

# NOTES ON ADULT LUMPFISH *CYCLOPTERUS LUMPUS* L. FROM THE BAY OF FUNDY

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Length, wet weight and gonad weight were measured on 33 male and 21 female lumpfish taken in a weir in the Upper Bay of Fundy in June 1980. All fish were mature. Testes represented about 3% ( $\pm 0.9$  S.D.) of total body weight. Estimates of female fecundity ranged from 54,000 to 159,000, the ovaries being 26% of total body weight. Considerations of ovary weight: body weight relations suggested that 12 of the 21 females had already shed part of their egg complement. All specimens were infected by the cod gill parasite *Lernaocera branchialis* (Copepoda).

Des mesures de la longueur, du poids humide et du poids des gonads ont été effectuées sur 33 mâles et 21 femelles "poules d'eau" capturées, en juin 1980, dans un barrage situé dans la partie supérieure de la Baie de Fundy. Tous les poissons avaient atteint leur maturité. Les testicules représentent approximativement 3% ( $\pm 0.9$ ) du poids total corporel. La fécondité des femelles varie de 54,000 à 159,000, les ovaries comptant pour 26% de poids corporel total. L'étude du rapport poids des ovaries: poids corporel semble indiquer que 12 des 21 femelles avaient déjà perdu une partie de leur masse d'oeufs. Tous les individus étaient infestés par le parasite des branchies de la morue *Lernaocera branchialis* (Copepoda).

## Introduction

The lumpfish, *Cyclopterus lumpus* L., is a large, but uncommon bottom-dwelling fish of coastal waters that has occasioned little study in North America. It is widely distributed, from Hudson Bay (Vladykov 1933) to Chesapeake Bay (Leim and Scott 1966) on the western side of the Atlantic. It is most frequently encountered during the shoreward spawning migration that occurs in early summer (Cornish 1907; Leim 1960; McKenzie 1939, 1959; Witman 1978; Collins 1976, 1979), but also occasionally collected during deeper water fishing operations (Cox and Anderson 1922; Collins 1976). Following hatching, the first year of life is spent mainly within the top 1 m of coastal waters and although immature individuals have been found in association with floating seaweed, the next 4 to 7 years are spent mostly on or near the bottom at depths  $< 400$  m (Cox and Anderson 1922).

Early attempts to promote the lumpfish as a food fish in Canada were unsuccessful (Anon, 1929). It is considered a delicacy, however, in northern Europe, and most of the 1968 world catch of 3,000 tonnes was taken from the north-east Atlantic (Rounsefell 1975).

The present study was carried out as part of a broad investigation of the occurrence and role of fishes inhabiting the upper Bay of Fundy and Minas Basin.

## Methods

Fifty-four adult lumpfish (33 ♂♂, 21 ♀♀) were obtained from a fish weir near Baxter's Harbour, N.S. in the upper Bay of Fundy (45° 15' N, 64° 28' W) during the first two weeks of June 1980. These were promptly wrapped in plastic bags, frozen and stored for use. After thawing, each individual was weighed (fresh weight—FW) to the nearest 0.01 kg and length was recorded to the nearest 1 mm. Gonads were removed *in toto* and weighed to the nearest 0.1 g. Groups of 150-300 eggs were counted and weighed, and fecundity of each female estimated by dividing total ovary weight by the mean egg weight derived from several egg groups.

Gut contents were examined to determine if any of the spawning fish had been feeding, and the gills and buccal cavity were inspected for parasites.

### Results

All fish examined were mature, and had either spawned recently or were about to spawn. Males exhibited nuptial colours varying from pink to a deep red, the colours being most intensely developed around the ventral sucker. Since these colours apparently fade shortly after spawning is completed (Cox and Anderson 1922) it may be assumed that the spawning season extends through the first half of June in the Bay of Fundy.

Male lengths ranged from 24 to 38 cm, and thus hardly overlapped the female range of 37-45 cm. In males, fresh weight was highly correlated with lengths and a functional regression provided a satisfactory fit to the data (Fig 1). For the 21 females, however, the correlation was much poorer because of wide variations in body weight at any given length; the best fit functional regression (Fig 1) therefore has little predictive value. For both sexes it is probable that a curvilinear relationship such as that obtained for juvenile lumpfish < 5 cm L (unpublished data), may be applicable to adults also, but our data are inadequate to determine this.

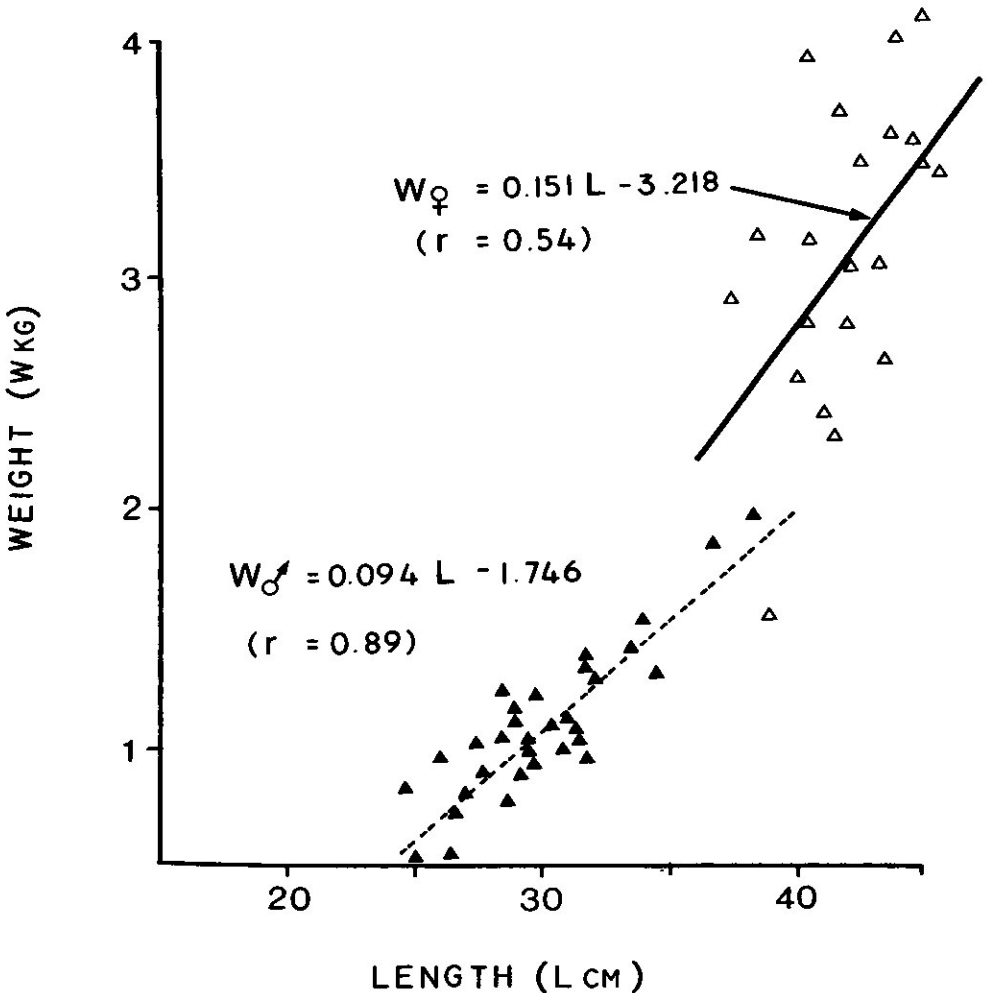


Fig 1 Length-weight relationships in lumpfish from the Bay of Fundy.

Testis weight in males was moderately well correlated with body weight (Fig 2), representing  $\pm 5\%$  of fresh weight (mean  $3.10\% \pm 0.93$  S.D.) for all sizes examined. With 3 possible exceptions (evident on Fig 2) we are confident that the individuals had not spawned. Ovary weight in the 21 females, however, ranged very widely, averaging  $17.96\% (\pm 5.78)$  of total body weight. Inspection of the data suggested that the sample could be divided into 2 groups (Fig 3): in one group of 9 individuals ovary weight represented  $> 20\%$  of FW (mean  $24.12 \pm 1.84\%$ ) whereas in the remainder ovaries were much lighter (mean  $13.24 \pm 2.02\%$ ). Each group is apparently homogeneous, showing high correlations between ovary weight and body weight and similar regression relations (Fig 3).

Estimates of fecundity showed a similar but incomplete separation of the 2 groups. Egg numbers ranged from 80,000 to 159,000 in the group with larger ovary weights, and showed a fair correlation with FW (Fig 4). With one exception, egg counts were distinctly lower in the second group, generally  $< 100,000$ . These results are conformable with Ehrenbaum's observation that the eggs are laid intermittently in 2 or 3 batches over 8-14 days (cf. Cox and Anderson 1922, p. 11). The difference between the 2 regression lines (Fig 4) is equivalent to ca. 40,000 eggs: approximately one third of the mean egg count for the unspawned females (125,000). It may be assumed, therefore, that the lower group consists of fish that have already spawned at least once.

Twenty-five of the specimens examined were completely devoid of food. Only 8 had material in the stomach, the others having food remnants only in the intestine. Identifiable fragments consisted largely of benthic polychaetes, one *Hyperia galba* (Amphipoda) and remnants of small pelecypods.

All specimens examined carried copepodite stages I-IV of the gill parasite *Lernaeocera branchialis*. In some instances, particularly males, infestations were heavy enough to cause notable damage to the gill tissue (cf. Templeman et al. 1976).

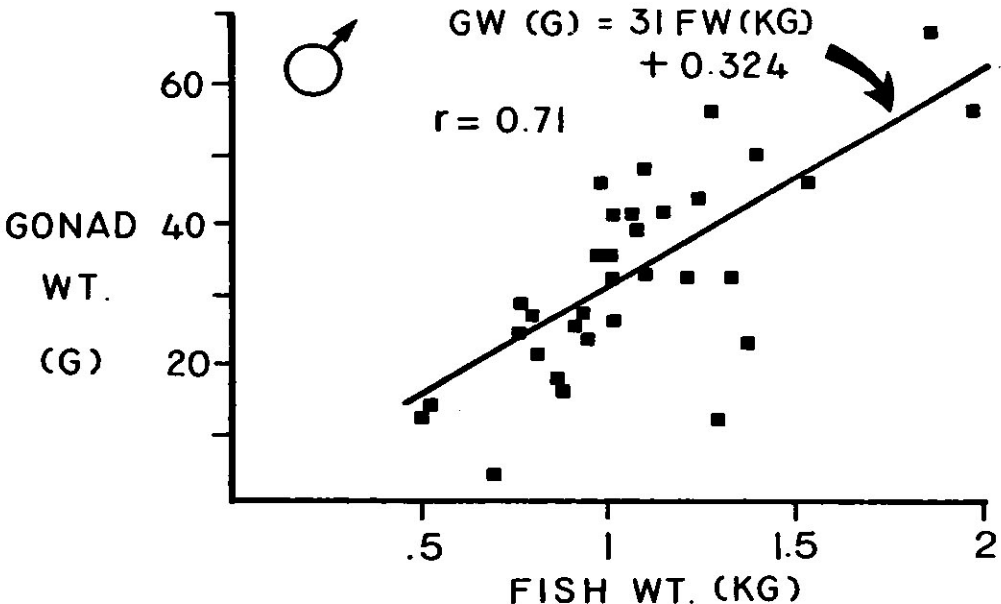


Fig 2 Testis weight-fresh weight relationship in adult male lumpfish from the Bay of Fundy.

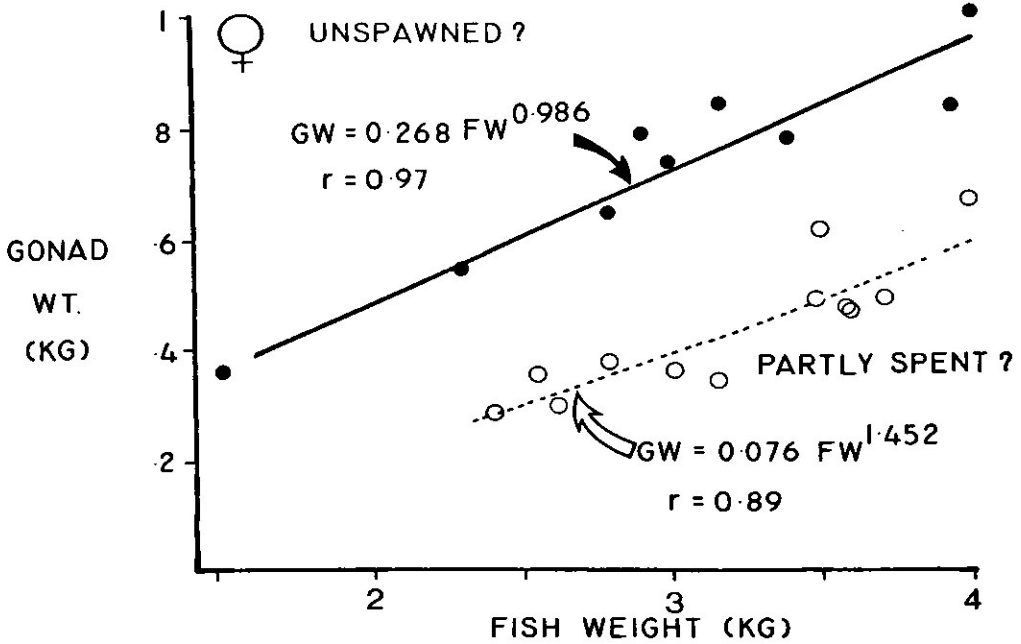


Fig 3 Ovary weight-fresh weight relationship in adult female lumpfish from the Bay of Fundy.

### Discussion

The results reported here are quite conformable with the fragmentary knowledge of this species summarised in Cox and Anderson (1922) and Leim and Scott (1966). Spawning apparently takes place along the whole Nova Scotia shore on the east side of the Bay of Fundy, and ripe adults have also been taken by groundfish druggers in Minas Basin (Bousfield and Leim 1960). The scarcity of suitable rocky habitat within Minas Basin, however, probably limits successful spawning of this species. Cox and Anderson (1922) noted that spawning adults were not encountered so far up the western (New Brunswick) side of the Bay of Fundy.

The present data on length-weight relationships need to be considerably augmented. Our sample included sizes up to the largest commonly recorded from Canadian waters (46 cm—McKenzie 1959; Leim 1960) although exceptionally large individuals  $\leq 60$  cm and weighing 9.5 kg have occasionally been encountered (Leim and Scott 1966). Extrapolation from our length-weight regression equations to these larger lengths results in estimates well below the recorded weights of such specimens.

Fecundity estimates from our data are similar to other records. The apparent division of the females into unspawned and partially spawned individuals supports the observation that spawning is intermittent, with two or three separate events taking place. Since males remain to guard the nest site, they are less likely to become trapped in an intertidal weir once spawning has commenced. We therefore assume that our sample consisted only of unspawned males, and that the average 3% FW of the testes is a measure of the normal reproductive effort of males in this species.

Although not used for human food in North America (cf. Collins 1979), the lumpfish is nevertheless a species of interest and significance in the Bay of Fundy. Its

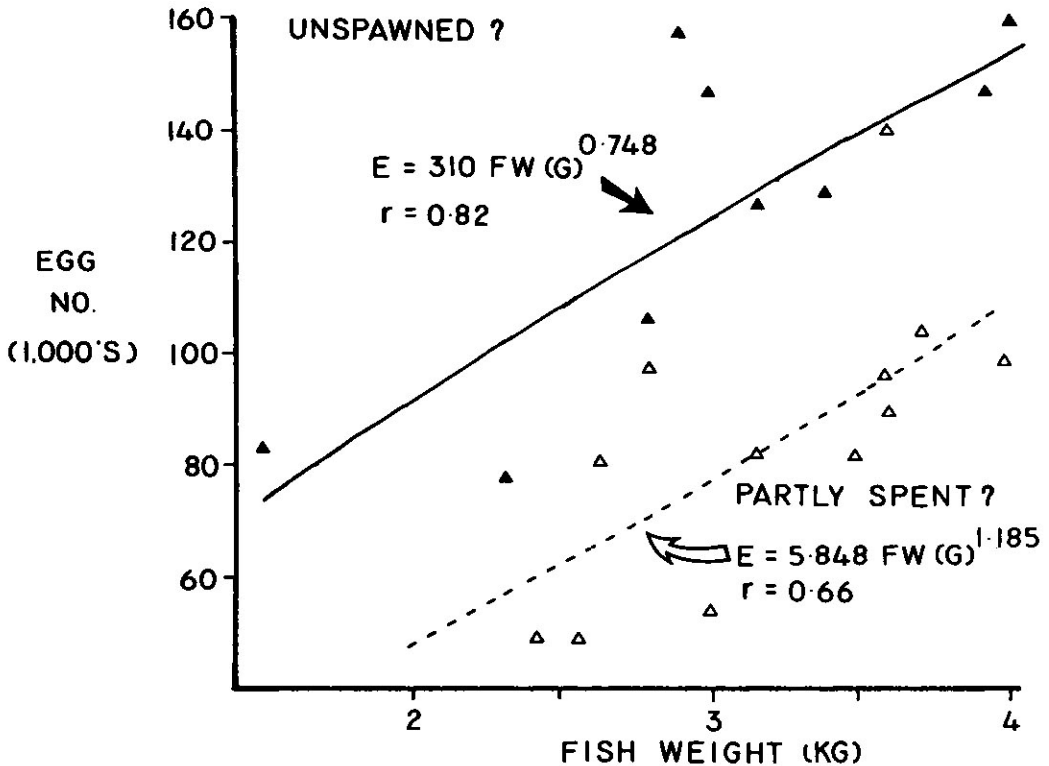


Fig 4 Fecundity of presumed unspawned and partially spawned female lumpfish from the Bay of Fundy.

prevalence at times is a source of difficulty for weir operators. It is preyed upon by seals, and is the only known intermediate host for the important cod parasite *Lernaeocera* in the northeastern Atlantic. Finally, its juvenile stage is a notable member of the near-surface plankton of the Bay of Fundy.

### Acknowledgements

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