder, Fig. LXIV (see Fam. XXXIX, *Bothidae*).

**BUT IF:** Ventral fins symmetrical, well separated from anal fin and tip of isthmus; anterior dorsal rays connected for their full height by membrane; gill rakers short and less than 20 in number; caudal fin rounded or of another shape; lateral line either arched or straight:—a member of the Halibut family, Figs. XI and LXV-LXVII (see Fam. XL, *Hippoglossidae*).

## Section 29.

**IF:** Single, long dorsal fin composed of spiny rays only, this fin, as well as anal fin extending back close to caudal fin, but clearly distinguishable from latter; body elongated, snake-like:—a member of the Blenny family, Figs. CXV and CXVI (see Fam. LXXIII, *Bleniidae*).

**BUT IF:** 1 long dorsal fin (which may possess a few spines in posterior part) or 2 or 3 dorsal fins composed of soft rays only; caudal fin either united with or separated from both dorsal and anal fins; body elongated or rather deep:—see Section 30.

## Section 30.

**IF:** Ventral fins rudimentary (absent in *Gymnelis viridis*), only a single dorsal and anal fin, both joined with caudal fin to form a continuous fin around tail; body elongated:—a member of the Eelpout family, Figs. CXX-CXXIV (see Fam. LXXVI, *Zoarcidae*).

**BUT IF:** Ventral fins well developed; 1 to 3 dorsal and 1 or 2 anal fins clearly separated from caudal fin; body more or less deep:—see Section 31.

## Section 31.

**IF:** Long distinctly notched anal fin and 2 separate dorsal fins, the second as long as the anal fin and notched; caudal fin slightly forked; mouth armed with sharp teeth; chin barbel absent:—a Silver Hake, Fig. LXII (see Fam. XXXVII, *Merlucciidae*).

**BUT IF:** 1 or 2 anal fins; 1 to 3 dorsal fins; caudal fin rounded or forked; teeth smaller and not so sharp; chin barbel always present:—see Section 32

## Section 32.

**IF:** In addition to a chin barbel, 3 barbels on snout; first dorsal fin consisting of a long filamentous first ray and a series of about 40 minute rays

concealed in a groove; second dorsal fin slightly longer than single anal fin; caudal fin rounded:—a Rockling, Fig. LIII (see Fam. XXXV, *Gaidropsaridae*).

**BUT IF:** Only barbel located on chin; first dorsal fin not concealed in a groove; number of dorsal fins from 1 to 3; single or double anal fins; caudal fin either rounded or slightly forked:—a member of the Cod family, Figs. X and LIV-LXI (see Fam. XXXVI, *Gadidae*).

### Subdivision 3.

Fishes with ventral fins in an abdominal position (Salmon type, Fig. XII).

#### Section 1.

**IF:** Middle ray of caudal fin extending as a long filament about equal to one-half body length; head very long terminating in long tubular snout; scales absent:—a Trumpetfish, Fig. LXXVII (see Fam. XLIV, *Fistulariidae*).

**BUT IF:** Caudal filament absent; head rather short without tubular snout; scales present or absent:—see Section 2.

#### Section 2.

**IF:** Body strongly compressed from side to side, rather squarish in shape; mouth very small with strong teeth; eye located above base of pectoral fin; ventral fin represented by a short, immobile, hardly visible spine:—see Section 3.

**BUT IF:** Body cylindrical, not strongly compressed; mouth small or large; eye located far in front of base of pectoral fin; ventral fin normally developed consisting of at least 6 rays:—see Section 4.

#### Section 3.

**IF:** First dorsal fin consisting of 3 spines connected by a membrane; head and body covered with thick, large plate-like scales:—a Triggerfish, Fig. CXXV (see Fam. LXXVII, *Balistidae*).

**BUT IF:** First dorsal fin consisting of only a single, long, strong spine armed with a double series of barbs; head and body covered with such very minute scales that skin is velvety to the touch:—a Filefish, Fig. CXXXVI (see Fam. LXXVIII, *Monacanthidae*).

#### Section 4.

**IF:** Both jaws elongated to form slender beak; several finlets behind both dorsal and anal fins:—a Billfish, Fig. L (see Fam. XXXII, *Scomberosocidae*).

**BUT IF:** Jaws not elongated; no finlets:—see Section 5.

## Section 5.

**IF:** Luminous organs (photophores) on head and body; mouth very large:—see Section 6.

**BUT IF:** No luminous organs on fish; mouth large or small:—see Section 8.

## Section 6.

**IF:** Body very thin and elevated, body depth more than half body length; high, triangular, bony ridge in front of dorsal fin consisting of several vertebral spines projecting beyond the muscle:—a Silver Hatchetfish, Fig. XL (see Fam. XXIII, *Sternoptichidae*).

**BUT IF:** Body elongated and rounded, body depth less than one-fourth body length; no bony ridge in front of dorsal fin:—see Section 7.

## Section 7.

**IF:** Dorsal fin situated over anal fin, far behind ventral fins; diameter of eye not greater than one-sixth length of head:—a Small-eyed Lanternfish, Fig. XXXIX (see Fam. XXII, *Gonostomidae*).

**BUT IF:** Dorsal fin situated in front of anal fin, about over ventral fins; diameter of eye not less than one-third length of head:—a member of the Large-eyed Lanternfish family, Figs. XLVI and XLVII (see Fam. XXIX, *Myctophidae*).

## Section 8.

**IF:** A single dorsal fin:—see Section 9.

**BUT IF:** 2 dorsal fins, second of which may be an adipose fin (shown in black on figures):—see Section 13.

## Section 9.

**IF:** Pectoral fin enlarged into a kind of wing, its length at least one-half body length:—a Flyingfish, Fig. LI (see Fam. XXXIII, *Exocoetidae*).

**BUT IF:** Pectoral fin not wing-like, its length less than one-fifth body length:—see Section 10.

## Section 10.

**IF:** Head covered with scales; caudal fin rounded, not forked:—a Mummichog, Fig. XLIX (see Fam. XXXI, *Cyprinodontidae*).

**BUT IF:** Head having no scales; caudal fin deeply forked:—see Section 11.

## Section 11.

**IF:** Last ray of dorsal fin extending beyond fin membrane as a long filament; scales larger than eye:—a Tarpon, Fig. XXVI (see Fam. XIV, *Megalopidae*).

**BUT IF:** No long filament in dorsal fin; scales smaller than eye:—see Section 12.

## Section 12.

**IF:** Anal fin situated behind posterior end of base of dorsal fin; posterior end of maxillary scarcely reaching posterior edge of eye orbit:—a member of the Herring family, Figs. XXVII-XXX (see Fam. XV *Clupeidae*).

**BUT IF:** Anal fin situated below dorsal fin, maxillary extending far behind posterior edge of eye:—an Anchovy, Fig. XXXI (see Fam. XVI, *Engraulidae*).

## Section 13.

**IF:** 2 dorsal fins, second possessing rays:—see Section 14.

**BUT IF:** 2 dorsal fins, the second an adipose fin (shown in black on figures) without rays (Salmon type, Fig. XII):—see Section 15.

## Section 14.

**IF:** Anal fin short with no more than 10 soft rays:—a Mullet, Fig. LXXIX (see Fam. XLVI, *Mugilidae*).

**BUT IF:** Anal fin long with more than 15 soft rays:—a Silverside, Fig. LXXVIII (see Fam. XLV, *Atherinidae*).

## Section 15.

**IF:** First dorsal fin very high, its length more than one-half body length:—a Lancetfish, Fig. XLVIII (see Fam. XXX, *Alepisauridae*).

**BUT IF:** First dorsal fin not high, its length not more than one-fifth body length:—see Section 16.

## Section 16.

**IF:** Posterior end of maxillary hardly extending to below front of eye:—see Section 17.

**BUT IF:** Maxillary extending at least to below middle of eye:—see Section 19.

## Section 17.

**IF:** Eye small, its diameter about equal to one-fifth head length; ventral fin situated below middle of base of dorsal fin:—a Whitefish, Fig. XXXIV (see Fam. XVIII, *Coregonidae*).

**BUT IF:** Eye large, its diameter not less than about one-third head length; ventral fin situated under rear end of base of dorsal fin:—see Section 18.

## Section 18.

**IF:** Diameter of eye more than one-third length of head; only 3 or 4 branchiostegal rays:—a Large-eyed Argentine, Fig. XXXVIII (see Fam. XXI, *Microstomidae*).

**BUT IF:** Diameter of eye less than one-third length of head; 6 to 8 branchiostegal rays:—a Small-eyed Argentine, Fig. XXXVII (see Fam. XX, *Argentinidae*).

## Section 19.

**IF:** Anal fin having less than 10 branched rays; ventral fin situated behind middle of base of dorsal fin:—a member of the Salmon family, Figs. XII and XXXIII (see Fam. XVII, *Salmonidae*).

**BUT IF:** Anal fin having 14 or more branched rays; ventral fin situated in front of middle of base of dorsal fin:—a member of the Smelt family, Figs. XXXV and XXXVI (see Fam. XIX, *Osmeridae*).



Fig. II—Lamprey (*Petromyzon marinus*). Type of fish without paired fins.

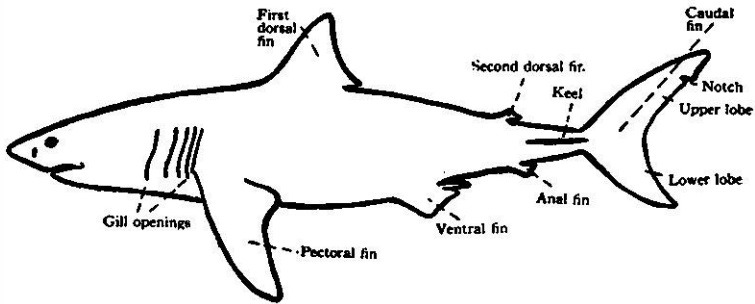


Fig. III—Man-eater Shark (*Carcharodon carcharias*). Shark type.

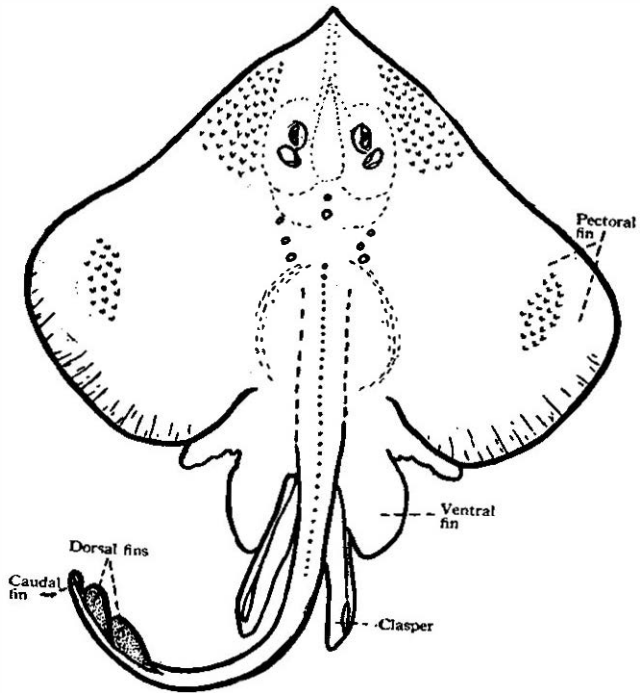


Fig. IV—Smooth Skate (*Raja senta*) Type of Skate; dorsal view.

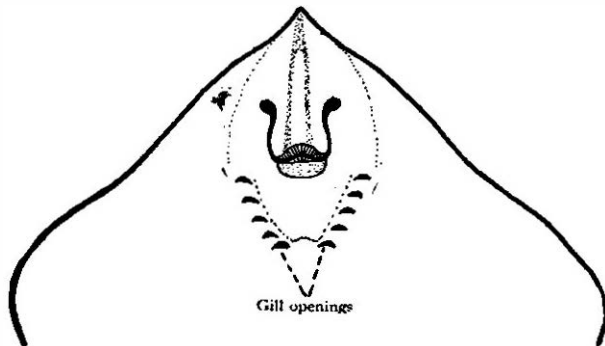


Fig. V—Smooth Skate (*Raja senta*); ventral view.



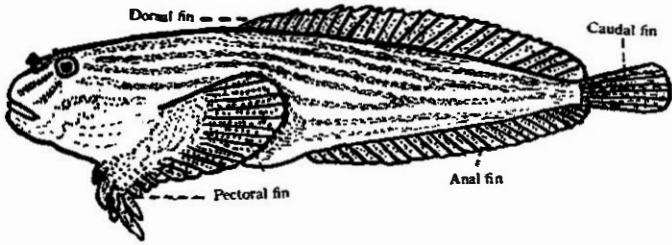


Fig. VI—Striped Sea Snail (*Liparis liparis*). Type of fish with ventral fins modified into a sucking disc; lateral view.

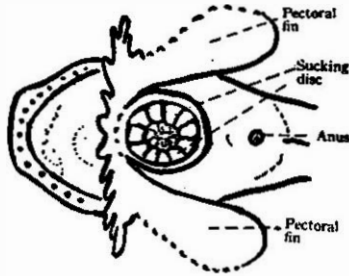


Fig. VII—Striped Sea Snail (*Liparis liparis*). ventral view.

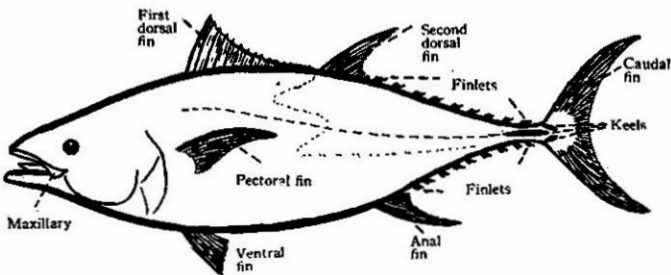


Fig. VIII—Tuna (*Thunnus thynnus*). Type of fish with ventral fins in thoracic position and with finlets.

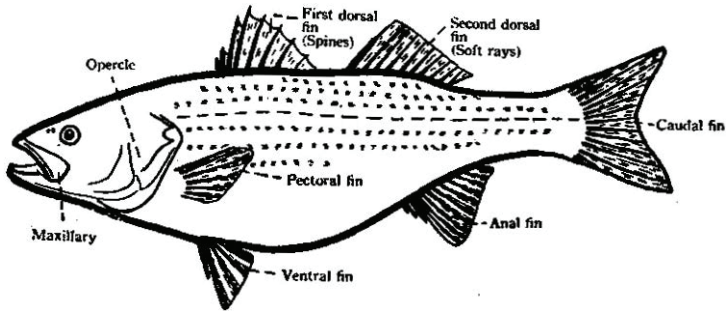


Fig. IX—Striped Bass (*Roccus lineatus*). Type of fish with ventral fins in a thoracic position, and with two dorsal fins, the first of which consists of strong spines only.

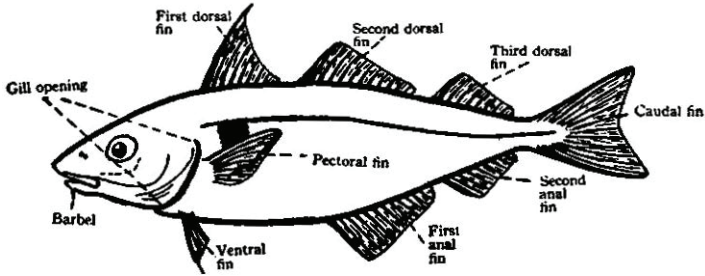


Fig. X—Haddock (*Melanogrammus aeglefinus*). Type of fish with ventral fins in a jugular position, and with three dorsal and two anal fins which, as well as the remaining fins, consist only of soft rays.

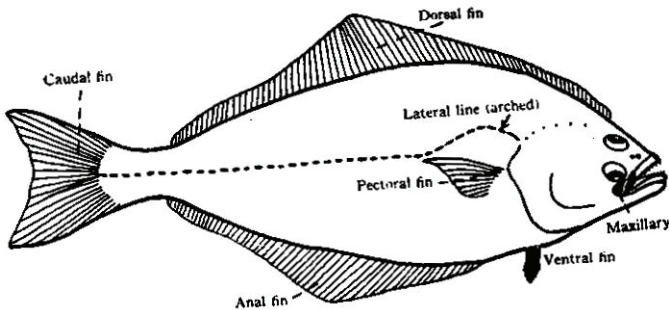


Fig. XI—Halibut (*Hippoglossus hippoglossus*). Type of right-handed Flatfish with ventral fins in a jugular position.

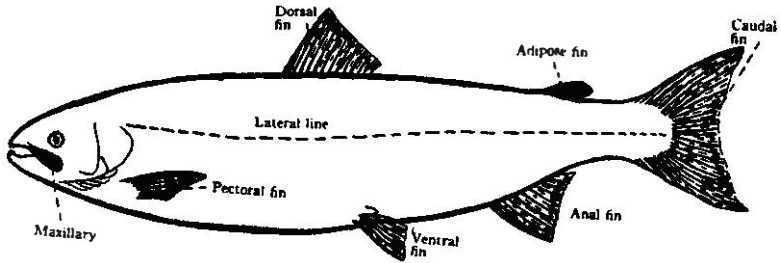


Fig. XII—Salmon (*Salmo salar*). Type of fish with ventral fins in an abdominal position, and with an adipose fin.

#### DESCRIPTION OF FISHES.

In our description, we follow, on the whole, the systematic arrangement of Jordan, Evermann and Clark<sup>13</sup>. The systematic description will not be mentioned here, since it has already been given concisely in the Key. However, brief remarks on seasonal occurrence, distribution, economic importance and size will be made for each species. In some cases, interesting points in the biology of the fishes will be given also.

For the reader's convenience, lengths and weights have been expressed in the English system. The information on the size of the fishes has been taken mainly from Bigelow and Welsh<sup>8</sup>, while the data on the vertical distribution of deep water forms have been obtained principally from Bean<sup>14</sup> and Goode and Bean<sup>5</sup>.

All fishes listed herein may be divided into two wide groups. One consists of species which are found throughout the whole year in our region (e. g., Cod and Haddock), and may be called "permanent residents", while the other group embraces fishes occurring for a relatively short period of time, or only occasionally found, within our waters, "seasonal visitors." Some species of the latter group (e. g., Tuna and Swordfish) visit our shores regularly every year, others only occasionally. Southern species are found during the warmest

<sup>13</sup>Jordan, Evermann and Clark. *Rept. U. S. Comm. Fish.*, 1928, Pt. 2, 670 pp. (1930).

<sup>14</sup>Bean. *Proc. U. S. Nat. Mus.*, 3, 75-116 (1881).

months (e. g. Hardtail), whereas northern fishes (e. g., Greenland Shark) are caught in our region during the coolest months.

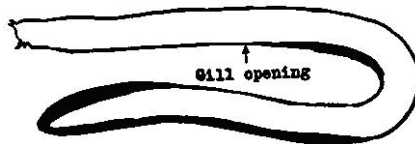
The Nova Scotian region under description is divided physiographically into two parts, the outer or Atlantic coast and the inner or Bay of Fundy area. In each part, the relatively shallow coastal waters (not exceeding 25 fathoms) are inhabited by certain fishes, while the deeper offshore areas are frequented, as a rule, by other species. Numerous banks (off the outer coast), with water from 30 to 80 fathoms deep, are populated by a number of species, some of which are found only on these banks. The deepest water (150 to 350 fathoms) is found in the gullies between the banks. The bank area, as a whole, is bounded by the edge of the Continental Slope where much greater depths are encountered. The distribution of each species is given according to these physiographical areas.

To designate differences in abundance of the various species, such terms as the following have been used: very rare or rare, uncommon, common and very common. Among the fishes described by the last two terms are many of economic importance. The data concerning the quantity caught and value of these species are taken from the *Fisheries Statistics of Canada*. The yearly averages for the ten year period, 1924 to 1933 inclusive, have been calculated and used in this paper.

The fishes marked with an asterisk (\*) either live in salt water, spending only part of the time in fresh water for the purpose of spawning (anadromous fishes, e. g., Salmon, Shad, etc.) or grow up in fresh water, returning to the sea for spawning (e. g., Eel).

#### I. HAGFISH FAMILY, *MYXINIDAE*.

**Hagfish,**  
*Myxine glutinosa*  
Linnaeus 1758  
(Fig. XIII).



Rather common on Nova Scotian banks and in the Bay of Fundy in depths of about 20 to 50 fathoms, but may descend

occasionally to 500 fathoms. Without economic importance. Up to 18 inches in length. Parasitic in behaviour, being found inside the bodies of other fishes and even in human corpses.

II. LAMPREY FAMILY, *PETROMYZONIDAE*.

\*Sea Lamprey, *Petromyzon marinus* Linnaeus 1758 (Fig. II).

Not uncommon, but very seldom caught in the sea (a few records from Brown's Bank). Usually captured in estuaries during early summer. At present without economic importance in our region; however, in Europe it is highly reputed. Historians tell us that Henry I of England died of a surfeit of this great delicacy. Up to 3 feet in length. Semi-parasitic, living on the blood and flesh of other fishes. Dies after spawning.

III. GREY SHARK FAMILY, *CARCHARIIDAE*.

Blue Shark,  
*Prionace glauca*  
(Linnaeus) 1758  
(Fig. XIV).



This pelagic fish not an uncommon summer visitor on Nova Scotian banks and sometimes even in the inshore waters of the outer coast. Nuisance to fishermen through destroying gear and catches. Maximum length 12 feet. Very common in southern waters. Skin of this species, as well as other sharks, sometimes used in making ladies' purses, shoes, etc.

IV. HAMMERHEAD SHARK FAMILY, *SPHYRNIDAE*.

Hammerhead Shark,  
*Sphyrna zygaena*  
(Linnaeus) 1758  
(Fig. XV).



This southern form very rare, only young individuals occasionally straying into the Atlantic waters of Nova Scotia

during the warmest seasons. Vladykov<sup>15</sup> reported finding a specimen 20½ inches long off Herring Cove, Halifax Harbour, September, 1932. Maximum length 17 feet in southern waters. Without economic importance. All our Sharks may be considered as pelagic fishes. However, some of them descend to a considerable depth.

V. THRESHER SHARK FAMILY. *ALOPTIDAE*.

**Thresher Shark,**  
*Alopes vulpes*  
(Bonnaterre) 1788  
(Fig. XVI).



Not uncommon during summer months on the Atlantic banks and in the Bay of Fundy. Without economic importance. Length up to about 20 feet. Very destructive to Herring and Mackerel.

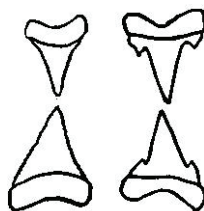
VI. MACKEREL SHARK FAMILY. *ISURIDAE*.

Key for genera.

**IF:** Teeth broad, triangular, saw-toothed on edges (Fig. XVIIA), without lateral cusps; pectoral fin one and a half to two times as long as height of first dorsal fin:—a Man-eater Shark (*Corcharodon*), Fig. III.

**BUT IF:** Teeth narrow, pointed, without saw-toothed edges (Fig. XVII B) but with lateral cusps; pectoral fin only slightly longer than height of first dorsal:—a Mackerel Shark (*Isurus*).

Fig. XVII—Types of teeth in two genera of the Mackerel Shark family; A.—*Corcharodon*;  
B.—*Isurus*.



A.

B.

<sup>15</sup>Vladykov. *Proc. N. S. Inst. Sci.*, 19, 1-8 (1935).

**Mackerel Shark, *Isurus nasus* (Bonnaterre) 1788.**

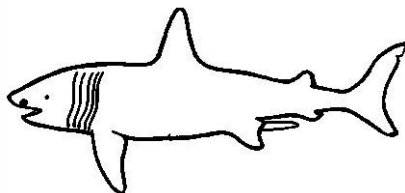
Not an uncommon summer visitor in the bays of the Atlantic coast. Occasionally caught in Mackerel traps and nets. Up to 12 feet in length. Name derived from its habit of feeding on Mackerel. Without economic importance.

**Man-eater Shark, *Carcharodon carcharias* (Linnaeus) 1758 (Fig. III).**

Not uncommon along the Atlantic coast and in the Bay of Fundy (Piers<sup>16b</sup>, pp. 196-198). Without economic importance. Maximum length about 40 feet<sup>17</sup>. Dangerous to man, occasionally attacking fishermen in their boats.

**VII. BASKING SHARK FAMILY, *CETORHINIDAE*.**

**Basking Shark,**  
*Cetorhinus maximus*  
(Gunner) 1765  
(Fig. XVIII).



Although there are no positive records of the capture of this Arctic species in the Nova Scotian area, no doubt it occurs here. Without economic importance. The largest of our fishes, maximum size at least 40 feet<sup>18</sup>. Sluggish in its movements, not dangerous to man. Feeds mainly on same food as Herring, such as smaller crustaceans.

<sup>16</sup>Piers. Numerous notes published in the Annual Reports of the Provincial Museum (Halifax) and several articles in *Proc. Trans. N. S. Inst. Sci.*, those of particular interest: (a) Vol. 10, Pt. I., 110-111 (1903); (b) *ibid.* 18, Pt. 3, 192-203 (1934).

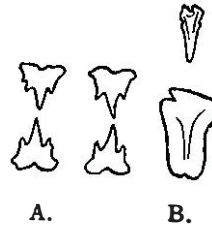
<sup>17</sup>According to the information of V. D. Vladykov, a 37 foot Man-eater Shark was found dead in a Herring weir on White Head Island (near Grand Manan) in the middle of June, 1930. From the liver 210 gallons of oil were obtained. Another idea of the huge size of this species may be obtained from the observation that a 30 foot Man-eater Shark had a young Sea Lion, weighing about 100 pounds, in its stomach (Jordan and Evermann) *loc. cit.*

<sup>18</sup>Perley, ("*Descriptive Catalogue (in part) of the Fishes of New Brunswick and Nova Scotia*," 2nd Ed. 1852, 50 pp.), gave an interesting account of a large Basking Shark caught in August, 1851 off Musquash Harbour in the Bay of Fundy. It was 40 feet in length, head 5 feet across, mouth 3 feet wide and the liver yielded 320 gallons of oil.

VIII. DOGFISH FAMILY, *SQUALIDAE*.

## Key for genera.

Fig. XIX—Types of teeth in two genera of the Dogfish family; A.—*Centroscyllium*;  
B.—*Centroscymnus*.



## Section 1.

**IF:** Spines in front of dorsal fins very short; upper lobe of caudal fin notched; teeth on upper jaw different from those on lower jaw (Fig. XIXB):—Portuguese Dogfish (*Centroscymnus*).

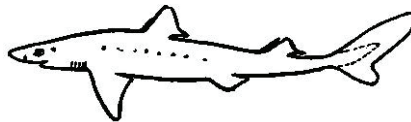
**BUT IF:** Spines in front of dorsal fins long; notch on upper lobe of caudal fin present or absent; teeth alike on both jaws:—see Section 2.

## Section 2.

**IF:** Teeth short without pronounced central cusp; no notch present on upper lobe of caudal fin; pectoral fin rather long and triangular:—a Spiny Dogfish (*Squalus*), Fig. XX.

**BUT IF:** Teeth rather long with well developed central cusp (Fig. XIXA); notch on upper lobe of caudal fin present, pectoral fin short and rounded:—a Black Dogfish (*Centroscyllium*), Fig. XXI.

**Spiny Dogfish,**  
*Squalis acanthias*  
Linnaeus 1758  
(Fig. XX).



Very common throughout the whole region, particularly abundant in inshore waters during the summer, withdrawing in winter months offshore and southward. Found usually from surface down to about 50 fathoms. At present of slight economic importance, only oil from the liver being used. This fish, however, can be utilized for human consumption. Dogfish are a great nuisance to line and net fishermen through destroying gear and catches. Up to 4 feet in length.



**Portuguese Dogfish, *Centroscymnus coelepis* Bocage and Capello 1864.**

Rather rare, being reported by Bean<sup>14</sup> from Quereau Bank at a depth of 180 to 260 fathoms and, according to Bigelow and Schroeder<sup>4</sup> (p. 18), from LeHave Bank. Without economic importance. Up to 4 feet in length.

**Black Dogfish,**  
*Centrosyllium fabricii*  
(Reinhardt) 1828  
(Fig. XXI).



Not uncommon on the Nova Scotian banks in rather deep water (200 to 250 fathoms), being caught on Halibut trawl. Without economic importance. About the same size as the Portuguese Dogfish.

#### IX. NURSE SHARK FAMILY, *SOMNIOSIDAE*.

**Greenland Shark,**  
*Somniosus*  
*microcephalus*  
(Bloch and Schneider)  
1801  
(Fig. XXII)



This rather northern form very rare. Jones<sup>19</sup> has reported the only capture of this species in our region, namely a specimen 11½ feet long off Halifax Harbour in February 1863. No other captures recorded since that time. Up to 18 feet in length.

#### X. SKATE FAMILY, *RAJIDAE*.

The distinction between the different species of Skates is a difficult systematic problem. Therefore, in this paper, only a tentative key for their identification is given, which is based chiefly on the data of Garman<sup>6</sup> (pp. 337-343) and Bigelow and Schroeder<sup>4</sup>. In this key, peculiar male characters, such as claspers and rows of spines on each pectoral fin, are not especially mentioned, hence in the near future a more detailed systematic account of our Skates will be published. The Skates, considering only their flattened body and the

<sup>19</sup>Jones. *Proc. Trans. N. S. Inst. Nat. Sci.*, 5, Pt. I, 87-97 (1882).

presence of both eyes on the same surface, might be confused with the Flatfishes. However, the nature of the flattening in the two groups of fishes is entirely different. The pigmented surface, bearing both eyes in the Skate, is really the back, not the right or left side of the fish, as in the case of Flatfishes. (For description of the latter group, see families XXXVIII-XL). The Skates are easily distinguished by the presence of the mouth and five pairs of gill slits on the lower or ventral surface, and a long tail (Figs. IV and V).

### Key for species of genus *Rajia*.

#### Section 1.

**IF:** Snout pronouncedly elongated and quite pointed; dorsal surface of fish almost naked; small spines developed on tip of snout and along front margin of body; only 1 series of small spines located along middle of tail extending slightly onto back:—a Barndoor Skate (*R. laevis*).

**BUT IF:** Snout not pronouncedly elongated; dorsal surface of fish covered with large or small spines; 1 or 2 series of spines along middle of tail and back:—see Section 2.

#### Section 2.

**IF:** Front outline of body rounded; 1 main series of small spines located along each side of dorsal mid-line of body and tail, leaving mid-line itself naked:—see Section 3.

**BUT IF:** Front outline of body more angular than rounded; 1 main series of spines located on dorsal mid-line of the body and tail:—see Section 4.

#### Section 3.

**IF:** 38 to 60 rows of teeth on each jaw:—a Little Skate (*R. erinacea*).

**BUT IF:** Teeth more numerous, varying from 66 to 140 rows on each jaw:—an Eyed Skate (*R. diaphanes*).

#### Section 4.

**IF:** Snout pointed; single series of small spines (over 30 in number) on dorsal mid-line extending over whole back but only onto anterior part of tail; tail length about equal to that of body; on the snout a parchment-like, triangular, transparent space:—a Smooth Skate (*R. senta*) Fig. IV.

**BUT IF:** Snout not noticeably pointed; single series of large spines on dorsal mid-line less than 20 in number; tail length about one-half that of body; no triangular, transparent space on snout:—see Section 5.

## Section 5.

**IF:** Dorsal surface in addition to dorsal mid-line thickly covered with large spines; less than 45 teeth in each jaw:—a Thorny Skate (*R. scabrata*).

**BUT IF:** Dorsal surface in addition to dorsal mid-line covered with small spines; about 60 teeth on each jaw:—a Deepwater Thorny Skate (*R. granulata*).

**Little Skate, *Raja erinacea* Mitchill 1825.**

Very common throughout the whole region, in coastal waters during summer months and deeper waters (down to 50 fathoms) in the winter. Of slight economic importance, used for making fish meal. Annual catch of all species of Skates in our region amounts to about 426,000 pounds, in value \$13,000. Up to 2 feet in length. This, as other Skates, is a bottom fish.

**Eyed Skate, *R. diaphanes* Mitchill 1803.**

Similar to the previous species in abundance, distribution and economic importance. Up to 3 feet in length.

**Thorny Skate, *R. scabrata* Garman 1913.**

Very common over whole region. Usually found in deeper water than the two previous species. Maximum length 3 feet.

**Smooth Skate, *R. senta* Garman 1885 (Fig. IV).**

Rather uncommon. Previously known from Le Have Bank (80 to 100 fathoms). Our specimens off Emerald Bank (50 to 60 fathoms). Up to 2 feet in length.

**Barndoor Skate, *R. laevis* Mitchill 1817.**

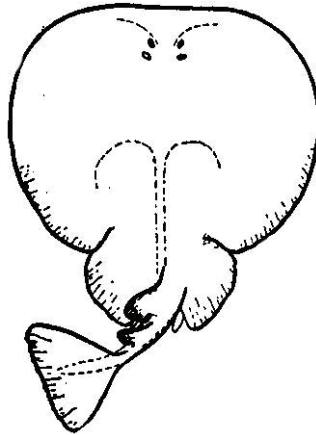
Common throughout the whole region from the shore out to a depth of 100 fathoms. The largest of our Skates, maximum length about 6 feet.

**Deepwater Thorny Skate, *R. granulata* Gill 1879.**

This rather deep water species (taken from 200 fathoms) very rare, only odd specimens known off Le Have Bank (Goode and Bean<sup>5</sup>, p. 29) and continental edge off Halifax (Bigelow and Schroeder<sup>4</sup>, p. 30).

XI. ELECTRIC RAY FAMILY, *TORPEDINIDAE*.

**Electric Ray,**  
*Narcacion nobilitanus*  
(Bonaparte) 1832  
(Fig. XXIII)



This southern form very rare. Bigelow and Schroeder<sup>4</sup> (p. 36) mentioned the capture of a specimen on Le Have Bank. We have verbal information on a specimen, presumably of this species, taken off Fox Point, St. Margaret Bay, about twenty years ago. Up to 5 feet in length. This fish is capable of giving an electric shock of considerable strength.

XII. CHIMAERA FAMILY, *CHIMAERIDAE*.

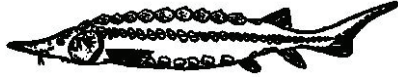
**Chimaera,**  
*Chimaera monstrosa*  
Linnaeus 1758  
(Fig. XXIV).



Not uncommon on Nova Scotian banks, being reported from a number of places in 160 to 350 fathoms by Bean<sup>14</sup> (p. 114) and Goode and Bean<sup>6</sup> (p. 32). Maximum length about 4 feet.

XIII. STURGEON FAMILY, *ACIPENSERIDAE*.

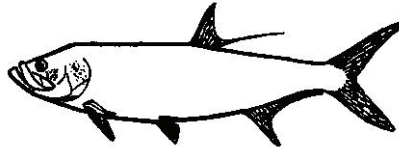
\*Sturgeon,  
*Acipenser sturio*  
Linnaeus 1758  
(Fig. XXV).



Rather common over whole area, being taken near estuaries, chiefly early in summer. Of slight economic importance. Annual catch reported as 3,500 pounds, value \$236. The eggs of this, as well as other species of Sturgeon, are used in making caviar.

XIV. TARPON FAMILY, *MEGALOPIDAE*.

Tarpon,  
*Tarpon atlanticus*  
(Cuvier and Valenciennes) 1884  
(Fig. XXVI).



This southern form very rare, only two positive records of capture are known, one off Isaac's Harbour, (Halkett,<sup>20</sup> p. 45) and one from Harrigan Cove which was 5½ feet in length<sup>21</sup>. Maximum length 8 feet and about 400 pounds in weight.

XV. HERRING FAMILY, *CLUPEIDAE*.

## Key for genera.

## Section 1.

**IF:** Body elongated, depth not more than one-fourth of body length; belly rounded, not very sharp or saw-toothed on edge; small patch of teeth on vomer:—a Herring (*Clupea*), Fig. XXVII.

**BUT IF:** Body rather deep, depth about one-third of body length; belly narrow, V-shaped, sharp and strongly saw-toothed; no teeth on vomer:—see Section 2.

## Section 2.

**IF:** Head large, length about one-third of body length; diameter of eye about one-seventh of head length; ventral fin located slightly in front of dorsal fin; posterior edge of scales possessing several radial keels:—a Menhaden (*Brevoortia*) Fig. XXX.

<sup>20</sup>Halkett. "Check list of the fishes of the Dominion of Canada and Newfoundland." Ottawa, 1913, 138 pp.

<sup>21</sup>This specimen was speared in the eel grass on September 6, 1906, and it is at present exhibited in the Provincial Museum, Halifax, (No. 3034).

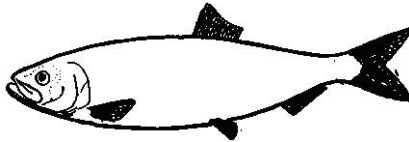
**BUT IF:** Head small, length at least one-fourth of body length; diameter of eye not less than one-fifth of head length; ventral fin located slightly behind front of dorsal fin; posterior edge of scales rounded and smooth without radial keels:—see Section 3.

Section 3.

**IF:** 2 wing-like folds of skin present at base of caudal fin, each covered with one elongated scale (black in the figure); upper jaw distinctly notched in front; point of junction of lower jaw with skull under posterior edge of eye:—a Shad (*Alosa*), Fig. XXIX.

**BUT IF:** No wing-like folds with elongated scales at base of caudal fin; upper jaw only slightly notched; junction of lower jaw with skull under middle of eye:—an Alewife (*Pomolobus*), Fig. XXVIII.

Herring,  
*Clupea harengus*  
Linnaeus 1758  
(Fig. XXVII).



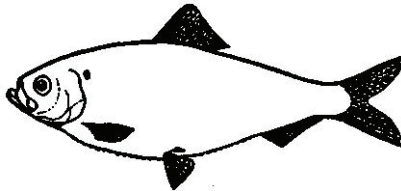
Very common throughout the whole region, particularly abundant in inshore waters (except in winter). One of the most important commercial fishes; annual catch about 21,250,000 pounds, in value \$420,000. Canadian "Sardines" are made from young Herring. Maximum length about 17 inches.

Key for species of genus *Pomolobus*.

**IF:** Diameter of eye about equal to length of snout; body about three and a half times as long as deep; lining (peritoneum) of belly cavity black; colour of back bluish-green:—a Blueback (*P. aestivalis*).

**BUT IF:** Diameter of eye greater than length of snout; body only about three times as long as deep; lining (peritoneum) of belly cavity pale; colour of back greyish-green:—a Gaspereau (*P. pseudoharengus*).

\*Gaspereau,  
*Pomolobus*  
*pseudoharengus*  
(Wilson) 1811  
(Fig. XXVIII).

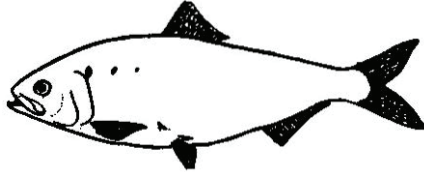


Very common over the whole region, main catches being made in estuaries and rivers in spring. Of considerable economic importance, annual catch about 2,143,000 pounds, in value \$30,400. Up to about 1 foot in length.

\*Blueback, *P. aestivalis* (Mitchill) 1815.

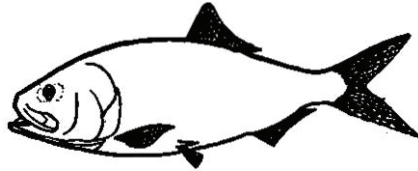
Rather uncommon, being more abundant on the Bay of Fundy side of Nova Scotia. Of slight economic importance. About the same size as the Gaspereau.

\*Shad,  
*Alosa sapidissima*  
(Wilson) 1811  
(Fig. XXIX).



Common throughout the whole region, main catches being made in the spring near estuaries and in the autumn in inshore waters. More abundant on the Bay of Fundy side of Nova Scotia.<sup>22</sup> Of considerable economic importance, about 80,000 pounds, valued at \$8,600, being taken annually. Length up to about 2½ feet, and as heavy as 14 pounds in weight.

Menhaden,  
*Brevoortia tyrannus*  
(Latrobe) 1802  
(Fig. XXX).



This southern form rather rare, being known only from St. Mary Bay (Bigelow and Welsh<sup>3</sup>, p. 120) on the western coast of Nova Scotia. Up to about 15 inches in length.

## XVI. ANCHOVY FAMILY, ENGRAULIDAE.

Striped Anchovy,  
*Anchoviella epsetus*  
(Bonnaterre) 1788  
(Fig. XXXI).



This southern fish very rare, being caught for the first time in our region in 1931, in Bedford Basin, Halifax Harbour (Vladykov<sup>15</sup>). Up to 6 inches in length.

<sup>22</sup>Leim (*Contr. Can. Biol. N. S.*, II, 163-184, 1924) published an important contribution on the life history of this species.

XVII. SALMON FAMILY, *SALMONIDAE*.

## Key for genera.

A.—*Salmo*.B.—*Salvelinus*.

Fig. XXXII—Types of vomers in two genera of the Salmon family.

**IF:** Posterior end of maxillary (shown in black in figures) scarcely reaching posterior edge of eye; vomer long, extending backwards slightly beyond posterior end of palatines; possessing teeth along its full length (in old specimens these teeth may be wanting); teeth on front part of vomer separated on either side by a narrow space from palatine teeth (Fig. XXXII A); scales large, less than 125 along lateral line; caudal fin slightly forked; no black marbling on dorsal and anal fins:—a Salmon (*Salmo*), Fig. XII.

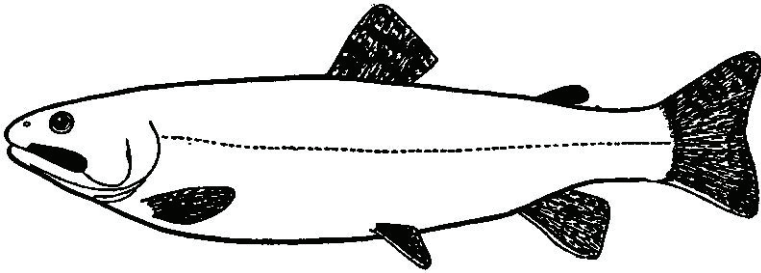
**BUT IF:** Maxillary reaching far behind posterior edge of eye; vomer very short, triangular in shape, practically not extending backwards at all between palatines; teeth on vomer not separated from palatine teeth (Fig. XXXII B); scales small, about 200 along lateral line; caudal fin usually squarish; black marbling on dorsal and anal fins:—a Trout (*Salvelinus*), Fig. XXXIII.

\*Atlantic Salmon, *Salmo salar* Linnaeus 1758 (Fig. XII).

Common throughout the whole region in coastal waters. Main fisheries concentrated near estuaries during summer months. One of the most important commercial fishes, annual catch about 1,000,000 pounds, valued at \$175,000, and of great sport value also. Scarcely ever reaches 50 pounds in weight in our region, but in the Scandinavian Peninsula and in northern Russia Salmon reach a much greater size. The largest recent record was of a 139 pound (63 kg.) fish caught July, 1928, in the Tana River between Norway and Finland<sup>22</sup>. In certain Nova Scotian lakes a landlocked form of Salmon is found, locally known as "Grayling."

<sup>22</sup>This record was published in "Fiskeritidsskrift for Finland," 1930, p. 75, according to Berg "Les poissons des eaux douces de l'U.R.S.S. et des pays limitrophes", 1932, p. 135, footnote.



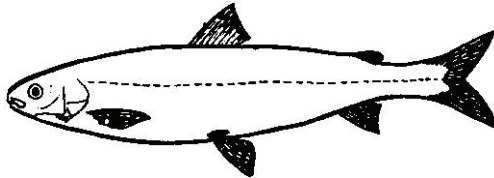


\*Sea Trout, *Salvelinus fontinalis* (Mitchill) 1815 (Fig. XXXIII).

Very common over the whole region in the coastal waters. Economically very important as one of the best sport fishes. Caught in estuaries, seldom in salt water. Scarcely ever reaches 6 pounds in weight. Its landlocked form, so-called "Brook Trout" or "Lake Trout"<sup>24</sup> is found in practically all streams, rivers and lakes of this province.

#### XVIII. WHITEFISH FAMILY, *COREGONIDAE*.

\*Round Whitefish,  
*Prosopium*  
*quadrilaterale*  
(Richardson) 1832<sup>25</sup>  
(Fig. XXXIV).



Rare in our region, only two specimens were caught at the mouth of the Sissibou River, St. Mary Bay, 1919, (Huntsman<sup>26</sup>, p. 59). Probably this species has been artificially introduced into our region<sup>27</sup>.

<sup>24</sup>The name "Lake Trout" is also applied to another much larger species of Trout (*Cristivomer namaycush*). The latter fish, found in certain lakes of Nova Scotia, is exclusively a freshwater species and is more often called "Grey Trout" or "Togue" in this Province.

<sup>25</sup>Concerning this specific name, Huntsman (see footnote 26) stated: "two specimens of a *Coregonus* (were) doubtfully identified as this species by Dr. Cox."

<sup>26</sup>Huntsman. *Contr. Can. Biol.*, 1921, No. III, 51-72 (1922).

<sup>27</sup>Piers (*Proc. Trans. N. S. Inst. Sci.*, 16, 92-95, 1927) reported the occurrence of another species of Whitefish (*Coregonus clupeaformis*) in the Petite Rivière at Millisigate Lake, Lunenburg County, which was probably artificially introduced into our waters also.

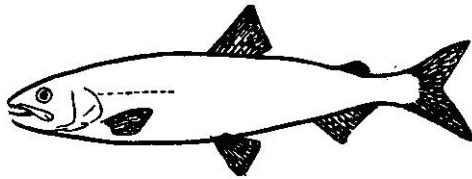
XIX. SMELT FAMILY, *OSMERIDAE*.

## Key for genera.

**IF:** Strong teeth in mouth particularly on tongue; large scales, less than 80 along lateral line; 12 or less rays in pectoral fin:—a Smelt (*Osmerus*), Fig. XXXV.

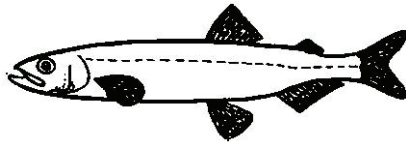
**BUT IF:** No large teeth; minute scales, about 200 along lateral line; 15 to 20 rays in pectoral fin:—a Capelin (*Mallotus*), Fig. XXXVI.

\*Smelt,  
*Osmerus mordax*  
(Mitchill) 1815  
(Fig. XXXV).



Very common throughout the coastal waters of the whole region. Of considerable economic importance (annual catch 797,000 pounds, valued at \$115,000). Caught principally in fresh water. Scarcely ever reaches more than 10 inches in length<sup>28</sup>. In some Nova Scotian lakes, a landlocked form of Smelt occurs, which is usually larger (up to 14 inches) than the salt water fish.

Capelin,  
*Mallotus villosus*  
(Müller) 1777  
(Fig. XXXVI).



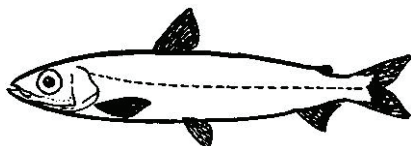
This northern fish is rare, only occasionally visiting our waters. Scarcely ever reaches 8 inches in length. The males have two ridges of scales along each side, one just above the lateral line and another along the side of the belly. At spawning time, these ridges become very pronounced. Usually two males crowd a female between them, holding her by means of these ridges, and all three rush swiftly up the sandy beach to deposit the spawn<sup>29</sup>.

<sup>28</sup>Kendall. *U. S. Bull. Bur. Fish.*, 42, 270-375, (1927).

<sup>29</sup>Sleggs. *Rept. Nfld. Fish. Res. Comm.*, 1, No. 3, 65 pp., (1933).

XX. ARGENTINE FAMILY, *ARGENTINIDAE*.

Argentine,  
*Argentina silus*  
Ascanius 1763  
(Fig. XXXVII).



This rather deep water fish very rare, only one positive record of a capture in our region, and that is of a specimen taken on Sable Island Bank in 200 fathoms (Goode and Bean<sup>5</sup>, p. 51). Length about 18 inches.

XXI. LARGE-EYED ARGENTINE FAMILY, *MICROSTOMIDAE*.

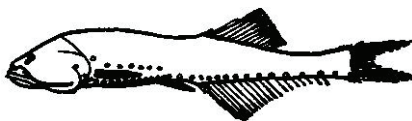
Large-eyed  
Argentine,  
*Nansenia*  
*gröenlandica*  
(Reinhardt) 1841  
(Fig. XXXVIII).



No doubt this deep water species may be found in our waters (though no records exist). One specimen was recently obtained from the stomach of a Black Swallower (*Chiasmodon niger*) which was captured somewhat south of the boundary of our region (Vladykov<sup>15</sup>). This specimen measuring 9½ inches is the largest ever recorded.

XXII. SMALL-EYED LANTERNFISH FAMILY, *GONOSTOMIDAE*.

Small-eyed  
Lanternfish,  
*Cyclothone signata*  
Garman 1899  
(Fig. XXXIX).



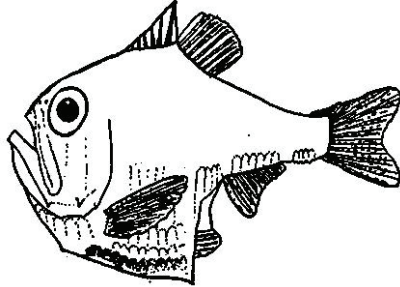
Although this deep water fish is probably common outside of the Continental Slope<sup>20</sup>, it is very rare in our waters. Positive records of its capture within our region have been made only by Bigelow and Welsh<sup>8</sup> (p. 154) who stated that

<sup>20</sup>Roule and Angel, (*Res. Comp. Sci. Monaco, Fasc. 79, 26-38, (1930)*), mentioned the capture of several specimens just southeast of the Nova Scotian area.

one specimen was taken in 30 fathoms on Brown's Bank, 1915, and another from the Fundy Deep (90 fathoms), 1920. Of small size, about 2 inches.

XXIII. HATCHETFISH FAMILY, *STERNOPTICHIDAE*.

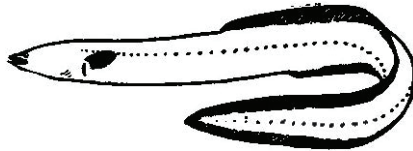
**Silver Hatchetfish,**  
*Argyropeleus olfersi*  
(Cuvier) 1829  
(Fig. XI).



A very rare deep water fish, only a single record of its capture within our region is known, and that is of a specimen taken just south of Brown's Bank in 144 fathoms (Goode and Bean<sup>6</sup>, p. 127). Length about 2 inches.

XXIV. TRUE EEL FAMILY, *ANGUILLIDAE*.

**\*Common Eel,**  
*Anguilla rostrata*  
(Le Suer) 1817  
(Fig. XLI).



Very common in the coastal waters over the whole region. Principal catches, with Eel traps, are made during the summer months (July-August). This fishery amounts to about 136,000 pounds per year with a value of \$12,900. Hardly ever more than 4 feet in length and 17 pounds in weight. Grow up in fresh water, but go back to the sea for spawning, journeying to east of Florida and the Bahamas and south of Bermuda where they spawn in deep water, afterwards dying<sup>11</sup>.

<sup>11</sup>In spite of the general belief, we wish again to emphasize the undoubted fact that *no Eel ever spawns in fresh water*. This astonishing discovery was made by the late Danish scientist, Dr. Joh. Schmidt (*Phil. Trans. Roy. Soc. London, Ser. B.*, 211, 179-208, (1923)).

XXV. CONGER EEL FAMILY, *CONGRIDAE*.

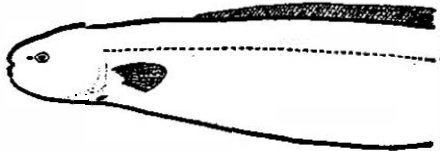
**Conger Eel,**  
*Conger conger*  
(Linnaeus) 1758  
(Fig. XLII).



Although no positive record of a capture of this species is known within our region, no doubt the larval stages, at least, will be discovered in our waters, since they are known from closely adjacent waters. This more southern species is much larger than the Common Eel, reaching 8 feet in length.

XXVI. SNUB-NOSED EEL FAMILY, *SIMENCHELYIDAE*.

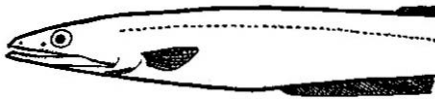
**Snub-nosed Eel,**  
*Simenchelys parasiticus*  
Gill 1879  
(Fig. XLIII).



This deep water species rather rare, being reported by Goode and Bean<sup>6</sup> (p. 140) only from Quereau Bank and off Sable Island Bank in 200 to 375 fathoms. Up to about 2 feet in length. It burrows into the muscle of living Halibut and other large fish, after the manner of the Hagfish, and excavates large cavities in the thicker parts of their bodies.

XXVII. LONG-NOSED EEL FAMILY, *SYNAPHOBRANCHIDAE*.

**Long-nosed Eel,**  
*Synaphobranchus*  
*pinnatus*  
(Gronow) 1854  
(Fig. XLIV).



This deep water fish not uncommon on the Nova Scotian banks (Quereau, Western and Le Have), being reported from a number of places in depths of 150 to 280 fathoms. Up to about 2 feet in length.

XXVIII. THREAD EEL FAMILY, *NEMICHTHYIDAE*.

Thread Eel,  
*Nemichthys scolopaceus*  
Richardson 1848  
(Fig. XLV).



This queer deep water form, found in from 300 to 2,000 fathoms, rare in our region. Jones<sup>19</sup> stated that this species was caught on the fishing banks off Nova Scotia. Recently, Roule and Angel<sup>22</sup> (p. 69) listed the capture of a number of specimens along the Continental Slope south of Sable Island Bank. Maximum length about 3 feet.

XXIX. LANTERNFISH FAMILY, *MYCTOPHIDAE*.

The preparation of a comprehensive key for the Lanternfishes is a difficult task, because the different genera and species are distinguished only by very fine characters. For a more complete account of this family, the reader is referred to the very elaborate papers on these fishes by Parr<sup>23</sup>. The above papers have been used extensively in the preparation of the following key.

## Key for genera.

## Section 1.

**IF:** Luminous organ on head in front of eye not conspicuously developed; luminous scales developed either on upper or lower surface of tail between adipose and caudal fins; only 2 luminous organs on lower part of base of caudal fin (shown in black in figures):—a Common Lanternfish (*Myctophum*), Fig. XLVII.

**BUT IF:** Luminous organ on head in front of eye conspicuously developed or not; luminous scales on upper surface of tail present or completely wanting; at least 3 luminous organs on lower part of base of caudal fin:—see Section 2.

## Section 2.

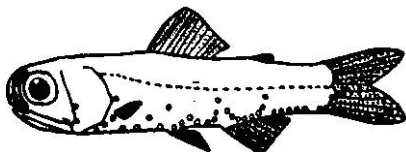
**IF:** Luminous organ on head in front of eye not conspicuously developed; luminous scales only on upper surface of tail in front of caudal fin; adipose fin wanting:—a Pearly Lanternfish (*Lampanyctes*).

**BUT IF:** Luminous organ on head in front of eye conspicuously developed; luminous scales on tail wanting; adipose fin present:—a Shiny Lanternfish (*Diaphus*), Fig. XLVI.

<sup>19</sup>Roule and Angel. *Res. Comp. Sci. Monaco*, Fasc. 86, 120 pp. (1933).

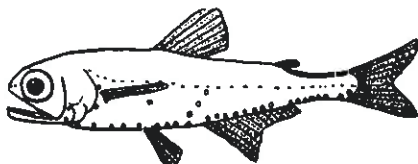
<sup>22</sup>Parr. *Bull. Bingham Ocean. Coll.*, 3, Art. 3, 193 pp. (1928); and *Proc. U. S. Nat. Mus.*, 76, Art. 10, 47 pp. (1929).

**Shiny Lanternfish,**  
*Diaphus esulgens*  
(Goode and Bean)  
1895  
(Fig. XLVI).



This pelagic form (sometimes descends to a depth of 1,639 fathoms) rather rare. For the first time in our waters its capture was reported by Goode and Bean<sup>5</sup> (p. 88), when a specimen was taken from a Cod caught on Brown's Bank. Another specimen was also obtained from a Cod stomach on Western Bank in 1930 (Vladykov<sup>16</sup>). Length about 3 inches. This species, as all other Lanternfishes, lives far away from the shores, ordinarily at considerable depths, coming to the surface at night or in stormy weather, and descending by day.

**Common Lantern-**  
**fish,**  
*Myctophum punctatum*  
Rafinesque 1810  
(Fig. XLVII).



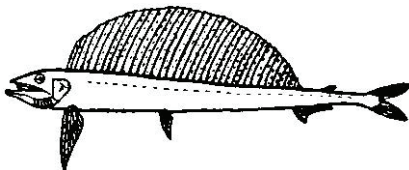
This pelagic form (occurring from the surface down to a depth of about 600 fathoms) is one of the most typical fishes of the High Seas. In our region it has been taken off Quereau Bank (Goode and Bean<sup>5</sup>, p. 72). Length up to about 4 inches.

**Pearly Lanternfish, *Lampanyctes margaritifer*** (Goode and Bean) 1895.

The distribution, habits and size of this fish are the same as for the previous species. It also has been taken on Quereau Bank.

### XXX. LANCETFISH FAMILY, *ALEPISAUROIDAE*.

**Lancetfish,**  
*Alepisauris ferox*  
Lowe 1833  
(Fig. XLVIII).

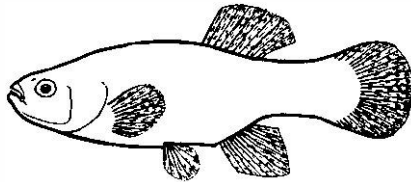


This deep water species rather rare, being taken on Le Have Bank and south of Emerald Bank (Goode and Bean<sup>5</sup>,

p. 117). According to Bigelow and Welsh\* (p. 155) a specimen "taken off Nova Scotia" in August, 1910, was about 6 feet long. More recently, Dr. A. W. H. Needler (personal communication) examined a specimen about 4 feet long (129 cm.) taken about September 1, 1926, in 150 fathoms at the seaward end of "The Gulley" between Sable Island and Quereau Banks. Nothing definitely known of the habits of this species.

XXXI. MUMMICHOG FAMILY, *CYPRINODONTIDAE*.

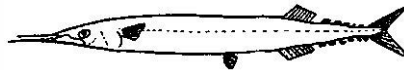
\*Mummichog,  
*Fundulus heteroclitus*  
(Linnaeus) 1766  
(Fig. XLIX).



Very common throughout the coastal waters (never deeper than 2 fathoms) of the whole region. They are an important article of food for several economic species,—Sea Trout, Eels, etc. This species, as well as another fresh water species (*F. diaphanus*), is commonly known as "Minnows" and both are extensively used as bait for Trout by anglers. Hardly ever reaches 6 inches in length.

XXXII. BILLFISH FAMILY, *SCOMBERESOCIDAE*.

Billfish,  
*Scomberesox saurus*  
(Walbaum) 1792  
(Fig. L).

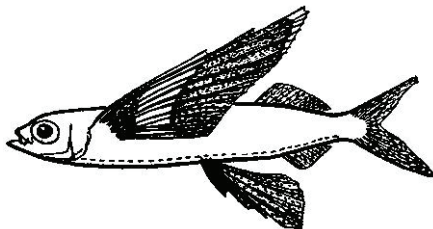


Very common summer visitor along the outer coast of Nova Scotia. Usually schooling in large numbers, "skipping" over the surface as they flee from enemies. An important food of Swordfish, Pollock and Tuna. Up to 18 inches in length.



XXXIII. FLYINGFISH FAMILY, *EXOCOETIDAE*.

Flyingfish,  
*Exocoetes*  
sp?<sup>2</sup>—  
(Fig. LI).



Jones<sup>19</sup> states that a specimen of this genus was taken at Sable Island in 1859, but the species was not determined. Probably it was *E. volitans* L. or, according to modern taxonomy, *Exonaules affinis* (Günther), shown in Fig. LI. However, it is possible, also, that it was *Cypselurus heterurus* (Nichols and Breder<sup>34</sup>, pp. 59-63). About 12 inches in length. Interesting observations on the flight of these fishes have been made by Hubbs<sup>35</sup>.

XXXIV. RAT-TAIL FAMILY, *MACROURIDAE*.

Unfortunately the only specimens in our collection are those of *Macrourus bairdii*. Due to this fact, and as there is no recent revision of this whole group of fishes, it has been impossible to give a really comprehensive key for this family.

## Key for genera.

## Section 1.

- IF:** Mouth small, inferior, its cleft not extending to sides of head; teeth all alike on both jaws and very minute:—a Rat-tail (*Macrourus*), Fig. LII.  
**BUT IF:** Mouth wide, its cleft extending to sides of head; among small teeth some large teeth in outer series on upper jaw:—see Section 2.

## Section 2.

- IF:** Teeth in outer series of upper jaw much larger than those in inner series; barbel long, longer than diameter of eye:—a Strap-tailed Grenadier (*Chalinura*).  
**BUT IF:** Teeth in outer series of upper jaw only slightly larger than those in inner series; barbel short, smaller than diameter of eye:—a Rock Grenadier (*Coryphaenoides*).

<sup>34</sup>Nichols and Breder. "The Marine Fishes of New York and Southern New England." New York. 1927, 192 pp.

<sup>35</sup>Hubbs. *Papers Mich. Acad. Sci., Art., Lett.*, 17, 575-611 (1933).

**Rock Grenadier, *Coryphaenoides rupestris* Gunner 1765.**

This deep water fish rare, only one positive record of a capture within our region, and that was a single specimen taken many years ago off Quereau Bank (Goode and Bean<sup>5</sup>, p. 403). Length up to about 3 feet.

**Strap-tailed Grenadier, *Chalimura occidentalis* (Goode and Bean) 1885.**

Rare, the only specimen taken in our region was caught in 133 fathoms on Quereau Bank (Goode and Bean<sup>5</sup>, p. 414). Up to 10 inches long.

**Key of species of genus *Macrourus*.**

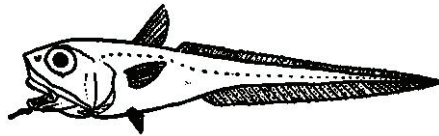
**IF:** Dorsal spine strongly saw-toothed; first dorsal fin high, about equal to length of head and triangular in shape:—a Common Rat-tail (*M. bairdii*).

**BUT IF:** Dorsal spine so finely saw-toothed as to appear smooth; first dorsal fin lower, about one-half head length and roundish in shape:—Smooth-spined Rat-tail (*M. berglax*), Fig. LII.

**Common Rat-tail, *Macrourus bairdii* (Goode and Bean) 1895.**

This deep water form not uncommon on Nova Scotian banks. The most recent finding was that made by the steam trawler *Lemberg*, (Capt. C. Samuelsson), on April 27, 1935, in 26 fathoms on Western Bank. It was about 1 foot long. Numerous records of its capture in neighbouring waters were given by Goode and Bean<sup>5</sup> (pp. 394-396). This species, as other Rat-tails, is a deep sea fish (found in depths from 100 down to 700 fathoms) living on the bottom, and is a weak swimmer. During the cold months, it may be found in shallower waters.

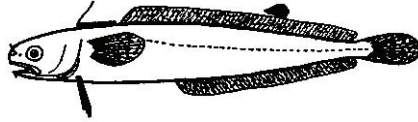
**Smooth-spined Rat-tail,  
*M. berglax*  
Lacépède  
(Fig. LII).**



This large Rat-tail, up to 3 feet in length and 5 pounds in weight, has been caught on Quereau and Sable Island Banks (Bean<sup>14</sup>, p. 80). In general, its habits and distribution are the same as the preceding species.

XXXV. ROCKLING FAMILY, *GAIDROPSARIDAE*.

**Common Rockling,**  
*Enchelyopus cimbrius*  
(Linnaeus) 1766  
(Fig. LIII).



Rather common throughout the whole area in coastal and bank waters. Without economic importance. Up to about 1 foot in length.

XXXVI. CODFISH FAMILY, *GADIDAE*.

## Key for genera.

## Section 1.

**IF:** 1 long dorsal and 1 long anal fin extending to caudal fin; caudal fin rounded:—a Cusk (*Brosmius*), Fig. LXI.

**BUT IF:** 2 or 3 dorsal fins; 1 or 2 anal fins; caudal fin rounded or slightly forked:—see Section 2.

## Section 2.

**IF:** 2 dorsal fins, second very long; 1 anal fin, which may be deeply notched even to appearing as 2 separate fins; caudal fin rounded:—see Section 3.

**BUT IF:** 3 dorsal fins; 2 anal fins; caudal fin slightly forked or rounded:—see Section 4.

## Section 3.

**IF:** Anal fin deeply notched even to appearing as 2 separate fins; snout, flattened above, keeled at sides:—a Blue Hake (*Antimora*), Fig. LVII.

**BUT IF:** Anal fin not notched; snout rounded above and on sides, not keeled:—a Hake (*Urophycis*), Fig. LX.

## Section 4.

**IF:** Lower jaw projecting beyond upper; chin barbel hardly visible; caudal fin deeply forked; fish uniformly greenish without pattern; lateral line whitish:—a Pollock (*Pollachius*), Fig. LIV.

**BUT IF:** Lower jaw equal to or shorter than upper; chin barbel well developed; caudal fin rounded or slightly forked; colour not uniformly greenish; lateral line white or black:—see Section 5.

## Section 5.

**IF:** Snout projecting beyond lower jaw; eye large, diameter not less than one-fourth of head length; caudal fin forked; fish silvery-grey with 1 large black patch above pectoral fin; lateral line black:—a Haddock (*Melanogrammus*), Fig. X.

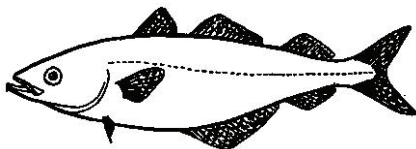
**BUT IF:** Snout not projecting beyond lower jaw pronouncedly; eye smaller, diameter not more than one-fourth head length; caudal fin rounded or slightly forked; fish without black patch; with whitish lateral line:--- see Section 6.

Section 6.

**IF:** Eye small, diameter not more than one-sixth of head length; chin barbel short; snout projecting beyond lower jaw; all vertical fins, especially the caudal, rounded; maximum size about 15 inches:—a Tomcod (*Microgadus*), Fig. LV.

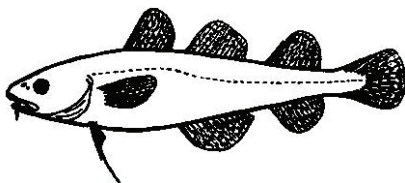
**BUT IF:** Eye large, diameter not less than one-fifth head length (in specimens of size corresponding to Tomcod, and even larger); chin barbel long; snout not projecting; both jaws about equal; all vertical fins squarish; caudal fin broom-shaped or slightly forked; average size about 25 inches:— a Codfish (*Gadus*), Fig. LVI.

**Pollock,**  
*Pollachius virens*  
(Linnaeus) 1758  
(Fig. LIV).



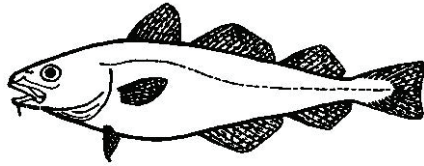
Very common throughout the whole region, particularly abundant off Digby Neck and on certain banks. One of the important commercial and sport species, about 4,187,000 pounds are caught yearly, valued at \$62,000. Up to 3½ feet in length and 40 pounds in weight.

**\*Tomcod,**  
*Microgadus tomcod*  
(Walbaum) 1792  
(Fig. LV).



Very common in the coastal waters of the whole region. Particularly abundant near and in estuaries. It is of small economic importance, only 28,000 pounds being caught yearly with a value of \$400. Maximum length about 14 inches. In many places it is called "Frostfish," because it is caught chiefly during the winter months.

Cod,  
*Gadus callarias*  
Linnaeus 1758  
(Fig. LVI).

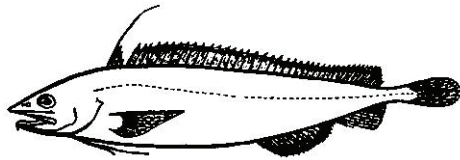


Very common throughout the whole region, and one of the most important commercial fishes, some 60,000,000 pounds are caught annually with a value of \$1,500,000<sup>36</sup>. Probably the largest Cod was taken off the Massachusetts coast in 1895, weighing 211¼ pounds and over 6 feet in length<sup>37</sup>. Ambrose<sup>38</sup> reported the capture of another huge Cod taken in 1865 off St. Margaret Bay, which measured 5 feet 10 inches in length. At present, fish over 70 pounds are rather the exception.

Haddock, *Melanogrammus aeglefinus*, (Linnaeus) 1758 (Fig. X).

Very common throughout the whole region, with the main fishery concentrated on the "banks." One of the most important commercial species in our waters, with a yearly catch of about 38,730,000 pounds, having a value of \$1,370,000. In our region it hardly ever reaches more than 3 feet in length and 20 pounds in weight, while in northern European waters much larger fish are taken. Thompson<sup>39</sup> reported a recent capture of a Haddock about 44 inches (112 cm.) long in Icelandic waters.

Blue Hake,  
*Antimora viola*  
(Goode and Bean)  
1878  
(Fig. LVII).



Although this deep water fish, according to Bigelow and Welsh<sup>3</sup> (p. 444), is rather plentiful along the Continental

<sup>36</sup>The amounts shown here are only one-half of those listed in the official statistics for Nova Scotia, because it is estimated that about fifty per cent. of the Cod catches are made outside of our region (e. g., Newfoundland banks).

<sup>37</sup>Jordan and Evermann. "American food and game fishes." New York, 1902, p. 514.

<sup>38</sup>Ambrose. *Proc. Trans. N. S. Inst. Nat. Sci.*, 1, Pt. 4, p. 37, footnote (1867).

<sup>39</sup>Thompson. *Fish., Scotland, Sci. Invest.*, 1928, 5, p. 65 (1929).

Slope in depths of from 350 to 1,000 fathoms, only occasionally is it reported from Nova Scotian banks (Quereau, Sable and Le Have). Length about 2 feet.

Key for species of genus *Urophycis*.

Section 1.

**IF:** First dorsal fin having no elongated rays; ventral fin scarcely reaching front of anal fin:—a Spotted Hake (*U. regius*), Fig. LVIII.

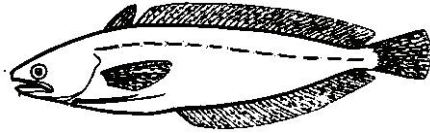
**BUT IF:** Third ray of first dorsal fin filamentous and greatly elongated reaching to about middle of second dorsal fin; ventral fin extending beyond front of anal fin:—see Section 2.

Section 2.

**IF:** Ventral fin not reaching middle of anal fin:—a Common Hake (*U. chuss*), Fig. LX.

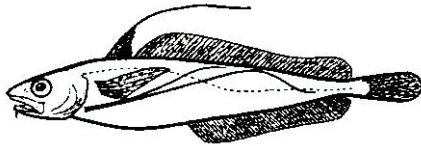
**BUT IF:** Ventral fin almost reaching posterior end of anal fin:—a Long-finned Hake (*U. chesteri*), Fig. LIX.

Spotted Hake,  
*U. regius*  
(Walbaum) 1792  
(Fig. LVIII).



This rather southern form very rare. Almost a hundred years ago, Richardson<sup>40</sup> (p. 253) mentioned a specimen "which was captured off Halifax" (no definite locality given). No additional records are known for our waters. Maximum length 16 inches.

Longfinned Hake,  
*U. chesteri*  
(Goode and Bean)  
1878  
(Fig. LIX).

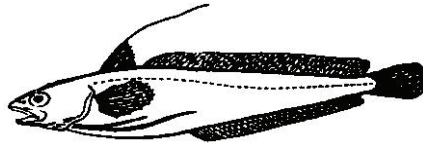


There is only one definite record of the capture of this deep water Hake in our region, and that was of a specimen taken off Halifax (Lat. 44° 26' N; Long. 62° 10' W.) in 127 fathoms (Goode and Bean<sup>5</sup>, p. 361). However, this species

<sup>40</sup>Richardson. *Fauna Boreali-Americana*, 3, 253 (1836).

was reported to be abundant along the Continental Slope in depths of from 100 to 500 fathoms (Bigelow and Welsh<sup>3</sup>, p. 456). It is the smallest of our Hakes, reaching only about 11 inches in length.

Common Hake,  
*U. chuss*  
(Walbaum) 1792<sup>41</sup>  
(Fig. LX).



Very common throughout the whole area, being a very important commercial species. The yearly yield of this Hake fishery is about 11,000,000 pounds, in value \$170,000<sup>42</sup>. The maximum length is about 3 feet (37 inches, our own record). and weight 17 pounds. However, much larger individuals are caught on the Atlantic banks, since Mr. W. H. Boutilier, Vice-President in charge of operations, Maritime National Fish Co., Limited, assures us that specimens weighing up to 60 pounds are frequently taken. The young Hake are sometimes found hiding in living Scallop shells.

Cusk,  
*Brosme brosme*  
(Müller) 1776  
(Fig. LXI).



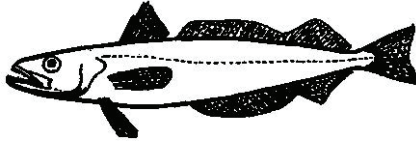
This commercial fish common throughout the whole region in rather deep water over a hard bottom. The Cusk fishery amounts yearly to about 1,000,000 pounds and \$18,000 in value. Maximum length about 3 feet and weight 30 pounds.

<sup>41</sup>We consider *U. tenuis* (Mitchill) 1815 as synonymous with *U. chuss* from a study of literature. However, a comparison of Hake obtained from the Bay of Fundy (Digby) with those from the Atlantic Banks shows certain dissimilarities, whose taxonomic significance must be determined by a more intensive study.

<sup>42</sup>In the official statistics, the Hake and Cusk catches are recorded as one. However, it may be stated that the Hake fishery amounts roughly to at least 90 per cent. of the total. The amounts shown above were determined on this basis.

XXXVII. SILVER HAKE FAMILY, *MERLUCCIIDAE*.

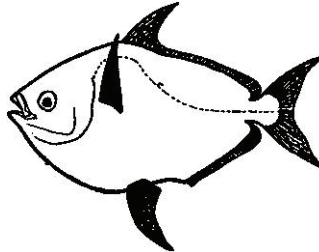
Silver Hake,  
*Merluccius bilineatus*  
(Mitchill) 1814  
(Fig. LXII).



Very common over the whole region, particularly abundant during the warmer months. Without economic importance at present, being, however, a good edible and sport fish. Adult Silver Hake prey on Herring and Mackerel, and very often damage these fishes in nets. But young Silver Hake, in turn, constitute an important part of the diet of Cod, Pollock, etc. Maximum length about 2 feet and weight 8 pounds<sup>48</sup>.

XXXVIII. OPAH FAMILY, *LAMPRIDAE*.

Opah,  
*Lampris regius*  
(Bonnaterre) 1788  
(Fig. LXIII).



This pelagic fish rather rare. Only the following records of its capture in our waters are known: Jones<sup>19</sup> stated that a specimen was taken at Sable Island during the late fifties (1856?), and Goode and Bean<sup>5</sup> (p. 223) recorded the capture of another specimen off Le Have Bank, while the most recent capture was made on Brown's Bank in the spring of 1932, when a specimen 4½ feet in length was taken (Vladkov<sup>15</sup>). Length up to 6 feet.

<sup>48</sup>The closely related, or even identical, European form (*M. merluccius*), attains a much larger size. According to Belloc ("Etude monographique du Merlu (*Merluccius merluccius* L.)" Par. 2. *Rev. Trav. Office Pêch. Marit.* II, p. 237, 1929) it reaches a length of 4½ feet and a weight of 32 pounds.



XXXIX-XLI. FLATFISHES, *HETEROSOMATA*.

In spite of the fact that our Flatfishes belong to three different families<sup>44</sup>, they are popularly considered as one group. In view of this it is considered advisable to make a single key for all the genera of Flatfishes, regardless of family differences. This key is based mainly on examination of material, as well as information from the literature, of which the comprehensive data on eastern Canadian species published by Huntsman<sup>7</sup> were of particular help.

Flatfishes may be easily distinguished from any other of our fishes by the fact that both eyes are situated on one (pigmented) side of the head, while the other, blind side, usually remains unpigmented (Fig. XI). Attention is called to the fact that Skates also have both eyes on the pigmented surface, which, however, is the back, not the side, of the fish. (For details, see description of the Skate family, X). However, it may be mentioned that all young Flatfishes shorter than about half an inch have a symmetrical body and an eye on each side of the head. As they grow older, the eye on one side gradually shifts close to the other, and the fish then develops the habit of lying on one side, blind side towards the bottom. Generally, the fish of one species have the eyes on the same side of the head.

When the fish is placed in front of the observer, pigmented side up and the guts next to the observer, then, if both eyes are on the observer's right, the fish is right-handed, but if both eyes are on the observer's left, the fish is left-handed. The majority of our Flatfishes are right-handed (Fig. XI), only two of them (the Summer Flounder, Fig. LXV, and Sand Flounder, Fig. LXIV) are left-handed. Occasionally, among individuals of a right-handed species, one may find a left-handed fish, but such exceptions are quite rare. In such an

<sup>44</sup>In this paper, the systematic arrangement of Flatfishes by Jordan, Evermann and Clark (*Rept. U. S. Comm. Fish.* 1928, Pt. II, 217-228, 1930) has been adopted because it is more generally recognized on this continent. Norman, "A Systematic Monograph of the Flatfishes", I. London. 1934, 439 pp, in his new revision of this group has used another family arrangement.

instance the other systematic characters mentioned in the key make the proper identification of the specimen possible. The most important characters are shown in black in the corresponding figures.

### Key for genera.

#### Section 1.

**IF:** Fish right-handed; mouth small; posterior end of maxillary scarcely reaching front of eye; caudal fin rounded:—see Section 2.

**BUT IF:** Fish either right or left-handed; mouth large; maxillary reaching posterior edge of eye; caudal fin either rounded, forked or of another shape:—see Section 5.

#### Section 2.

**IF:** Lateral line pronounced arched over pectoral fin; body thin; several, irregular, rusty, red spots on coloured side; yellow tinge on tail and around base of long fins on blind side (unpigmented side):—a Yellowtail (*Limanda*), Fig. LXXI.

**BUT IF:** Lateral line almost straight, or only slightly arched; no rusty spots on pigmented side nor yellow tinge to blind side:—see Section 3.

#### Section 3.

**IF:** Blind side of dark hue; pectoral fin on pigmented side black; body shape elliptical in outline; about 100 rays in dorsal and anal fins respectively:—a Witch (*Glyptocephalus*), Fig. LXVIII.

**BUT IF:** Blind side almost white; pectoral fin brownish not black; body shape roundish; only about 50 rays in dorsal and anal fins respectively:—see Section 4.

#### Section 4.

**IF:** Head between eyes scaleless; bony ridge present; pigmented surface rather smooth, lateral line very distinct and straight; fish almost round and rather thin:—a Smooth Flounder (*Liopsella*), Fig. LXIX.

**BUT IF:** Head between eyes covered with scales, bony ridge absent; pigmented surface rough to touch; lateral line not so distinct and slightly arched over pectoral fin; fish not so round and rather thick bodied:—a Winter Flounder (*Pseudopleuronectes*), Fig. LXX.

#### Section 5.

**IF:** Fish left-handed: ventral fins not symmetrical, that on pigmented side extending from tip of isthmus to beginning of anal fin (giving impression that these 2 fins are continuous); upper part of some of anterior dorsal rays free from membrane; lateral line well arched over pectoral fin;

caudal fin rounded; pigmented side with dark spots on body and fins; body thin:—a Sand Flounder (*Lophopsetta*), Fig. LXIV.

**BUT IF:** Fish either left or right-handed; ventral fins symmetrical, even that on pigmented side being well separated from tip of isthmus and anal fin; no free rays in dorsal fin; lateral line either straight or arched; caudal fin rounded, forked or of another shape:—see Section 6.

#### Section 6.

**IF:** Fish right-handed; lateral line almost straight:—see Section 7.

**BUT IF:** Fish either right or left-handed; lateral line well arched:—see Section 8.

#### Section 7.

**IF:** Caudal fin round; teeth rather weak; blind side whitish:—a Canadian Plaice (*Hippoglossoides*), Fig. LXVII.

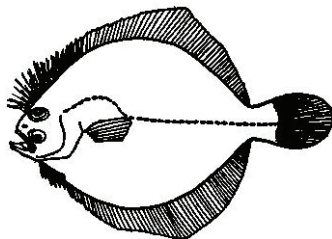
**BUT IF:** Caudal fin slightly forked; teeth strong; blind side greyish not whitish:—a Greenland Halibut (*Reinhardtius*), Fig. LXVI.

#### Section 8.

**IF:** Fish right-handed, of large size; middle rays of caudal fin shorter than lateral, and this fin forked; dorsal beginning over eye, not in front of it; the blind side white in smaller fish and greyish in larger:—a Halibut (*Hippoglossus*), Fig. XI.

**BUT IF:** Fish left-handed and of smaller size; middle rays of caudal fin longer than lateral, hence this fin rounded or cross-bow shaped; dorsal beginning in front of eye; blind side whitish:—a Summer Flounder (*Paralichthys*), Fig. LXV.

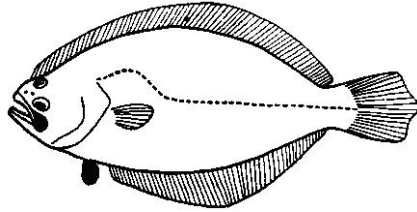
Sand Flounder,  
*Lophopsetta maculata*  
(Mitchill) 1814  
(Fig. LXIV).



This rather southern form distributed sporadically in our region, being found mainly in Minas Basin, St. Mary Bay and on certain parts of Western Bank. Of little economic importance. Maximum length 18 inches and weight about 2 pounds.

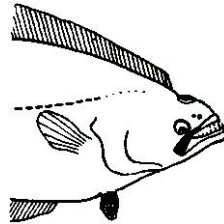
XL. HALIBUT FAMILY, *HIPPGLOSSIDAE*.

**Summer Flounder,**  
*Paralichthys dentatus*  
(Linnaeus) 1766  
(Fig. LXV).



There is only one positive record of the capture of this southern fish in our region, and that was of a specimen taken on Le Have Bank (Lat. 43° 3' N; Long. 63° 39' W.) in 85 fathoms during the *Challenger* Expedition (Günther<sup>45</sup>, p. 3). Reaches a maximum length of 3 feet and weight of 26 pounds.

**Greenland Halibut,**  
*Reinhardtius*  
*hippoglossoides*  
(Walbaum) 1792  
(Fig. LXVI).



This northern form rather uncommon, being reported a number of times as caught on the Nova Scotian banks only. It has been more often taken off Canso on a muddy bottom in about 50 fathoms (Cornish<sup>46</sup>, p. 90). Of slight economic importance due to its scarcity in our region. Attains a maximum length of about 3 feet and weight of 25 pounds.

**Halibut,** *Hippoglossus hippoglossus* (Linnaeus) 1758 (Fig. XI).

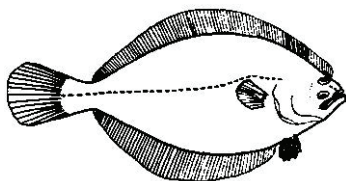
Common throughout whole region, being caught chiefly in the deeper water and on the "banks." Economically the

<sup>45</sup>Günther. *Challenger Rept.* Shore Fishes, Zoology, 1, p. 3 (1880).

<sup>46</sup>Cornish. *Contr. Can. Biol.*, 1902-05, 81-90 (1907).

most important Flatfish, about 2,600,000 pounds being caught yearly with a value of \$387,000. The largest of our Flatfishes, reaching a maximum length of about 10 feet and 700 pounds in weight. Our own records show that every year odd fish, weighing 500 to 600 pounds, are caught in the Bay of Fundy.

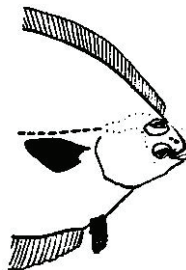
**Canadian Plaice,**  
*Hippoglossoides*  
*platessoides*  
(Fabricius) 1780  
(Fig. LXVII).



Probably our most abundant and commonest Flatfish, being usually found in from 10 to 50 fathoms over a sandy bottom. This species composes the major part (Halibut excepted) of the bank Flatfish catches. The total yearly catch of all Flatfishes (excluding Halibut) amounts to about 1,400,000 pounds and \$63,000 in value. The largest North American specimen on record is that of 28½ inches in length, caught by the steam trawler *Viernoë* (Capt. F. Tidman) on Western Bank, September 6, 1934.

XLI. FLOUNDER FAMILY, *PLEURONECTIDAE*.

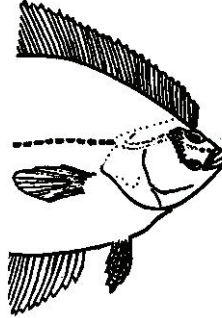
**Witch,**  
*Glyptocephalus*  
*cynoglossus*  
(Linnaeus) 1758  
(Fig. LXVIII).



Very common throughout the whole region in rather deep water, sometimes as deep as 858 fathoms (Goode and Bean<sup>8</sup>,

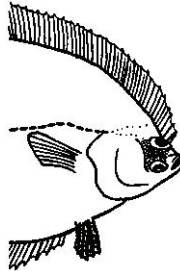
p. 433). Of slight economic importance because of its rather watery flesh. Maximum length about 2 feet and weight of 5 pounds.

**Smooth Flounder,**  
*Liopsetta putnami*  
(Gill) 1864  
(Fig. LXIX).



This northern form rather uncommon, being found in shallow waters over a muddy bottom. Without economic importance. It is the smallest of our Flatfishes, the maximum length being about 1 foot and 1½ pounds in weight.

**Winter Flounder,**  
*Pseudopleuronectes*  
*americanus*  
(Walbaum) 1792  
(Fig. LXX).



Very common in shallow waters (usually less than 20 fathoms) throughout the whole region. A variety of this species found on the Nova Scotian banks, and sometimes called "Lemon Sole," plays an important part in the Flatfish fishery. The Lemon Sole reaches a larger size than the in-shore fish. The largest specimen from North American waters was that caught by the steam trawler *Viernoe* (Capt. F. Tidman) on September 8, 1934, on Western Bank. It was 25 inches in length and 8 pounds in weight.

**Yellowtail,**  
*Limanda ferruginea*  
(Storer) 1839  
(Fig. LXXI).



Very common over the whole area, particularly abundant on the "banks" in depths from 20 to 30 fathoms. Important economic species, with a more delicious flavour than any other of our Flatfishes. Length up to 2 feet.

#### XLII. STICKLEBACK FAMILY, *GASTEROSTEIDAE*.

##### Key for genera.

###### Section 1.

**IF:** 8 to 11 free spines in front of dorsal fin; a keel along each side of posterior part of body and tail; a bony plate between and behind ventral fins:—a Nine-spined Stickleback (*Pungilius*), Fig. LXXIII.

**BUT IF:** Less than 6 free spines in front of dorsal fin; keel and bony plate between ventral fins either present or absent:—see Section 2.

###### Section 2.

**IF:** Body usually possessing bony plates (varying in number from 0 to 33); 2 long, stout spines on back in addition to 1 small spine immediately in front of dorsal fin; a keel along each side of posterior part of body; a bony plate between and behind ventral fins:—a Three-spined Stickleback (*Gasterosteus*), Fig. LXXII.

**BUT IF:** Body naked, without bony plates; as a rule 3 stout, free spines in addition to 1 smaller spine immediately in front of dorsal fin; keels absent, 2 narrow, bony plates 1 on each side of belly, not between ventral fins:—a Four-spined Stickleback (*Apeltes*), Fig. LXXIV.

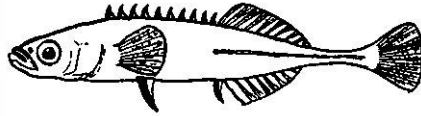
**\*Three-spined  
Stickleback,**  
*Gasterosteus aculeatus*  
Linnaeus 1758  
(Fig. LXXII).



Extremely abundant in very shallow water along the whole shoreline of the region, as well as in estuaries and creeks. Without economic importance. Maximum length about 4

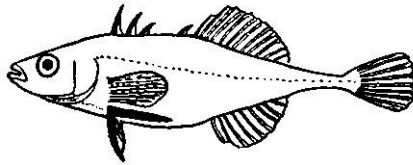
inches. The males of this species, as well as other Stickleback species, build nests of aquatic plants. The eggs are deposited in the nests by the females and protected thereafter by the males only.

**\*Nine-spined  
Stickleback,  
*Pungitius pungitius*  
(Linnaeus) 1758  
(Fig. LXXIII).**



This fish is similar to the Three-spined species in abundance, distribution and habits. However, it occurs more often in fresh water than the above species, and does not grow quite as large.

**\*Four-spined  
Stickleback,  
*Apeltes quadracus*  
(Mitchill) 1815  
(Fig. LXXIV).**



Rather common along the coast of the whole region, being, however, almost exclusively a salt and brackish water species. Without economic importance and less than 3 inches in length.

#### XLIII. SEA HORSE FAMILY, *SYNGNATHIDAE*.

##### Key for genera.

**IF:** Body elongated, needle-like; head long with tube-like snout; caudal fin present:—a Pipefish (*Syngnathus*), Fig. LXXV.

**BUT IF:** Body rather short, divided into stout front part and long tail curled inwards; head horse-like; caudal fin absent:—a Sea Horse (*Hippocampus*), Fig. LXXVI.

**Pipefish,  
*Syngnathus fuscus*  
(Storer) 1839  
(Fig. LXXV).**



Rather common in the coastal waters of the whole region in warm water amongst Eel grass and other aquatic vegetation. Without economic importance. Up to 12 inches in length.



Since the days of Aristotle it has been known that the Pipefish incubates its eggs in a brood pouch. This pouch is found on the ventral surface of the male only, who takes care of the eggs until they hatch.

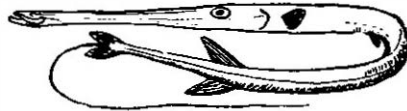
Sea Horse,  
*Hippocampus*  
*hudsonius*  
DeKay 1842  
(Fig. LXXVI).



There are only odd records of the occurrence of this southern fish in our region. These are from the shore waters of the Atlantic coast of Nova Scotia. Less than 8 inches in length. The male protects the eggs in the same manner as described for the Pipefish. No doubt other species of Sea Horse may stray into our region from the south (Vladykov<sup>15</sup>).

#### XLIV. TRUMPETFISH FAMILY, *FISTULARIIDAE*.

Trumpetfish,  
*Fistularia serrata*  
Cuvier 1817<sup>47</sup>  
(Fig. LXXVII).



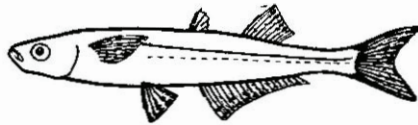
This southern form very rare. Odd captures from time to time have been reported from the Atlantic coast of Nova

<sup>47</sup>Jones (see footnote 19) listed another species, *F. tabacaria* L., from our area, besides *F. serrata*. However, the specimens of the Provincial Museum examined by us are similar to the description and illustration of *F. serrata* given by Günther., (*loc. cit.*, p.p. 68-69, pl. xxxii. It may be mentioned also that distinction between different species of *Fistularia* is quite difficult (Meek and Hildebrand, *Field Mus. Nat. Hist. Pub. No. 250, Zool. Ser.*, 15, 249-254, 1923). Thus, in our list we consider Jones' *F. tabacaria* as synonymous with *F. serrata*.

Scotia as far northeast as Halifax Harbour. Several specimens are exhibited in the Provincial Museum at Halifax. The more recent record is of a capture of a specimen off Port Mouton, N. S., 1931 (Vladykov<sup>16</sup>). This species reaches a length of about 5 feet.

XLV. SILVERSIDE FAMILY, *ATHERINIDAE*.

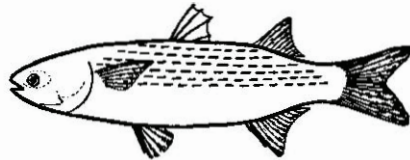
Silverside,  
*Menidia notata*  
(Mitchill) 1815  
(Fig. LXXVIII).



This species is found rather sporadically in shallow, inshore waters, as well as in brackish waters. It prefers shallow, sandy inlets where the water becomes quite warm in summer. Up to about 6 inches in length.

XLVI. MULLET FAMILY, *MUGILIDAE*.

Mullet,  
*Mugil cephalus*  
Linnaeus 1758  
(Fig. LXXIX).



There is only one record of a capture of this southern species in our region, and that is of a young specimen taken in Bedford Basin, Halifax Harbour, 1931 (Vladykov<sup>16</sup>). In southern waters it reaches a length of about 2 feet.

XLVII. MACKEREL FAMILY, *SCOMBRIDAE*.

Key for genera.

Section 1.

**IF:** 2 dorsal fins far apart, separated by a space equal to at least one-half of head length; 2 keels present on each side at base of caudal fin:—see Section 2.

**BUT IF:** 2 dorsal fins close together, almost touching; 3 keels present on each side at base of caudal fin:—see Section 3.

## Section 2.

**IF:** Eye small; air bladder absent; first dorsal fin with 10 to 14 spines; sides below lateral line silvery, not spotted:—a Mackerel (*Scomber*), Fig. LXXX.

**BUT IF:** Eye large; air bladder present; first dorsal fin with 9 or 10 spines; sides below lateral line mottled with dusky blotches:—a Chub Mackerel (*Pneumatophorus*), Fig. LXXXI.

## Section 3.

**IF:** Pectoral and ventral fins about equal in length; first dorsal fin slightly higher than second; teeth on vomer absent; sides having black longitudinal bands:—a Bonito (*Sarda*), Fig. LXXXII.

**BUT IF:** Pectoral fin much longer than ventral fin; first dorsal fin lower than second; minute teeth on vomer; sides without black longitudinal bands:—see Section 4.

## Section 4.

**IF:** Pectoral fin short, about one-half length of head; fish large, usually longer than 6 feet and over 200 pounds in weight:—a Tuna (*Thunnus*), Fig. VIII.

**BUT IF:** Pectoral fin long, about one and a half times length of head; fish smaller, less than 4 feet in length and 70 pounds in weight:—a Long-finned Tuna (*Germo*), Fig. LXXXIII.

Mackerel,  
*Scomber scombrus*  
Linnaeus 1758  
(Fig. LXXX).



Very common throughout the whole region, particularly abundant in the numerous bays along the shore during the summer months. Mackerel is well known as a marine sport fish, and it is also one of the most important commercial species with a yearly catch of about 11,350,000 pounds, having a value of \$379,000. Length up to 20 inches, and weight to about 4 pounds.

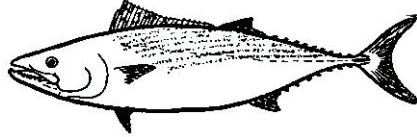
Chub Mackerel,  
*Pneumatophorus colias*  
(Gmelin) 1788  
(Fig. LXXXI).



This species rather uncommon in our region. Probably a small number are mixed every year with the Mackerel.

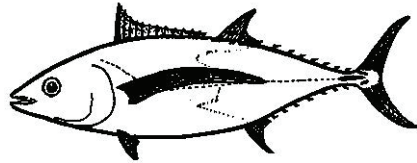
However, it is only recently that its definite occurrence has been recorded (Vladykov<sup>15</sup>). Without economic importance. Length about 1 foot.

**Bonito,**  
*Sarda sarda*  
(Bloch) 1793  
(Fig. LXXXII).



Only two positive records of the capture of this more southern form in our waters are known (Vladykov<sup>15</sup>). Length up to about 3 feet, and weight to 15 pounds.

**Long-finned Tuna,**  
*Germo alalunga*  
(Gmelin) 1788  
(Fig. LXXXIII).



The occurrence of this southern form in our region is similar to that of the Bonito (Vladykov<sup>15</sup>). Much smaller than the Tuna, reaching only about 70 pounds in weight.

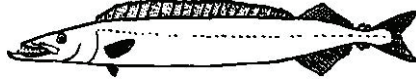
**Tuna or Albacore** *Thunnus thynnus* (Linnaeus) 1758 (Fig. VIII).

Common summer visitor, only along the outer coast of Nova Scotia. One of the highly prized sport fishes, as well as an important commercial species. The annual catch is about 233,000 pounds, with a value of \$14,000. This yield could be easily increased, due to the abundance of the fish, if market conditions were more favourable. It is one of the largest of our fishes. The record specimen measuring 10½ feet in length and weighing 956 pounds was caught off Liverpool, N. S., on August 17, 1934 with rod and line<sup>48</sup>. Specimens less than 60 pounds are only occasionally seen in our region.

<sup>48</sup>This information is taken from the pamphlet "Deep Sea Fighters," issued by the Highway Department of Nova Scotia, Halifax, 1935, 16 pp.

XLVIII. OILFISH FAMILY, *GEMPYLIDAE*.

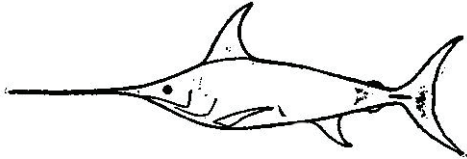
**Oilfish,**  
*Escolar violaceus*  
(Bean) 1887  
(Fig. LXXXIV).



There is only one positive record of a capture of this southern deep water species in our waters, and that was of a specimen taken on Le Have Bank in 125 fathoms many years ago (Goode and Bean<sup>s</sup>, p. 195). This specimen measured about 4 feet in length.

XLIX. SWORDFISH FAMILY, *XIPHIIDAE*.

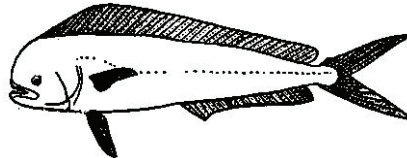
**Swordfish,**  
*Xiphius gladius*  
Linnaeus 1758  
(Fig. LXXXV).



A common summer visitor only, along the outer coast of Nova Scotia. Particularly abundant off the east coast of Cape Breton. One of the best sport fishes, as well as an important commercial fish. The annual yield is about 970,000 pounds, with a value of \$149,000. Reaches a weight of about 700 pounds, slightly smaller than the Tuna. Younger specimens, less than 50 pounds, are seldom found in our waters.

L. DOLPHIN FAMILY, *CORYPHAENIDAE*.

**Dolphin,**  
*Coryphaena hippurus*  
Linnaeus 1758  
(Fig. LXXXVI).

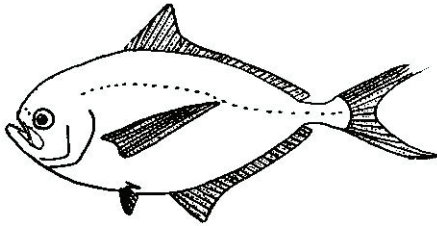


This southern pelagic fish extremely rare. Only one specimen, about 2 feet in length, has ever been caught in our

waters, and that was taken in Bedford Basin, Halifax Harbour, on August 7, 1901. This is exhibited in the Provincial Museum, Halifax (No. 357). In southern waters it reaches a length of 6 feet. This Dolphin is an extremely fast-swimming fish, feeding to a considerable extent on Flyingfishes.

LI. SEA BREAM FAMILY, *BRAMIDAE*.

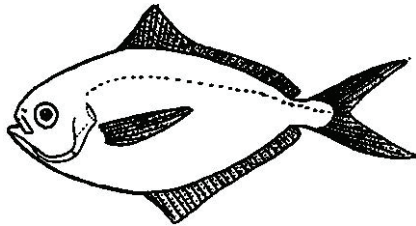
**Sea Bream,**  
*Taractes princeps*  
Johnson 1863  
(Fig. LXXXVII).



This rather southern fish extremely rare. Only one specimen has been caught in our waters, and this was taken on Brown's Bank, January 10, 1928 (Bigelow and Schroeder<sup>4</sup>). Originally this species was described from Madeira, where it reaches a length of about 30 inches.

LII. DOLLARFISH FAMILY, *STROMATEIDAE*.

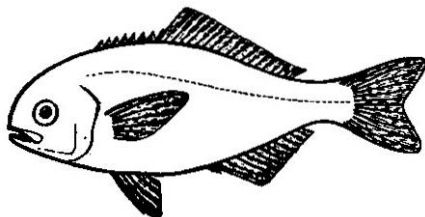
**Dollarfish,**  
*Poronotus triacanthus*  
(Peck) 1800  
(Fig. LXXXVIII).



A not uncommon summer visitor in the coastal waters of the whole region. Without economic importance. Hardly ever reaches 1 foot in length. The name is derived from its round shape and silvery colour.

LIII. BARRELFISH FAMILY, *CENTROLOPHIDAE.*

Barrelfish,  
*Palinurichthys*  
*perciformis*  
(Mitchill) 1818  
(Fig. LXXXIX).



Rather rare, being known only from the outer coast of Nova Scotia, where the capture of the odd specimen probably takes place every year during the summer months. Reaches a length of 1 foot. They owe their common name to the habit of congregating around wreckage or inside of floating boxes and barrels, which serve as shelter. There they may be easily caught with dipnets.

LIV. HARDTAIL FAMILY, *CARANGIDAE.*

## Key for genera.

## Section 1.

**IF:** 1 finlet behind each dorsal and anal fin:—a Mackerel Scad (*Decapterus*), Fig. XC.

**BUT IF:** No finlet behind either dorsal or anal fin:—see Section 2.

## Section 2.

**IF:** Body very thin, depth not less than one-half body length; first dorsal reduced to merely a few spines, the anterior of which may be connected by a membrane, the fin, as a whole, much lower than second dorsal; ventral fin very short, smaller than diameter of eye:—see Section 3.

**BUT IF:** Body not very thin; depth not more than one-third of body length; first dorsal fin well developed, about equal in height to second dorsal fin; ventral fin longer than diameter of eye:—see Section 4.

## Section 3.

**IF:** Anterior rays of both second dorsal fin and anal fin not pronouncedly elongated, only about equal to posterior rays of respective fins; a row of keeled shields along posterior part of lateral line:—a Common Moonfish (*Vomer*), Fig. XCII.

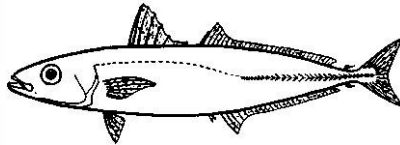
**BUT IF:** Anterior rays of both second dorsal fin and anal fin pronouncedly elongated, at least eight times as long as posterior rays of respective fins; no keeled shields along posterior part of lateral line:—a Horsehead Moonfish (*Argyreiosus*).

## Section 4.

**IF:** Shoulder girdle having a deep cross furrow near its juncture with isthmus and a fleshy knob above it; eye large, diameter not less than one-third of head length:—a Big-eyed Scad (*Trachurops*).

**BUT IF:** Shoulder girdle having no furrow, fleshy knob absent; eye small, diameter not more than one-fourth of head length:—a Hardtail (*Caranx*), Fig. XCI.

**Mackerel Scad,**  
*Decapterus macarellus*  
(Cuvier and Valenciennes) 1833  
(Fig. XC).



So far as is known, the only two specimens captured in our region were taken in the Chedabucto Bay trap-nets near Canso, N. S. (Cornish<sup>46</sup>, p. 85). It reaches about 1 foot in length. The Mackerel Scad, as the other members of this family, is pelagic in habit, being common in more southern waters.

**Big-eyed Scad, *Trachurops crumenophthalma*** (Bloch) 1793.

This form is equally as rare as the Mackerel Scad. Only the capture of two specimens has been reported from our region, and these were taken in the Canso vicinity (Cornish<sup>46</sup>, p. 85). Maximum length 15 inches.

#### Key for species of genus *Caranx*.

**IF:** Breast naked except for a small triangular patch of scales immediately in front of ventral fins; number of keeled shields along lateral line 26 to 30:—a Jack (*C. hippos*).

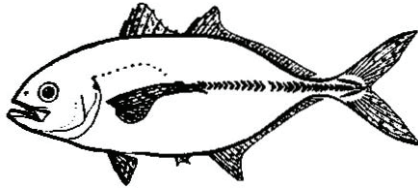
**BUT IF:** Breast fully scaled, number of keeled shields along lateral line 38 to 45:—a Hardtail (*C. crysos*), Fig. XCI.

**Jack, *C. hippos*** (Linnaeus) 1766.

This rare species had not been reported from our region until recently, when three small specimens (about 1½ inches in length) were caught in Musquodoboit Harbour in the summer of 1933 (Vladykov<sup>15</sup>). In southern waters it attains a maximum size of about 20 pounds.

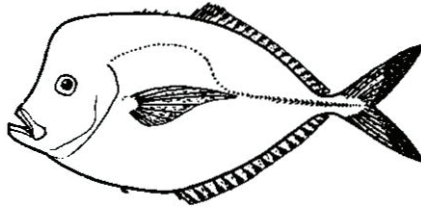


**Hardtail,**  
*C. crysos*  
(Mitchill) 1815  
(Fig. XCI).



This species is more commonly found in our region than any of the other members of the Hardtail family. Probably every year a few specimens are found along the outer coast of this province during the late summer months. It reaches a weight of about 3 pounds in southern waters. Specimens straying into our region are hardly ever over 1 foot in length.

**Common Moonfish,**  
*Vomer setapinnis*  
(Mitchill) 1815  
(Fig. XCII).



Small specimens (about 2 inches in length) are sometimes found during the warm months along the outer coast of this province (Leim<sup>49</sup>; Vladykov<sup>16</sup>). In southern waters it reaches about 1 foot in length.

**Horsehead Moonfish, *Argyreiosus vomer* (Linnaeus) 1758.**

Very rare in our region. According to Jones<sup>19</sup> and Honeyman<sup>60</sup> (p. 328) occasional specimens were taken in the in-shore waters of this province. In southern regions it grows to a size of about 2 pounds.

#### LV. PILOTFISH FAMILY, *SEROLIDAE*.

##### Key for genera.

**IF:** First dorsal fin represented by 4 short spines practically without connecting membrane, second dorsal fin with 25 to 27 soft rays; mouth small; posterior edge of maxillary scarcely reaching front of eye; body depth about one-quarter of body length:—a Pilotfish (*Naucrates*).

<sup>49</sup>Leim. *Proc. N. S. Inst. Sci.*, 17, Pt. 4, p. xlvi (1930).

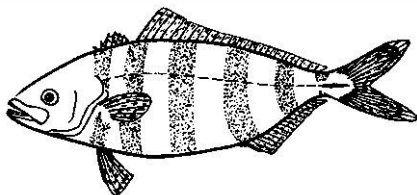
<sup>60</sup>Honeyman. *Trans. N. S. Inst. Nat. Sci.*, 6, Pt. 4. 228-232; 328-330 (1886).

**BUT IF:** First dorsal fin well developed, consisting of 6 to 7 spines connected by a membrane; second dorsal with 36 to 40 soft rays; mouth somewhat larger, maxillary practically reaching middle of eye; body depth about one-third of body length:—a Rudderfish (*Seriola*), Fig. XCIII.

**Pilotfish, *Naucrates ductor*** (Linnaeus) 1758.

Many years ago, Honeyman<sup>50</sup> (p. 330) presumably observed this rare species in our region. During recent years (1932-34) three specimens, caught on Nova Scotian banks, have been at our disposal (Vladykov<sup>16</sup>). These specimens are all around 16 inches in length. In southern waters, this species reaches about 2 feet in length. The name Pilotfish is derived from its habit of following ships and larger sharks. The general belief that it leads sharks to food is probably erroneous.

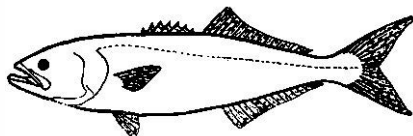
**Rudderfish,**  
*Seriola dumerili*  
(Risso) 1810  
(Fig. XCIII).



Young specimens (about 7 inches in length) of this fish are more commonly found than the Pilotfish during summer months along the shores of the outer coast of Nova Scotia. In southern waters this pelagic fish reaches a maximum weight of 100 pounds (Hildebrand and Schroeder<sup>51</sup>, p. 218). This species is quite well known to our fishermen, as it is often seen around buoys, floating wreckage, etc.

LVI. BLUEFISH FAMILY, *POMATOMIDAE*.

**Bluefish,**  
*Pomatomus saltatrix*  
(Linnaeus) 1758  
(Fig. XCIV).



This pelagic southern form rare, only odd specimens being reported from our waters, and these mainly off Yarmouth

<sup>51</sup>Hildebrand and Schroeder. *Bull. U. S. Bur. Fish.*, 43, 366 pp. (1928).

(personal observations) and Liverpool, N. S. (Leim<sup>49</sup>). In southern waters it reaches about 3 feet in length, and is a highly prized edible fish.

LVII. WHITE BASS FAMILY, *MORONIDAE*.

Key for genera.

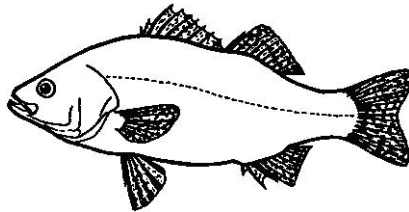
**IF:** First dorsal fin separated from second dorsal fin by a space about equal to twice diameter of eye; scales small, about 65 along lateral line; eye small, about one-seventh of head length; longitudinal dark stripes on side:—a Striped Bass (*Roccus*), Fig. IX.

**BUT IF:** 2 dorsal fins meeting at their bases; scales larger, about 53 along lateral line; eye larger, about one-quarter head length; sides not distinctly striped:—a White Perch (*Morone*), Fig. XCV.

\*Striped Bass, *Roccus saxatilis* (Walbaum) 1792 (Fig. IX).

Rather rare in salt water, being more often found close to and in estuaries, relatively plentiful in the Shubenacadie River and Grand Lake. A highly prized sport and commercial fish, but it is not very abundant in this province. The yearly catch is only about 7,600 pounds, valued at \$800. Specimens up to about 50 pounds in weight have been caught in Grand Lake. The largest specimen, weighing about 125 pounds and 6 feet in length, was taken at Edenton, N. C., in 1891 (Bigelow and Welsh<sup>3</sup>, p. 252).

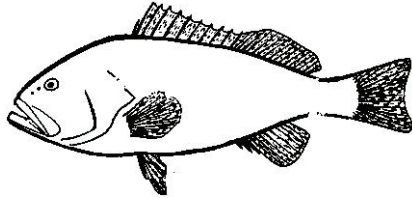
\*White Perch,  
*Morone americana*  
(Gmelin) 1789  
(Fig. XCV).



It is commonly found in a number of Nova Scotian lakes, while in salt and brackish waters it is not so frequently seen. A very good sport and edible fish. Maximum length about 15 inches and weight 3 pounds.

LVIII. SEA BASS FAMILY, *EPINEPHELIDAE*.

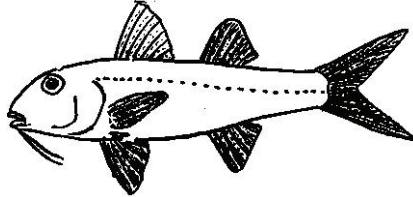
**Red Grouper,**  
*Epinephelus morio*  
(Cuvier and Valenciennes) 1828  
(Fig. XCVI).



Only two young specimens (about 1 inch in length) of this rare southern species are known to have been captured in our waters, and these were taken in Eastern Passage, Halifax Harbour, October 12, 1928 (Vladykov<sup>18</sup>). In southern waters it grows to about 3 feet in length.

LIX. SURMULLET FAMILY, *MULLIDAE*.

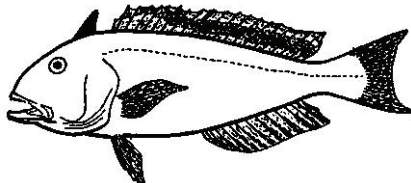
**Red Mullet,**  
*Mullus auratus*  
Jordan and Gilbert  
1882  
(Fig. XCVII).



Only one specimen (3 inches long) of this southern species has been caught in our region, and this was taken along with the Red Grouper in 1928 (Leim<sup>49</sup>), as mentioned above. Length up to about 8 inches. The Mediterranean species (*M. surmuletus*) was famous in Roman times, when large amounts of money were spent in keeping this fish in glass vessels in order to see the exquisite play of colours in dying specimens.

LX. TILEFISH FAMILY, *BRANCHIOSTEGIDAE*.

**Tilefish,**  
*Lopholatilus chamaeleonticeps*  
Goode and Bean  
1879  
(Fig. XCVIII).

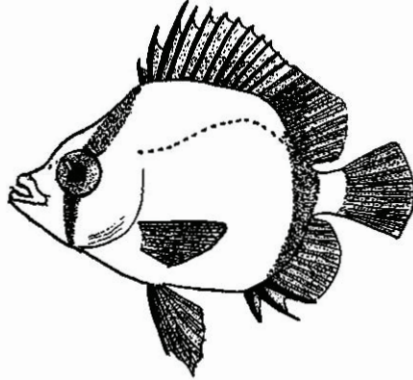


The only positive record of a capture of this rare fish in our region was that of a small specimen taken on Quereau

Bank and reported by Smith<sup>42</sup>. Reaches, in southern waters, about 50 pounds in weight. It is a peculiarity of the Tilefish that extraordinary mortality occurs among them from time to time over large areas.

LXI. BUTTERFLY FISH FAMILY, *CHAETODONTIDAE*.

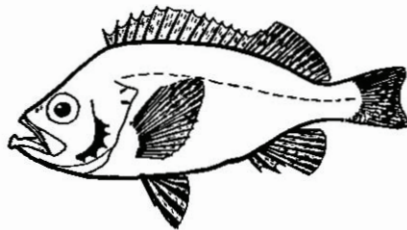
**Common Butterfly  
Fish,**  
*Chaetodon ocellatus*  
Bloch 1787  
(Fig. XCIX).



Only one specimen (about 1 inch in length) of this rare fish has been captured in our waters, and that was taken in Musquodoboit Harbour in 1933 (Vladykov<sup>16</sup>). In southern waters it reaches a length of about 8 inches. It is a typical coral reef species, flitting about from place to place in a rather butterfly-like fashion.

LXII. ROCKFISH FAMILY, *SCORPAENIDAE*.

**Rosefish,**  
*Sebastes marinus*  
(Linnaeus) 1758  
(Fig. C).



Common throughout our whole region in water of about 20 to 50 fathoms in depth. Particularly abundant during

<sup>42</sup>Smith. *U. S. Comm. Fish and Fish. Rept. Commiss.* 1903, p. 85 (1905).

winter months on Western Bank where as many as 2,000 pounds per haul may be taken by the steam trawlers. Without economic importance at present, although the flesh is very tasty. It is regrettable that it is not generally used for human consumption in this country. Reaches a maximum length of 2 feet and weight of 12 pounds.

LXIII. SCULPIN FAMILY, *COTTIDAE*.

Key for genera.

Section 1.

**IF:** Only 1 dorsal fin consisting of a spiny-rayed anterior part and a soft-rayed posterior part:—a Deep-sea Sculpin (*Cottunculus*).

**BUT IF:** 2 separate dorsal fins, first spiny and second soft-rayed:—see Section 2.

Section 2.

**IF:** Anal fin long with at least 20 rays; about 45 bony plates on each side of body:—a Mailed Sculpin (*Triglops*), Fig. CII.

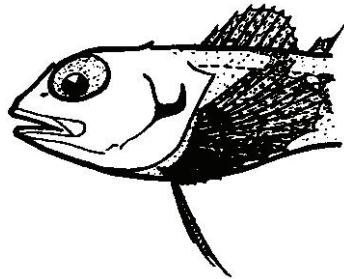
**BUT IF:** Anal fin short, with less than 16 rays; no bony plates along sides of body:—see Section 3.

Section 3.

**IF:** Eye large, diameter about one-third of head length; upper large spine on edge of cheek strongly curved upwards; head and body naked; fish of smaller size, not more than 4 inches in length:—a Hook-eared Sculpin (*Artdiellus*), Fig. CI.

**BUT IF:** Eye smaller, diameter not more than one-quarter of head length; upper and all other spines on cheek straight, not curved; head and body naked or covered with odd patches of bony shields; fish usually more than 5 inches in length:—a Common Sculpin (*Myoxocephalus*), Fig. CIII.

Hook-eared Sculpin,  
*Artdiellus uncinatus*  
(Reinhardt) 1833  
(Fig. CI).



Not uncommon, being reported from a number of places off the outer coast of Nova Scotia in water of 50 to 190 fathoms

in depth (Goode and Bean<sup>6</sup>, p. 268). Without economic importance. Growing to about 4 inches in length.

**Mailed Sculpin,**  
*Triglops pingeli*  
Reinhardt 1832  
(Fig. CII).



Rather common, being particularly numerous on Western Bank where it constitutes part of the food of Cod. Without economic importance. Up to 8 inches in length.

**Deep-sea Sculpin, *Cottunculus microps*** Collett 1875.

Rare, being reported only by Goode and Bean<sup>6</sup> (p. 270) from south of Brown's Bank in water of from 122 to 141 fathoms in depth. Length about 8 inches.

Key for species of genus *Myoxocephalus*.

Section 1.

**IF:** Spines on head sharp; upper spine on margin of cheek very long, about four times longer than the one below it and reaching to posterior margin of gill cover:—a Long-horned Sculpin (*M. octodecimspinosus*), Fig. CIV.

**BUT IF:** Spines on head rather blunt; upper spine on margin of cheek only twice as long as the one below it, and reaching only half-way to posterior margin of gill cover:—see Section 2.

Section 2.

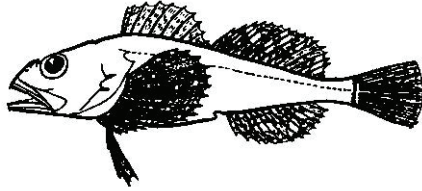
**IF:** Anal fin having 10 to 11 rays; second dorsal fin 13 to 14 rays; head and body naked; fish never longer than 8 inches:—a Little Sculpin (*M. aeneus*).

**BUT IF:** Anal fin having 13 to 14 rays; second dorsal fin having 16 to 17 rays; fish usually between 8 and 14 inches in length:—a Common Sculpin (*M. scorpius gröenlandicus*), Fig. CIII.

**Little Sculpin, *M. aeneus*** (Mitchill) 1815.

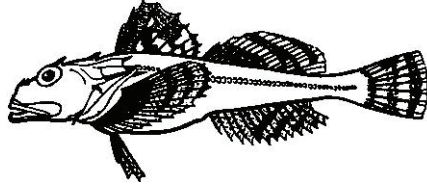
Common in coastal waters along the whole region. Usually found in shallow inlets during the summer. Without economic importance. Maximum length about 8 inches.

**Common Sculpin,**  
*M. scorpius*  
*gröenlandicus*  
(Cuvier and Valenciennes) 1829  
(Fig. CIII).



Very common throughout the whole region in shallow water from 2 to about 20 fathoms in depth. Is seldom seen on the "banks." Without economic importance. Grows to a length of about 3 feet. The typical form of this species is distributed throughout northern European waters.

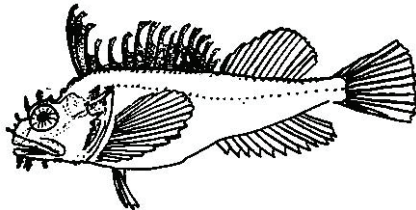
**Longhorned Sculpin,**  
*M. octodecimspinosus*  
(Mitchill) 1815  
(Fig. CIV).



Very common throughout the whole region, but in deeper water (10 to 50 fathoms) than the previous species. Also without economic importance, being rather a nuisance to fishermen, as it often becomes entangled in the nets and also greedily takes baited hooks on line trawls. The very long spines on this Sculpin quite often wound the fishermen's hands when removing it from the gear. Length about 1½ feet.

LXIV. SEA RAVEN FAMILY, *HEMITRIPTERIDAE*.

**Sea Raven,**  
*Hemitripterus*  
*americanus*  
(Gmelin) 1788  
(Fig. CV).



Very common throughout the whole region, usually being found in water from 15 to 50 fathoms in depth. Without economic importance. Maximum length about 25 inches



and weight 5 pounds. When taken from the water it usually exerts its power of inflating the belly like a balloon. Because of this, it is frequently called "Puff Belly."

LXV. ALLIGATORFISH FAMILY, *ASPIDOPHOROIDIDAE*.

Common Alligator-  
fish,

*Aspidophoroides  
monopterygius*  
(Bloch) 1786  
(Fig. CVI).

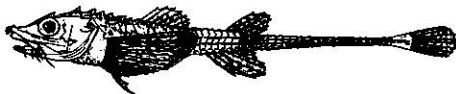


Very common throughout our whole region. Sometimes found as deep as 100 fathoms. Without economic importance. Length up to about 7 inches. The name Alligatorfish is derived from the fact that it is covered with regular bony plates, reminding one of the bony shields of an Alligator.

LXVI. SEA POACHER FAMILY, *AGONIDAE*.

Northern  
Alligatorfish,

*Leptagonus decagonus*  
(Black and Schneider)  
1801  
(Fig. CVII).



This northern form very rare. Only recently Thompson<sup>68</sup> (p. 127) reported the capture of a young specimen near the surface on Quereau Bank in 1932. This is the first record of this species in our waters. Reaches a maximum of about 8 inches.

LXVII. LUMPFISH FAMILY, *CYCLOPTERIDAE*.

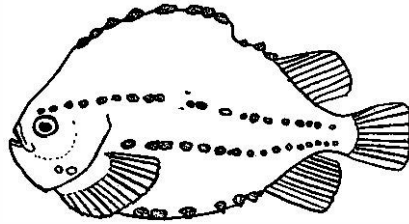
Key for genera.

**IF:** 2 dorsal fins, first persisting throughout life; head and body rounded and covered with large, sharply pointed bony tubercles; fish less than 5 inches in length:—a Spiny Lumpfish (*Eumicropterus*).

**BUT IF:** Only 1 dorsal fin, (in adult first dorsal fin covered with flesh and not noticeable while in the very young both fins may be seen); head and body triangular in shape, covered with smaller, blunt tubercles; fish usually over 6 inches in length:—a Common Lumpfish (*Cyclopterus*), Fig. CVIII.

<sup>68</sup>Thompson. *Rept. Nfld. Fish. Res. Comm.*, 2, No. I, 125-127 (1933).

**Common Lumpfish,**  
*Cyclopterus lumpus*  
Linnaeus 1758  
(Fig. CVIII).



Common over the whole region, usually found in shallow waters under floating sea weeds or under wharves. Without economic importance, although it is a good edible fish. Length up to 20 inches and weight about 50 pounds.

**Spiny Lumpfish, *Eumicropterus spinosus*** (Müller) 1777.

This northern form very rare, being only occasionally reported from our waters (Jones<sup>54</sup>). About 5 inches in length.

#### LXVIII. SEA SNAIL FAMILY, *LIPARIDAE*.

##### Key for genera<sup>54</sup>.

###### Section 1.

**IF:** Anterior 6 rays of dorsal fin separated from posterior part of fin by a deep notch; sucking disc large, diameter about five times that of eye; skin of the head and body rather firm not very easily torn:—a Common Sea Snail (*Neoliparis*), Fig. CIX.

**BUT IF:** No notch in dorsal fin; sucking disc of variable size; skin of head and body rather soft and very easily torn:—see Section 2.

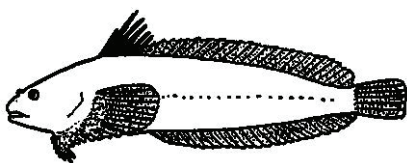
###### Section 2.

**IF:** Sucking disc large and flat, diameter about three times that of eye; longitudinal dark stripes on head and body:—a Striped Sea Snail (*Liparis*), Figs. VI and VII.

**BUT IF:** Sucking disc small and cup-like, diameter about equal to that of eye; colour of head and body uniformly whitish without stripes:—a Sea Tadpole (*Careproctus*).

<sup>54</sup>The recent revision of this family made by Burke (U. S. Nat. Mus. B. 11., 150, 204 pp. (1930) ) has been very helpful in the preparation of this key.

Common Sea Snail,  
*Neoliparis atlanticus*  
Jordan and Evermann  
1898  
(Fig. CIX).



Not uncommon in the coastal waters of the whole region. Usually found among rocks, to which they are attached by their ventral sucking disc. Sometimes they attach themselves to lobster traps and are brought to the surface. Without economic importance. Grow to a length of about 5 inches.

Striped Sea Snail, *Liparis liparis* (Linnaeus) 1766 (Fig. VI).

Jones<sup>19</sup> reported the presence of this uncommon fish in our waters. Found in somewhat deeper water than the previous species. Maximum length about 6 inches.

Sea Tadpole, *Careproctus ranulus* (Goode and Bean) 1879.

In spite of the fact that this species was discovered for the first time in our waters near Chebucto Head, Halifax Harbour, in 52 fathoms, on September 24, 1877 (Goode and Bean<sup>5</sup>, p. 276), no further records of its capture are known. Probably it is more northern in its distribution, as may be deduced from the bottom temperature of 35° F. where it was captured. Up to about 3 inches in length.

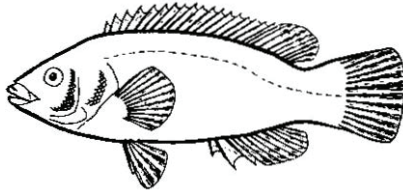
#### LXIX. CUNNER FAMILY, LABRIDAE.

##### Key for genera.

**IF:** Snout and top of head rounded giving a large angle profile; edge of cheek smooth not saw-toothed; gill covering largely naked; scales small, about 70 along lateral line; fish usually more than 15 inches in length:— a Tautog (*Tautoga*), Fig. CXI.

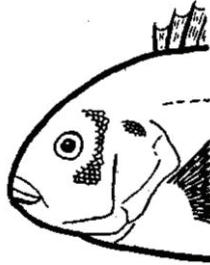
**BUT IF:** Snout and top of head rather flattened giving a small angle profile; edge of cheek saw-toothed; gill covering largely covered with scales; scales large, about 40 along lateral line; usually less than 10 inches in length:— a Cunner (*Tautoglabrus*), Fig. CX.

**Cunner,**  
*Tautoglabrus*  
*adspersus*  
(Walbaum) 1792  
(Fig. CX).



Very common in the coastal waters of the whole region, being particularly abundant around fish wharves, among rocks and in kelp beds. Without economic importance, but is occasionally used as fish bait. Up to 15 inches in length and as heavy as 2½ pounds.

**Tautog,**  
*Tautoga onitis*  
(Linnaeus) 1758  
(Fig. CXI).



There are only three positive records of the capture of this southern species in our region. Two specimens are exhibited in the Provincial Museum, Halifax, one of which was caught in Scott's Bay, Kings Co., July 12, 1902 (No. 950) and the other at Petpeswick Harbour, Halifax Co., May 12, 1903 (No. 1845). The third was caught at Cranberry Head, Yarmouth Co., in 1912, and reported by Fowler<sup>55</sup> (p. 517). Up to 3 feet in length and 15 pounds in weight.

#### LXX. SHARKSUCKER FAMILY, *ECHENEIDAE*.

##### Key for genera.

**IF:** Dorsal and anal fins long, practically equal in length, with 31 to 41 rays in each; sucking disc with 20 to 23 plates; a wide, dark, brown band along side on a brownish background:—a Large Sharksucker (*Echeneis*).

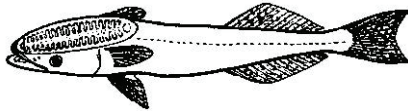
<sup>55</sup>Fowler. *Proc. Acad. Nat. Sci. Philad.*, 67, 517 (1915).

**BUT IF:** Dorsal and anal fins short, with 20 to 25 rays each; sucking disc with 18 plates; colour uniformly dark blue without stripes:—a Blue Shark-sucker (*Remora*), Fig. CXII.

**Large Sharksucker, *Echeneis naucrates*** Linnaeus 1758.

Rare, being an occasional visitor during the summer months. Many years ago, Jones<sup>19</sup> mentioned it among Nova Scotian fishes. Recently Leim<sup>49</sup> referred to another capture of a specimen 26½ inches in length, which was taken on a line trawl off Herring Cove, Halifax Harbour. Up to about 3 feet in length. All species of the Sharksucker family are pelagic fishes and are distributed throughout warm seas. In these fishes the first spiny dorsal fin is modified into a sucking disc by means of which they attach themselves to Sharks and other large moving objects. Even when the Shark is taken from the water they remain attached to it. In southern waters the natives sometimes use Sharksuckers to catch Sea Tortoises. Fastened on a line, the Sharksucker is released from the boat into the water close to the Sea Tortoise, to which it immediately attaches itself so firmly that the fisherman can, by pulling on the line, draw both the captor and its captive into the boat.

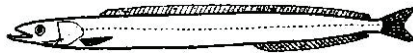
**Blue Sharksucker,**  
*Remora remora*  
(Linnaeus) 1758  
(Fig. CXII).



This rare species was reported only recently for the first time from our region by Vladykov<sup>15</sup>. It is usually found attached to the Blue Shark (*Prionace glauca*). Grows up to 15 inches in length.

LXXI. SAND LAUNCE FAMILY, *AMMODYTIDAE*.

**Sand Launce,**  
*Ammodytes americanus*  
DeKay 1842  
(Fig. CXIII).

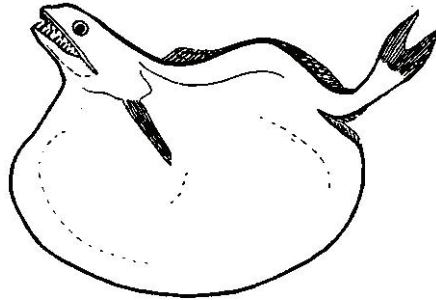


Very common, particularly abundant over sand bottom on Western Bank. Without economic importance in our

region. However, it plays an important part in the economy of the northern seas as food for fishes and larger animals. Cod, Haddock, Pollock, Halibut, Skates, etc., find it a staple article of food. Finback Whale also devour them greedily. The Sand Launce can burrow into the sand with great speed, thanks to their strong, pointed snout.

LXXII. BLACK SWALLOWER FAMILY, *CHIASMODONTIDAE*.

**Black Swallower,**  
*Chiasmodon niger*  
Johnson 1863  
(Fig. CXIV).



This deep water fish very rare. Goode and Bean<sup>5</sup> (p. 292) refer to the capture of a specimen floating over Le Have Bank in June, 1880. Another specimen was taken just south of our region in 1932 (Vladykov<sup>15</sup>). This remarkable fish has sometimes been caught as deep as 1,500 fathoms. It has the ability to swallow fishes many times its own size through its large mouth and the great distensibility of the body walls. Our drawing represents a specimen containing a fish three times longer than itself. Grows up to about 1 foot in length.

LXXIII. BLENNY FAMILY, *BLENNIIDAE*.

The Blennies described herein are usually considered to belong to three families, but for the sake of simplicity they will be regarded here as belonging to a single family. These fishes, by their elongated snake-like body, may be confused with the Eel group, Ghostfish and Eelpout families. They differ from the first two in that they possess ventral fins, and from the last by the fact that the dorsal fin consists only of spiny rays and the caudal fin is clearly separated from both the dorsal and anal fins.

## Key for genera.

## Section 1.

**IF:** Ventral fin very small, less than one-fifth of length of pectoral fin; lateral line absent; at least 10 small, round, black spots along dorsal fin:—a Rock Eel (*Pholis*), Fig. CXV.

**BUT IF:** Ventral fin well developed, at least equal to one-third of length of pectoral fin; lateral line present or absent; dark spots on dorsal fin present or absent:—see Section 2.

## Section 2.

**IF:** Body stout, depth not less than one-seventh of total length; caudal fin rounded:—see Section 3.

**BUT IF:** Body elongated, depth not more than one-tenth of total length; caudal fin slightly forked or pointed, not rounded:—see Section 4.

## Section 3.

**IF:** Lateral line branched immediately behind head, lower branch running along middle of side for whole length of body, upper branch reaching only as far back as tip of pectoral fin; dorsal fin with less than 50 spines; a large, oval dusky blotch on anterior part of dorsal fin:—a Radiated Shanny (*Ulvaria*), Fig. CXVI.

**BUT IF:** Lateral line single, running full length of body along side of back; dorsal fin with about 75 spines; usually 5 large, round, dark spots along dorsal fin:—an Arctic Blenny (*Stichaeus*).

## Section 4.

**IF:** Pectoral fin notched, due to lower rays of fin being much longer than upper ones; margin of caudal fin straight or slightly forked; body depth not less than one-eleventh of total length:—a Common Shanny (*Leptoclinus*).

**BUT IF:** Pectoral fin not notched, lower rays of pectoral fin much shorter than upper rays; caudal fin pointed; body depth not greater than one-thirteenth of total length:—a Snake Blenny (*Lumpenus*).

Rock Eel,  
*Pholis gunnelis*  
(Linnaeus) 1758  
(Fig. CXV).

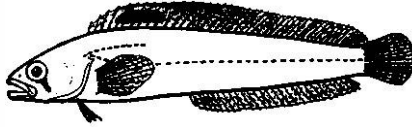


Common in inshore waters throughout the whole region. As its name indicates, it prefers to dwell among the rocks. Without economic importance. Often found in Cod stomachs. Up to 12 inches in length. In spite of its name "Eel", this fish has nothing in common with the true Eel except its shape.

**Arctic Blenny, *Stichaeus punctatus* (Fabricius) 1780.**

There have been only two specimens of this rare Arctic fish reported from our waters, and these were taken in Chedabucto Bay, near Canso, N. S. (Cornish<sup>46</sup>, p. 87). Length up to about 7 inches.

**Radiated Shanny, *Ulvaria subbifurcata* (Storer) 1839 (Fig. CXVI).**



Rather uncommon, being reported from St. Mary Bay (Huntsman<sup>26</sup>, p. 66) and around Canso (Cornish<sup>46</sup>, p. 87) in water from 6 to 30 fathoms in depth. Length up to about 6 inches.

**Common Shanny, *Leptoclinius maculatus* (Fries) 1837.**

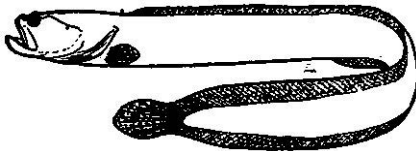
Only Jones<sup>19</sup> has listed this rare Arctic species among our fishes. However, no exact locality was given. Up to 7 inches in length.

**Snake Blenny, *Lumpenus lampetraeformis* (Walbaum) 1792.**

Huntsman<sup>26</sup> (p. 66) has reported the only capture of specimens of this northern species in our region, and these were taken in St. Mary Bay. Probably it may be found on Nova Scotian banks also, but no doubt this species is rather rare in our waters. Up to about 16 inches in length.

**LXXIV. WRYMOUTH FAMILY, *CRYPTACANTHODIDAE*.**

**Ghostfish, *Cryptacanthodes maculatus* Storer 1839 (Fig. CXVII).**



This form rather common in coastal waters throughout the whole region. Probably during the winter months these fish withdraw to deeper waters. Through the courtesy of



Capt. F. Tidman (S. T. *Viernoe*), we have received two specimens of Ghostfish from Western Bank taken in about 60 fathoms of water, on January 21 and March 10, 1935. Without economic importance. Maximum length about 3 feet.

LXXV. WOLFFISH FAMILY, *ANARHICHADIDAE*.Key for species of genus *Anarhichas*.

The following key is based on the comprehensive data by Gill<sup>66</sup>.



Fig. CXVIII—Types of teeth in two species of the Catfish family;

A.—*A. minor*; B.—*A. latifrons*.

## Section 1.

**IF:** Vomerine teeth extending backwards only about one-half as far as palatine teeth (Fig. CXVIII B); colouration brown with obscure dark blotches, not with distinct dark cross-bands or spots:—a Broad-headed Catfish (*A. latifrons*).

**BUT IF:** Vomerine teeth extending farther backwards than palatine teeth (Fig. CXVIII A); distinct dark cross-bands or spots:—see Section 2.

## Section 2.

**IF:** 9 to 12 distinct dark cross-bands on side of body:—a Common Catfish (*A. lupus*), Fig. CXIX.

**BUT IF:** Head and body (lower surface excluded) together with dorsal and caudal fins covered with rounded, black spots on a yellowish background:—a Leopardfish (*A. minor*).

<sup>66</sup>Gill. *Proc. U. S. Nat. Mus.*, 39, 157-187 (1911).

**Common Catfish,**  
*A. lupus*  
 Linnaeus 1758  
 (Fig. CXIX).



Very common throughout the whole region in both coastal and bank waters. Of slight economic importance at present, with the annual catch amounting to about 133,000 pounds and valued at \$4,500. It is an excellent table fish, growing to a maximum of 5 feet in length and 30 pounds in weight.

**Broad-headed Catfish, *A. latifrons*** Steenstrup and Hallgrimsson 1842.

Bean<sup>14</sup> (p. 82) for the first time reported the capture of this rare northern fish in our region, namely off Quereau Bank in 300 fathoms. Cornish<sup>46</sup> (p. 87) also mentioned the capture of a specimen off Canso in about 50 fathoms. Length about 5 feet.

**Leopardfish, *A. minor*** Olafsen 1774.

Rather rare. Bean<sup>14</sup> (p. 82) many years ago mentioned the capture of a specimen of this northern fish in 200 fathoms off Quereau Bank. The most recent capture in our region was made on the same Bank in 50 fathoms on November 5, 1934, by S. T. *Rayon d'Or* (Capt. H. S. Hansen) and reported by Vladykov<sup>15</sup>. Up to about 6 feet in length. In Europe the skins of this species, as well as of other Catfishes, are used for making ladies' purses, book covers, etc.

#### LXXVI. EELPOUT FAMILY, ZOARCIDAE.

These fishes are easily separated from the Blennies as the dorsal fin consists of soft rays only, or at the most, has only a few spines in the posterior part, while in the Blennies this fin is entirely spiny-rayed. Moreover, in the Eelpout family, there is no line of demarcation between the dorsal, anal and caudal fins, which, are continuous around the posterior part of the body. The latter character, as well as the fact that the dorsal fin is usually composed of soft rays, makes this family quite similar to the Eel group. The Eelpouts, however, are easily distinguished from the Eels by possessing small ventral fins, located on the lower surface in front of the

pectoral fins and immediately behind the isthmus. A single exception to this rule, however, exists in the Green Eelpout, which has no ventral fins, and thus is still more similar to the Eel group. The Green Eelpout (Fig. CXXIV), by having the gill opening above the base of the pectoral fin, thick lips, long pectoral fins and a rather stout body, may be readily distinguished from the Eels. Because of the great degree of similarity between the Eels and the Green Eelpout, the latter has been separated from the other Eelpouts and placed next to the Eel groups in the General Key.

#### Key for genera.

**IF:** Ventral fins absent:—a Green Eelpout (*Gymnelis*), Fig. CXXIV.

**BUT IF:** Ventral fins present:—see Section 2.

#### Section 2.

**IF:** Dorsal fin in its posterior part consisting of very short spines, giving impression of a gap between long dorsal rays and caudal fin:—a Common Eelpout (*Zoarces*), Fig. CXX.

**BUT IF:** No short spines, consequently no appearance of a gap between dorsal fin and caudal fin:—see Section 3.

#### Section 3.

**IF:** Body stout, depth not less than one-thirteenth of total length, dorsal fin beginning close to head above middle of pectoral fin:—an Arctic Eelpout (*Lycodes*), Fig. CXXI.

**BUT IF:** Body snake-like, depth not more than one-sixteenth of total length; dorsal fin beginning farther from head, over tip of pectoral fin or slightly in front, not over middle of this fin:—a Wolf Eel (*Lycenchelys*), Fig. CXXIII.

**Common Eelpout,**  
*Zoarces anguillaris*  
(Peck) 1804  
(Fig. CXX).



Very common throughout the whole region, both in coastal and "bank" waters. Although its flesh is of a very good quality, it is, as yet, without economic importance in this country. The European species is a well known commercial fish. Maximum length about 4 feet and weight about 12 pounds. This fish is well known to our fishermen, but under the name "Conger Eel", for it is found often in lobster traps or caught on baited hooks.

Key for species of genus *Lycodes*.

The exact number of *Lycodes* species found in North American waters is, as yet, unknown. In our list we follow, in part, the data given by Bean<sup>14</sup>, and Goode and Bean<sup>5</sup>, in the light of the critical remarks made by A. S. Jensen<sup>8</sup>. The distinction between the species of the Arctic Eelpout is very difficult and consists in different development of the lateral line which may be single or double, and situated in various positions along the side; the number of rays in the dorsal and anal fins; the length of the tail (the distance from the anus to the posterior tip of the fish); and the degree to which the belly and anterior part of the trunk are covered with scales. All these characters require particular attention for correct identification, and are applicable for specimens not smaller than 5 inches in length, while correct identification of small specimens by the non-specialist is almost impossible. The following key is principally based on the excellent monograph on "The North-European and Greenland *Lycodinae*" by A. S. Jensen<sup>8</sup>.

## Section 1.

**IF:** Lateral line single, running along middle of side; tail short, usually slightly less than one-half of total length; belly and anterior part of back naked (in front of dorsal); number of rays in dorsal and anal fins less than 95 and 80 respectively; 7 to 9 dark cross bands on trunk and tail, which may form a network pattern in older specimens:—an Arctic Eelpout (*L. reticulatus*), Fig. CXXI.

**BUT IF:** Lateral line single or double and at least one of them running along lower part of side; tail longer, more than one-half total length; entire body covered with scales; number of rays in dorsal and anal fins more than 95 and 80 respectively; colouration variable:—see Section 2.

## Section 2.

**IF:** Lateral line single, running along lower edge of side; body in larger specimens with or without dark cross bands; dark patches (1 to 3) on anterior part of dorsal fin:—a Vahl's Eelpout (*L. vahl'i*), Fig. CXXII.

**BUT IF:** Lateral line double, more distinct one running along lower edge of side, the other, along middle of side; body dark with 5 to 9 whitish yellow cross bands; no black patches on anterior part of dorsal fin:—an Esmark's Eelpout (*L. esmarkii*).

Arctic Eelpout,  
*L. reticulatus*  
Reinhardt 1838  
(Fig. CXXI).



This is usually believed to be the most common *Lycodes* in our waters, frequenting depths around 50 fathoms. Without economic importance. Maximum length about 2 feet. This, as well as the following species of this genus, is not frequently captured in our region, because of the habit of living close to the bottom in relatively deep water.

Vahl's Eelpout,  
*L. vahlii*  
Reinhardt 1838  
(Fig. CXXII).



Goode and Bean<sup>5</sup> (p. 308) have recorded the capture of this species on the Nova Scotian banks (Quereau Bank) in 130 to 190 fathoms. Length about 1½ feet.

Esmark's Eelpout, *L. esmarkii* Collett 1875.

According to Goode and Bean<sup>5</sup> (pp. 303-305) this species has been taken on Le Have Bank and in the Bay of Fundy in depths of 224 to 400 fathoms. Maximum length slightly more than 2 feet.

#### Key for species of genus *Lycenchelys*.

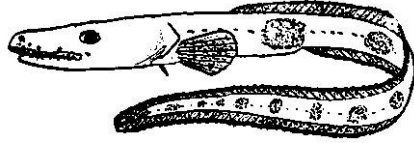
**IF:** Dorsal and anal fins long, with 118 and 110 rays respectively; scales covering entire body; nearly all vertical fins and body uniformly brownish; head dark:—a Common Wolf Eel (*L. paxillus*).

**BUT IF:** Dorsal and anal fins shorter, with 92 and 88 rays respectively; scales rather scarce upon lower half of body and none on anal fin; colour greyish with irregular brown patches:—a Verrill's Wolf Eel (*L. verrilli*), Fig. CXXIII.

**Common Wolf Eel, *L. paxillus*** (Goode and Bean) 1879.

This fish is probably not uncommon in the deeper gullies between the Nova Scotian banks. Goode and Bean<sup>5</sup> (p. 311) discovered this fish for the first time in the gully between Le Have and Sable Island Banks at a depth of 200 to 400 fathoms. Without economic importance. Maximum length about 1 foot.

**Verrill's Wolf Eel,**  
*L. verrillii*  
 (Goode and Bean)  
 1877  
 (Fig. CXXIII).



This is possibly a rarer species than the Common Wolf Eel. According to Bigelow and Welsh<sup>8</sup> (p. 382) "it is known from the fishing banks off the outer coast of Nova Scotia, off Cape Negro and off Halifax (90 to 101 fathoms)." Grows to about 10 inches in length.

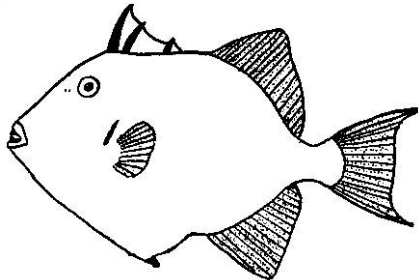
**Green Eelpout,**  
*Gymnelis viridis*  
 (Fabricius) 1780  
 (Fig. CXXIV).



This Arctic species is no doubt very rare, although several authors have listed it among Nova Scotian fishes. However, none of them has given any definite records of its capture in our region. They usually just repeat the statement of Goode and Bean<sup>8</sup> (p. 313) that "this species has been found in abundance in the Arctic Seas from Alaska to Nova Scotia." In northern waters it reaches about 10 inches in length.

#### LXXVII. TRIGGERFISH FAMILY, *BALISTIDAE*.

**Triggerfish,**  
*Balistes capriscus*  
 Gmelin 1788  
 (Fig. CXXV).

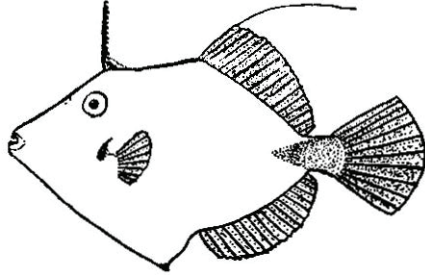


This southern form is only occasionally found during the summer months in both the coastal and "bank" waters of the

outer coast of Nova Scotia. Vladykov<sup>15</sup> summarized the data on its occurrence in our region. Maximum length about 1 foot.

LXXVIII. FILEFISH FAMILY, *MONACANTHIDAE*.

Filefish,  
*Monacanthus hispidus*  
(Linnaeus) 1766  
(Fig. CXXVI).



This tropical fish is similar to the preceding species in its occurrence in our region. Maximum length about 10 inches. The name is derived from the file-like dorsal spine. The rough, hard skin, formerly at least, was used as an abrasive in a manner similar to sandpaper.

LXXIX. PORCUPINEFISH FAMILY, *DIODONTIDAE*

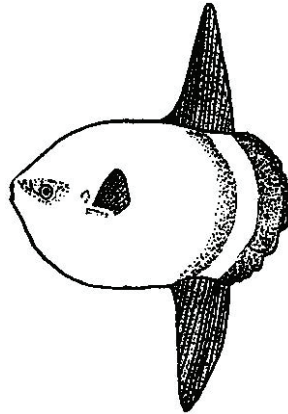
Burrfish,  
*Cyclichthys schoepfi*  
(Walbaum) 1792  
(Fig. CXXVII).



Piers<sup>16a</sup> (p. 110) first mentioned the capture of a specimen of this rare southern fish in our waters, namely off Sambro, near Halifax, in the summer of "about 1896." Attains a length of about 10 inches.

LXXX. SUNFISH FAMILY, *MOLIDAE*.

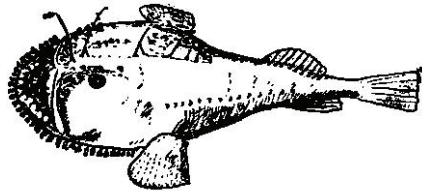
**Sunfish,**  
*Mola mola*  
(Linnaeus) 1758  
(Fig. CXXVIII).



A regular summer visitor to both shore and "bank" waters of the outer coast of Nova Scotia. Usually swims close to the surface. Without economic importance. Grows up to 11 feet in length and a ton in weight.

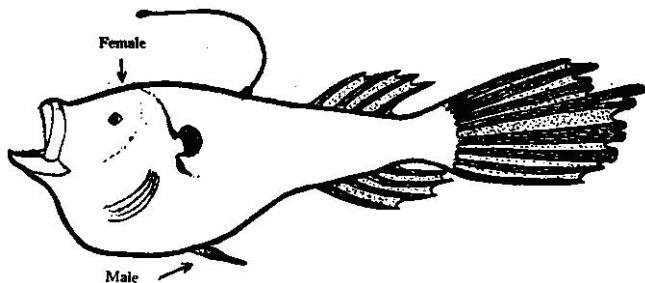
LXXXI. ANGLER FAMILY, *LOPHIIDAE*.

**Monkfish,**  
*Lophius piscatorius*  
Linnaeus 1766  
(Fig. CXXIX).



Very common on the "banks", and frequently found in the coastal waters of the whole region. Of slight economic importance, being used only recently in the making of fish meal. In Europe, however, it is a regular marketable fish. Up to 4 feet in length and 70 pounds in weight. Its appetite is almost proverbial, as it feeds on a number of fishes, lobsters, crabs, etc. Even sea birds (gulls, loons, ducks, etc.) do not escape its mouth, hence the name of "Goosefish" used in some places.



LXXXII. SEA DEVIL FAMILY, *CERATIIDAE*.

Sea Devil, *Ceratias holbolli*, Krøyer 1844 (Fig. CXXX).

According to Goode and Bean<sup>6</sup> (p. 489), one specimen of this remarkable deep water fish has been taken "off Nova Scotia" (exact location not given). Length up to about 2 feet. The drawing (Fig. CXXX) represents a female with a curious appendage attached to her throat which is a diminutive male of the same species, fully adult and apparently the mate of the relatively gigantic female. The discovery and description of these parasitic males was recently made by Regan<sup>67</sup>.

<sup>67</sup>Regan. *Proc. Roy. Soc. London*, (B) 97 (1925) and the "*Danish Dana Expedition*", 1920-22. *Oceanogr. Rept. No. 2*, Copenhagen, 1926.