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Some notes on the occurrence of larval nematodes in adult
herring and mackerel caught in Division 6A and 6B of ICNAF Subarea 6

by

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Abstract

This report presents data on the incidence and intensity of infestation of herring and mackerel with larval *Anisakis*. The examination of fish was made in April and May 1971.

Incidence and intensity of infestation of herring and mackerel varied slightly depending on fishing grounds. Mackerel was slightly higher infested than herring. Both the incidence and intensity of infestation increased with age and size of fish. The relatively low but similar infestation of fish suggests, that both species belong to the same population of herring and mackerel, as it was reported by Sette 1950, Mackay 1967, Mackay and Garside 1969.

Introduction

Since 1955, when it became certain, that the incidence of larval nematodes in marine fish is harmful to human health, the importance of the investigations on nematodes increased. According to the authors, these cosmopolitan parasitic larvae are found in herring in both the Atlantic and Pacific areas. Larval *Anisakis* are usually embeded and encysted on the stomach, pyloric caecae, intestine and mesenterium, gonads, peritoneal cavity and very rarely on liver and in the flesh.

From another point of view, the larvae of *Anisakis* as a biological "tag" may be used as some kind of indicator for indentification of fish population.

In this report the previous contributions of different authors (Templeman, Squires and Fleming, 1957; Sindermann, 1961a; Templeman and Squires, 1960; Kabata, 1963; Margolis, 1963; Templeman and Fleming, 1963; Parsons and Hodder, 1971) were taken into consideration.

Materials and methods

In April and May 1971 about 1,200 herring and 2,200 mackerel were examined for larval nematodes. These fish were taken mostly by midwater trawl and very rarely by bottom trawl. The length of herring examined was 20.5 to 37.0 cm and length of mackerel 21.0 to 48.0 cm. All fish were examined microscopically immediately on board. Nematode larvae were collected from the body cavity in the following order: liver, intestine and mesenterium, pyloric caecae, stomach, gonads, peritoneal cavity and flesh. Larvae were identified as *Anisakis* when the following characteristics were found:

- 1) Ventriculus between oesophagus and intestine; the joint between ventriculus and intestine is oblique;
- 2) Excretory pore situated ventrally of the boring tooth in front of the head;
- 3) Three anal glands near the rectum.

The fish examined were measured and the sex, stage of maturity and stomach contents were determined. Otoliths were collected for age determination. The length used was the greatest total length measured from the tip of the lower jaw to the end of the longest lobe of the caudal fin (total length).

Length measurement data were recorded to the nearest 0.5 cm below (i.e. all lengths ranging from 250 mm to 254 mm were grouped into the 25 cm interval).

Stage of maturity was determined by gross examination of gonads using the various stages of gonadal development as adopted by ICNAF (1964).

Results of investigations on herring infestation

The nematode larvae in herring were usually found encapsulated on the intestine and mesenteries, pyloric caecae, stomach, gonads, peritoneal cavity and in the flesh (Fig. 1). Nematodes were found in flesh by the means of direct search.

Both the incidence (percentage of fish infested) and the mean intensity of infestation (average number of nematodes per infested fish) increase with fish size (Fig. 2) and slightly in fish taken northwards.

The black points given in Fig. 3 indicate the geographical positions where the samples, always consisting of 100 fish were taken for investigation. The upper number shows the incidence and the lower the mean intensity of infestation.

Herring of the 27 cm and 28 cm length classes were found not to be infested. However this result was based on a limited number of fish. The degree of infestation of herring in the 34 cm length class (about 10-year-old fish) was relatively low. An increase in infestation was evident in the 35.5 cm length class where up to 5 larvae per infested fish were found. In herring more than 35.5 cm in length, the degree of infestation decreased.

In general, the herring examined were in the III and IV stage of maturity.

Results of investigations on mackerel infestation

Nematode larvae were also found encapsulated in the mackerel in the same places as in the herring, except in flesh. However, they did occur to some extent on the liver (Fig. 1).

Mean intensity of infestation of mackerel increased gradually with fish length from 39.5 cm up to 46 cm reaching a maximum of 8.5 larvae per infested mackerel in the 46 cm length class (Fig. 4).

Generally, both the incidence (Fig. 5) and the mean intensity of infestation increased in fish as they were taken farther northwards.

Almost all mackerel examined were in IV, V and VI stage of maturity.

Discussion

According to our investigations, herring and mackerel show a similar degree of infestation by larvae *Anisakis*.

The slight variations in the incidence and mean intensity of infestation of herring indicate that the herring belong to a single population occurring in the investigated area.

For mackerel there is a relatively small difference in the incidence and mean intensity of infestation by *Anisakis*, which may point to homogeneity of the stock. The higher incidence and mean intensity of infestation of mackerel compared with that of herring may be attributed to a difference in diet. Macroplanktonic crustacea were found more often in the stomachs of mackerel than of herring where *Sagitta* appeared more frequently.

In general, more food was found in the stomachs of mackerel than of herring. More intensive feeding by mackerel on crustacea is probably the reason for the greater infestation of mackerel with larval *Anisakis*.

On the other hand, it is uncertain if infestation with larval *Anisakis* decreases with age in adult fish. It was observed, however, that a decrease of larval *Anisakis* infestation with age occurs in adult herring fished in the waters adjacent to the United Kingdom.

Detailed evaluation of statistical data would be very useful in elucidating the problem.

Khalil (1969) observed that larval *Contracaecum* infestation in herring decreases with age of the fish.

Certainly marine mammals are the final hosts of *Anisakis*. The occurrence of marine mammals, the common dolphin, *Delphinus delphis* L., *Pseudorca crassidens* (Owen) and unidentified whales were observed during the research cruise in the region investigated - 37°N to 41°N latitude.

Thus it appears that the low level of infestation with larval *Anisakis* in herring and mackerel is dependent upon the occurrence and abundance of these marine mammals in the investigated areas.

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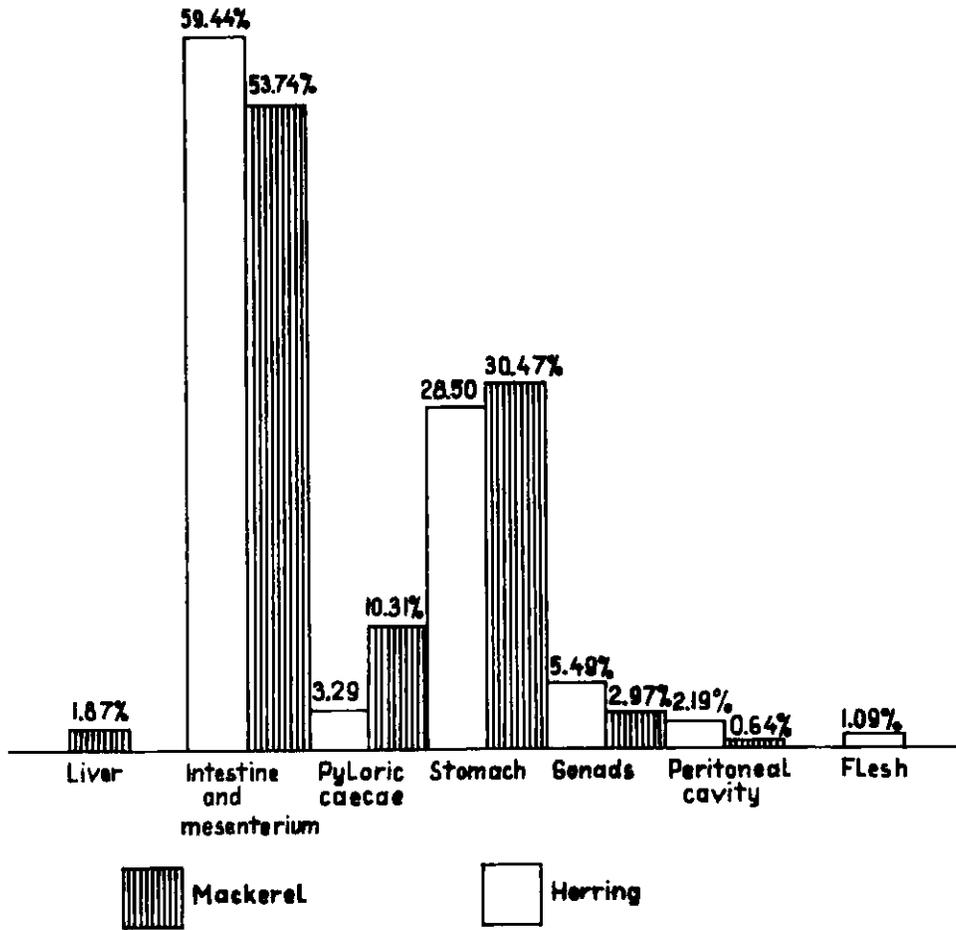


Fig. 1. Site of larval nematodes in herring and mackerel.

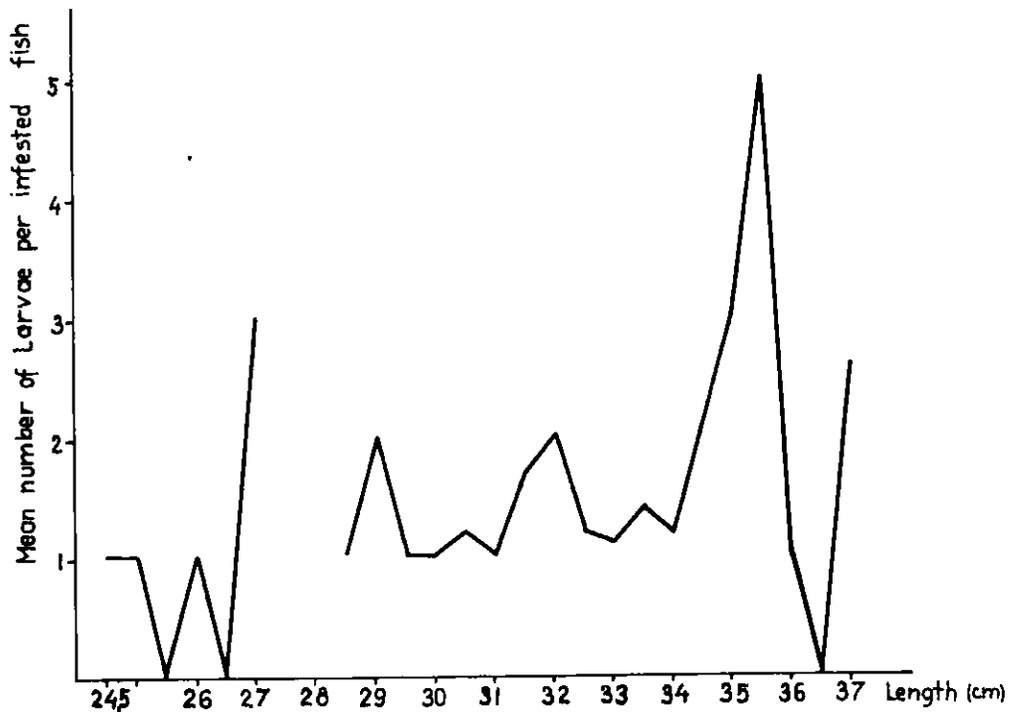


Fig. 2. Relation between the mean number of *Anisakis* larvae per infested herring (mean intensity of infestation) and length of herring for 37°N to 41°N latitude area (basing on the 1200 analyzed herring).

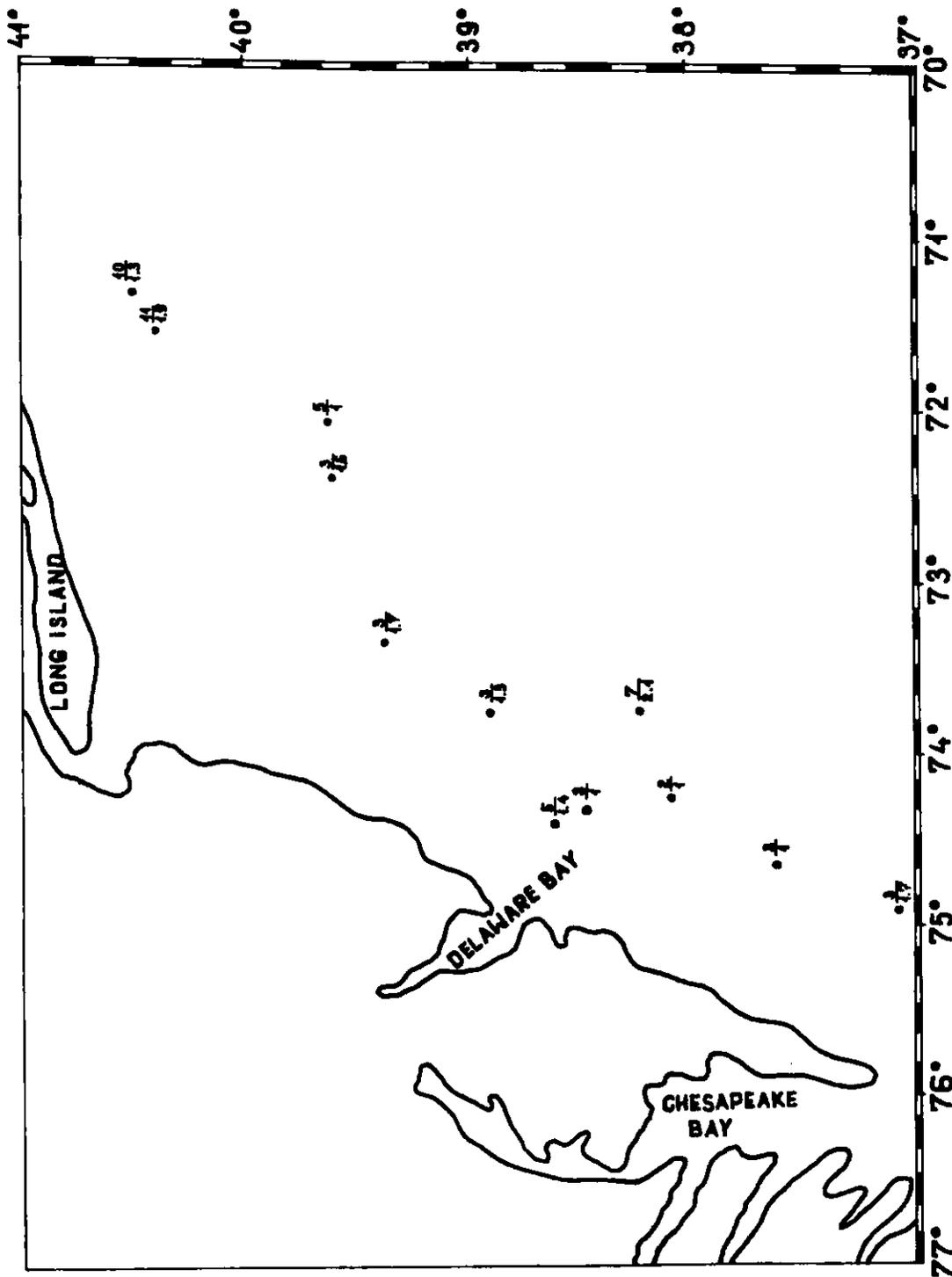


Fig. 3. Nematode larval incidence (numerator) and average intensity (denominator) of infestation of herring at sampling locations in ICNAF Subarea 6.

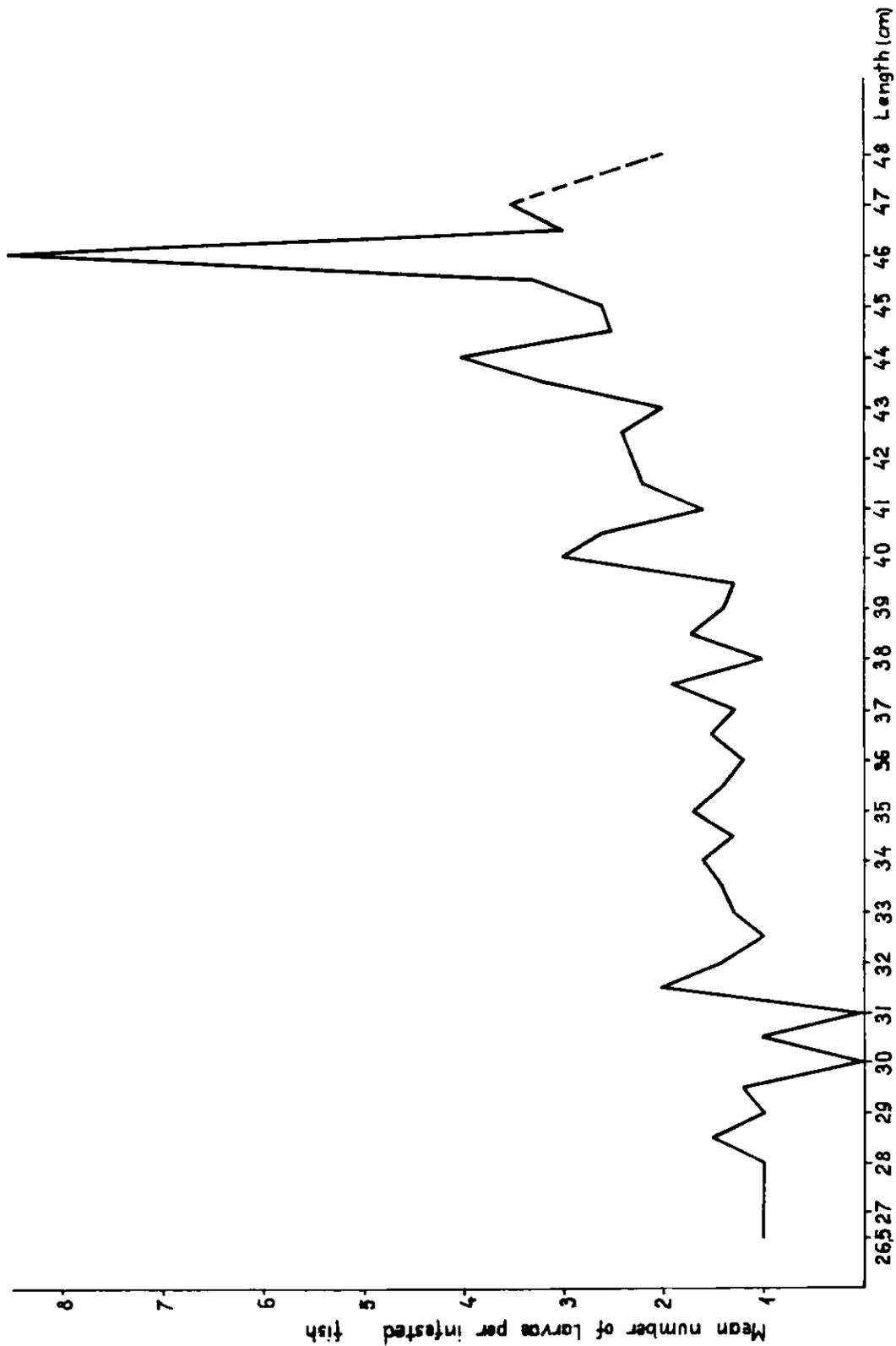


Fig. 4. Relation between the mean number of *Arisaeta* larvae per infested mackerel (mean intensity of infestation) and length of mackerel for 37°N to 41°N latitude area (based on the 2200 analyzed mackerel).

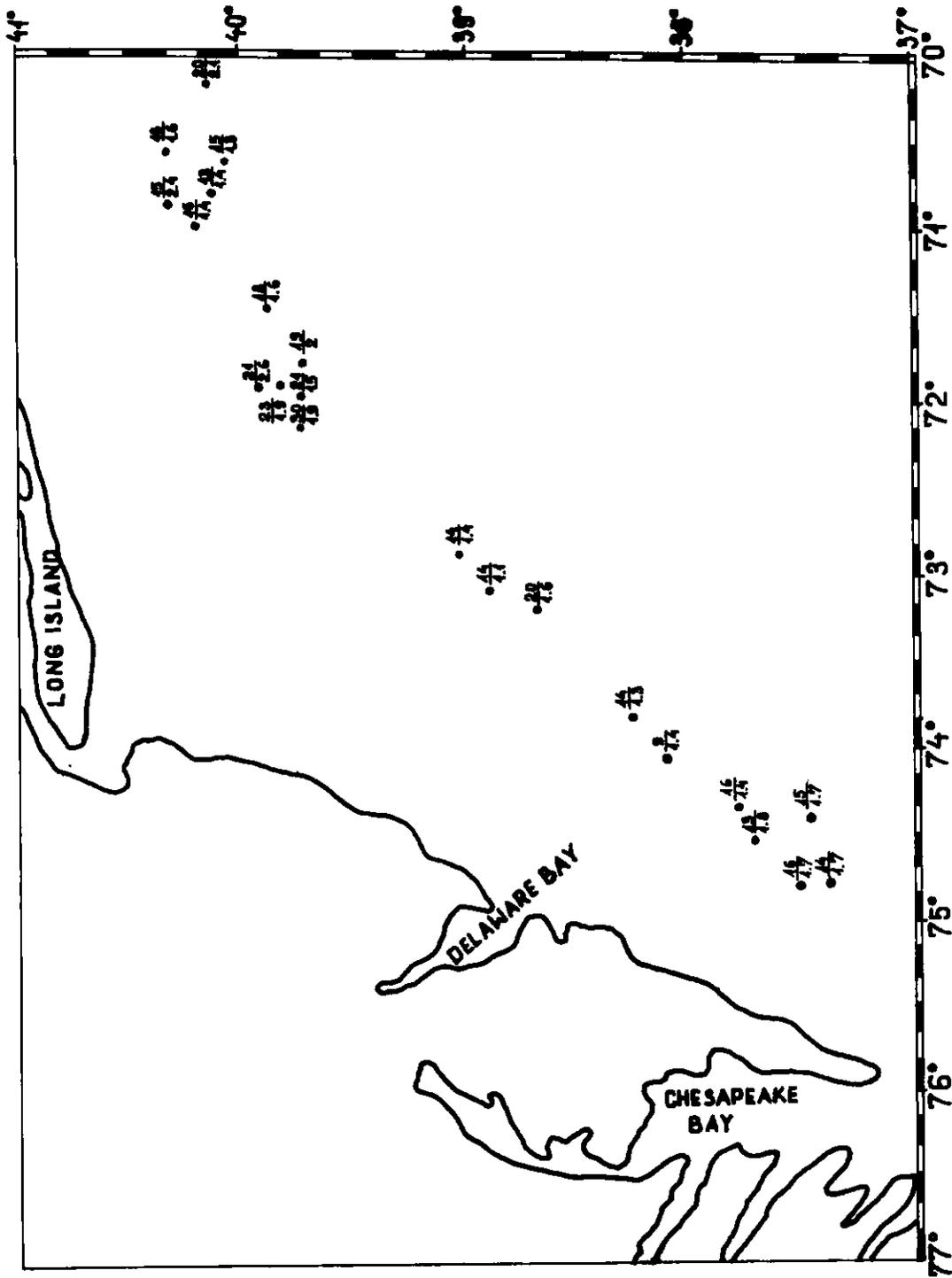


Fig. 5. Nematode larval incidence (numerator) and average intensity (denominator) of infestation of mackerel at sampling locations in ICNAF Subarea 6.