

Dariusz ROMUK-WODORACKI

PARASITIC FAUNA OF ATLANTIC MACKEREL (*SCOMBER SCOMBRUS* L.)
FROM THE FISHING GROUNDS OF CAPE HATTERAS

PARAZYTOFAUNA MAKRELI ATLANTYCKIEJ (*SCOMBER SCOMBRUS* L.)
Z ŁOWISK PRZYLĄDKA HATTERAS

Department of Parasitology and Environment Protection
University of Szczecin

A study was made of the parasitic fauna of Atlantic mackerel from east shore of the United States. A short characteristic is given of the parasite species found. The results are compared to those presented by other authors.

INTRODUCTION

Unproper exploitation of the Atlantic mackerel resources have led in the recent years to considerable overfishing of this valuable fish. As a result, commercial mackerel catches decreased drastically. In view of this, a collaborative Polish-American research project has been initiated in order to obtain a thorough knowledge on the biology of this species, age composition of the stocks, feeding habits, characteristics of the mackerel schools, bacterial and viral diseases etc.

The objective of this work was to study the parasitic fauna of mackerels originating from Cape Hatteras fishing grounds (USA). So far, parasitologic studies of mackerel from these regions have been very scarce.

MATERIAL AND METHODS

The materials were collected during a research cruise of m/s "Admirał Arciszewski" on the waters of north-west Atlantic. The fishes originated from a haul performed on 3ed April, 1984, when the ship's position was 35°54'N and 75°20'W. Complete parasito-

logical studies were made on 80 mackerels (45 females and 35 males).

Fish length (*longitudo totalis*) ranged from 27 to 48 cm, individual body weight from 100 to 710 g. Over 50% of the fishes were 33–39 cm long and weighed 210–320 g.

The following organs were studied after fish thawing: eyes, nostrils, gills, heart, liver, gonads, gall-bladder, urinary bladder, intestines, stomach, muscles and skin. Macro- and microscopic (stereoscope microscopy) tests were performed. Microscopic slides were made from the content of the gall-bladder and scraps of the urinary bladder. These were analysed under immersion. Other parasites were fixed and determined with the usual methods. The studies embraced also parasitic Copepoda which had been collected in the same region in 1982–1984. Samples of these crustaceans were fixed in 10% formalin.

RESULTS

Eight species of the parasitic fauna were found, belonging to five systematic groups. Two species were not determined.

1. *Ceratomyxa* sp.

Familia: *CERATOMYXIDAE*

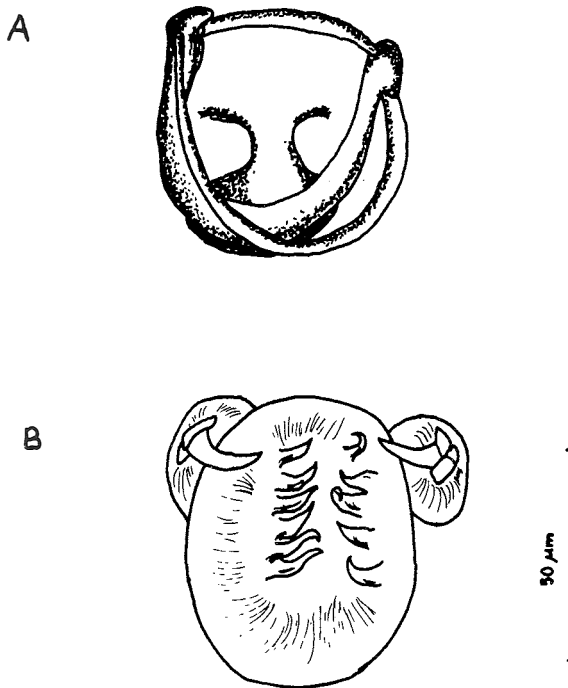


Fig. 1. *Kuhnia scombri*. A. claps structure, B. framing of the genital pore.

Thorough microscopic studies of 35 gall-bladders revealed the presence of Protozoa from the *Ceratomyxa* genus. They were found in 14 mackerels. The extensiveness of the infection was 40%. Its intensity differed; most frequently single spores were observed in one vision field. Numerous or very numerous spores were rarely observed.

2. *Kuhnia scombri* (Kuhn, 1829) Sproston, 1945 (Fig. 1 and 2).

Familia: *MAZOCRAEIDAE*

These parasites were found only on the fish gills, in about 45% of the fishes. Intensity of the infestation was 1–4 specimens pef fish, 1–2 being most frequent. Totally, 57 monogenetic trematodes were found, 5–7 mm long.

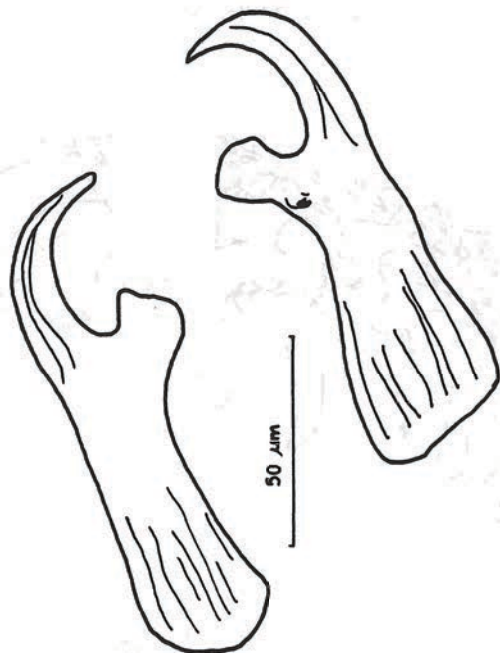


Fig. 2. *Kuhnia scombri*. Structure of the attachment plate hooks

3. *Grillotia erinaceus* (van Beneden, 1858) (Fig. 3).

Familia: *LACISTORHYNCHIDAE*

Plerocercoids of the tape worm were found in stomach walls, walls of other organs of the abdominal cavity, and in the peritoneum. 56 specimens were found. From among these, 50% were located in stomach walls and 40% in the intestines and the pyloric processes. Single cysts were found in gall-bladder and peritoneum. Plerocercoids were found in 37.5% of the fishes. Intensity of the infestation was usually 1–3 specimens per fish, maximally 7. Cysts of *G. erinaceus* in mackerels were 3–5 mm long (these fishes are a secondary host). Isolated larvae were 5–7 mm long, with well developed scolex having two botridia and four hooked suckers.

4. *Cestoda* gen. sp.

Larval cysts of tapeworms of unidentified systematic status were found in 10 mackerels. Similarly as *Grillotia erinaceus*, these were found in the intestine walls. Isolated cysts each 3–4 mm in length. They had no developed hooks. Only small swellings were observed in the front part of the larvae.

5. *Didymozoida* gen. sp.

Trematodes of *Didymozoida* gen. were found in the heart ventricle of one fish. They were tape-shaped and formed numerous, irregular bundles. Trematodes of this group usually occur in pairs, so they got slightly destroyed during slide preparation. Hence, only tubule-like vitelline and tape-shaped uteri filled with numerous eggs were observed, but it

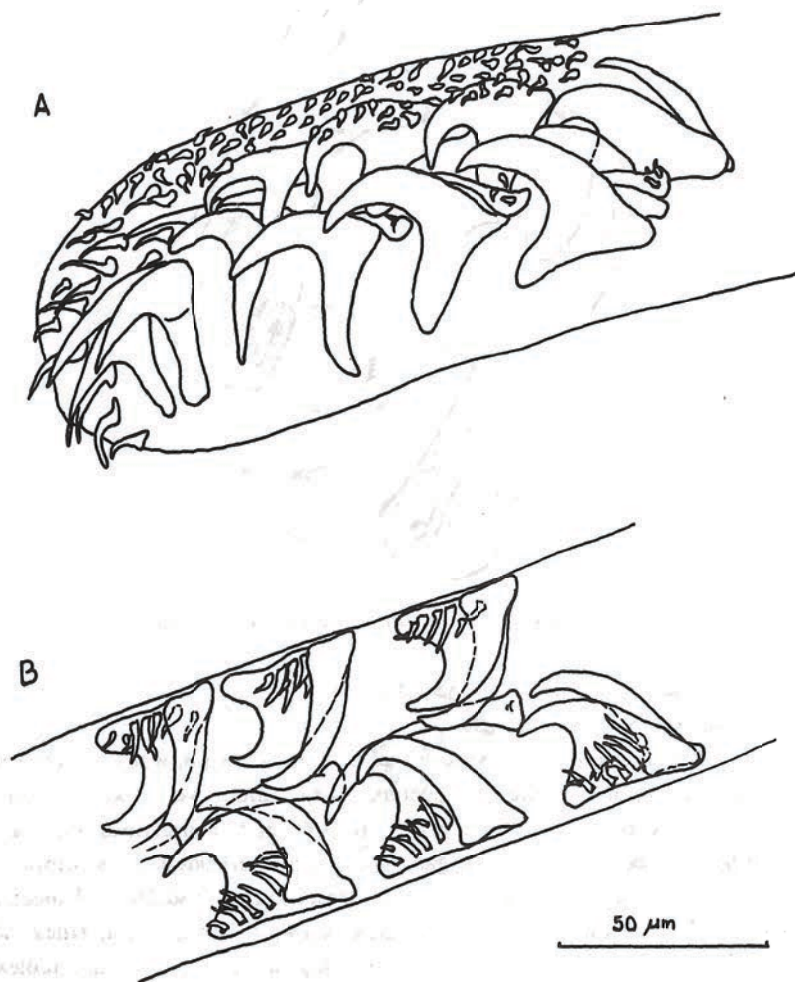


Fig. 3. *Grillotia erinaceus*: fragments of retracted proboscis. A. top section; B. mid-part

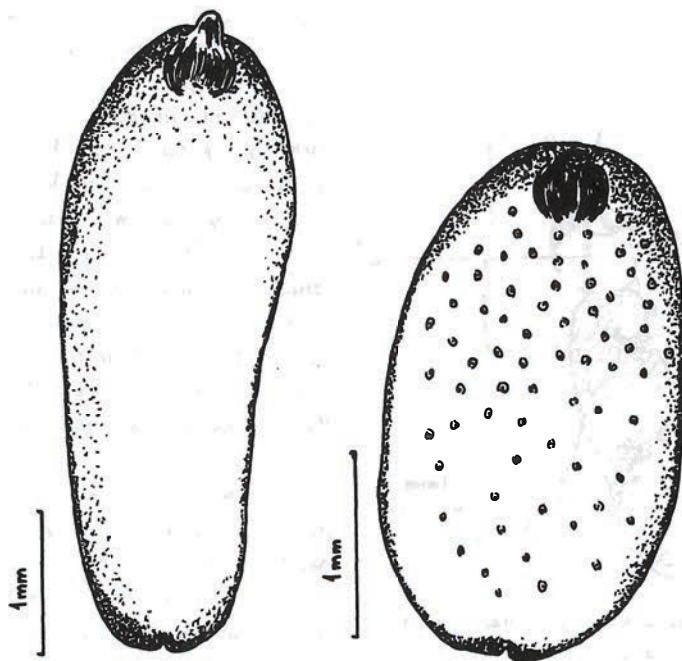


Fig. 4. Larvae of Cestoda gen. sp.

was not possible to notice the suckers. Consequently, it was not possible to identify this species.

6. *Anisakis simplex* (Rudolphi, 1809).

Familia: *ANISAKIDAE*.

Larvae of *A. simplex* were found in 37.5% of the fishes. Their maximal number in one fish amounted to 12. The larvae were present on the intestines, between the pyloric processes, on stomach, gonads and liver. They formed a characteristic spiral covered with a thin, transparent cyst. The larvae (15–22 mm in length) were in the 3rd stage of development.

7. *Thynnascaris adunca* (Rudolphi, 1802).

Familia: *ANISAKIDAE*

Larvae in the 3rd stage were present over the walls of the intestines, stomach, between pyloric processes and on liver (in one case a larvae was found in stomach content). *Th. adunca* was found in 23 mackerels (intensity 28.8%). Usually the parasite numbers did not exceed 5, maximal number found was 23. Totally, 85 larvae were collected. *Th. adunca* did not form spirals. The larvae reached 6–7 mm, exceptionally 10 mm. Caudal part of the body of larvae being in the 4th stage was well noticeable through the cuticle.

8. *Advena paradoxa* (van Beneden, 1851) (Fig. 5, 6, 7, 8).

Familia: *LERNAEPODIDAE*

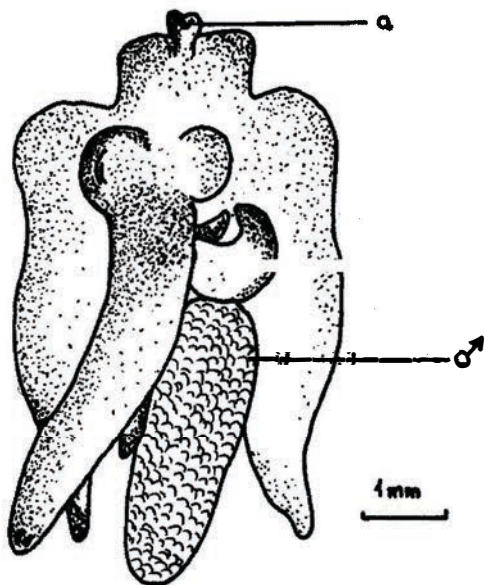


Fig. 5. Female *Advena paradoxa*: thorax in dorsal view
a. attachment organ

Crustaceans *A. paradoxa* were present in gills. The parasites were rare. In the material under study (80 fishes) none were found. In the additional material (500 fishes) female parasites were found in the gills of three mackerels (single in two fishes, and two specimens in one fish). A small male was attached to each female. Females of *A. paradoxa* were 6–8 mm long, 3–4 mm wide, males reached 1–1.5 mm. The females possessed long, cylindrical cephalothorax. Part of the thorax was broad, flat, with two lateral processes extending backwards. Between these, a short sexual process was located. Large, subspherical swellings were noticed in front as well as an organ in form of a "sucker", with which the parasites attached themselves to the host gills. The males possessed

cephalothorax which was dorsally convex and flat at the abdominal side.

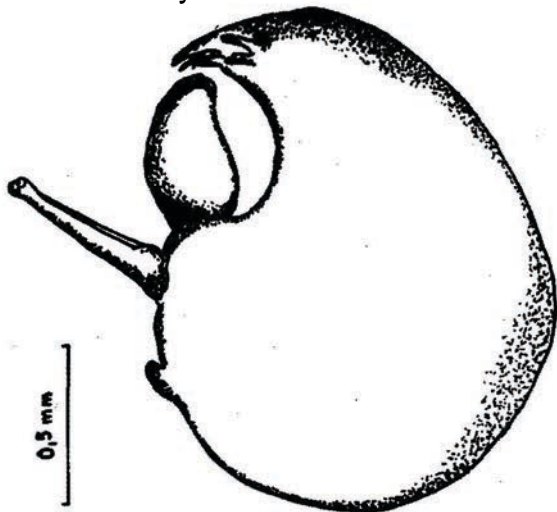


Fig. 6. Male *Advena paradoxa*

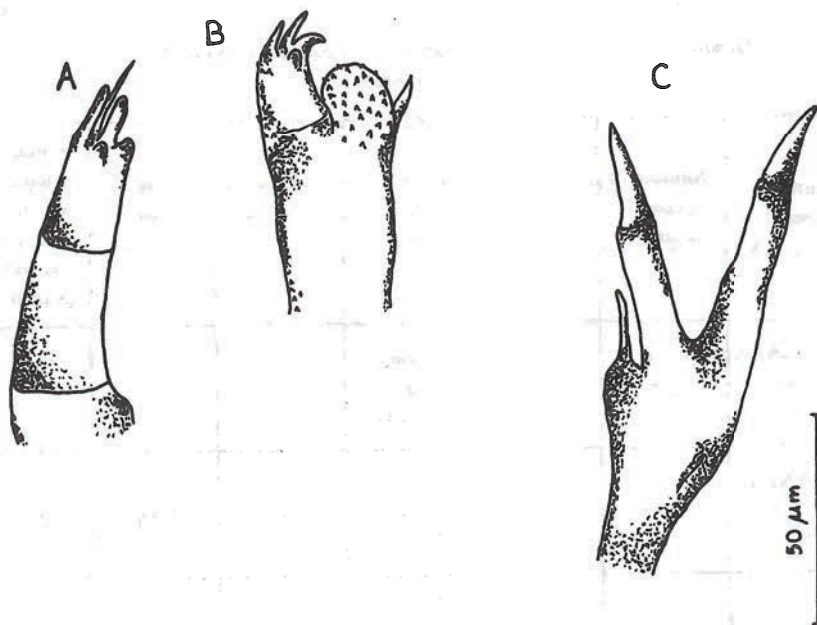


Fig. 7. Selected fragments of appendages of male *A. paradoxa*.
A. 1 st antennae, B. 2. nd antennae, C. 1 st maxillae

DISCUSSION

Studies on *Scomber scombrus* revealed that parasitic fauna of this fish in the north-west Atlantic was relatively poor, both quantitatively and qualitatively. 8 species of the parasites were found. Also Orecchia and Paggi (1978) found 9 parasitic species in 100 mackerels originating from the waters around Appenine Peninsula (*Monogenea* 2, *Cestoda* 2, *Digenea* 2, *Didymozoida* 1, *Nematoda* 1, *Acanthocephala* 1). On the other hand, Sey (1968, 1970) found 6 species in 41 fishes from the Adriatic Sea (*Trematoda* 4, *Nematoda* 2). Margolis and Arthur (1979) mentioned 5 species in a list of fish parasites in the Atlantic coastal waters of Canada (*Monogenea* 1, *Digenea* 2, *Nematoda* 2). Gaevskaja and Umnova (1977) found one monogenetic trematode and two species of *Nematoda* and *Digenea* in mackerel from the fishing grounds of Georges Bank and New Scotland.

The most frequent parasites found in my studies were *Kuhnia scombri* and *Ceratomyxa* sp. (Tab. 1). *Kuhnia scombri* was described also by Treasurer (1976) in the coastal waters of north-west Scotland (extensiveness 15.9%). Prost (1966) compared *Monogenea* in the Mediterranean, Adriatic and Baltic Sea and found that the extensiveness of fish infestation amounted to 32.3% in the Mediterranean (intensity 1–2) and to 66.6% in the Adriatic (intensity 1–6). No *K. scombri* was found in the Baltic Sea, this being due to low water salinity. Near Appenine Peninsula this species was found by Orecchia and Paggi (1979). Margolis and Arthur (1979) found it in Candian coastal waters.

Parasites of Atlantic mackerel, *Scomber scombrus* from the fishing grounds of Cape Hatteras

Parasite species	Number of infested fishes	Estensiveness of infestation	Intensity of infestation	Number of parasites found	Average intensity of infestation	Average intensity of infestation of the fish population
PROTOZOA <i>Ceratomyxa</i> <i>sp.</i>	14	40	single very numerous	+	+	+
MONOGENEA <i>Kuhnia</i> <i>scombr</i>	36	45	1–4	57	1,58	0,71
CESTODA <i>Grillotia</i> <i>erinaceus</i>	30	37.5	1–7	56	1.87	0.7
<i>Cestoda</i> <i>gen. sp.</i>	10	12.5	1	10	1	0.13
TREMATODA <i>Didymozoida</i> <i>gen. sp.</i>	1	1.3	1	1	1	0.01
NEMATODA <i>Anisakis</i> <i>simplex</i>	30	37.5	1–12	109	3.63	1.36
<i>Thynnascaris</i> <i>adunca</i>	23	28.8	1–23	85	3.7	1.06
CRUSTACEA <i>Advena</i> <i>paradoxa</i>	3	ab. 0.5	1–2	4 ♂♂ 4 ♀♀	+	+

A few authors described parasitic Protozoa in mackerels. MacLean (1980) found *Haematractidium scomбри* Henri, 1910, in the erythrocytes of mackerel from the shelf of Virginia. Earlier, Johnson (1975) carried out detailed studies on the genus *Haematractidium* Henri, 1910, in this fish. Spores of *Ceratomyxa* sp. have not so far been observed in mackerel from west Atlantic. Only Kudo (1919) mentioned two species of Protozoa belonging to the genus *Leptotheca* Thelohan, 1895 (syn. *Ceratomyxa*) from coastal waters of Norway and from west and south waters of France. One species was found in the fish kidneys, the other (*Leptotheca parva* Thelohan, 1895) in the gall-bladder. Wierzbicka (1987) carried out extensive studies on protozoan parasites in *Scomber scombrus*. She described a new species *Ceratomyxa americana*.

Plerocercoids of *Grillotia erinaceus* were frequently found in my material. They were also found by many authors in other fishes from north Atlantic and the near-by seas (Dollfus 1942). In 1980 McKenzie described *G. angeli* Dollfus, 1969, in mackerels from the fishing grounds of north-west England. However, this species differed considerably from *G. erinaceus* as regards the morphologic features.

Nematodes *Anisakis simplex* and *Thynnascaris adunca* belong to frequent parasites of marine fishes. They have been most popular in north Atlantic and Pacific. Both species have also been noted in mackerel. Gaevskaja and Umnova (1977) and Smith and Wootten (1984) mentioned *A. simplex* larvae, while Sey (1970), Gaevskaja and Umnova (1977), Orecchia and Paggi (1978) and Margolis and Arthur (1979) described *Th. adunca*. These authors, however, did not state the extensiveness of the infestation. *A. Simplex* is

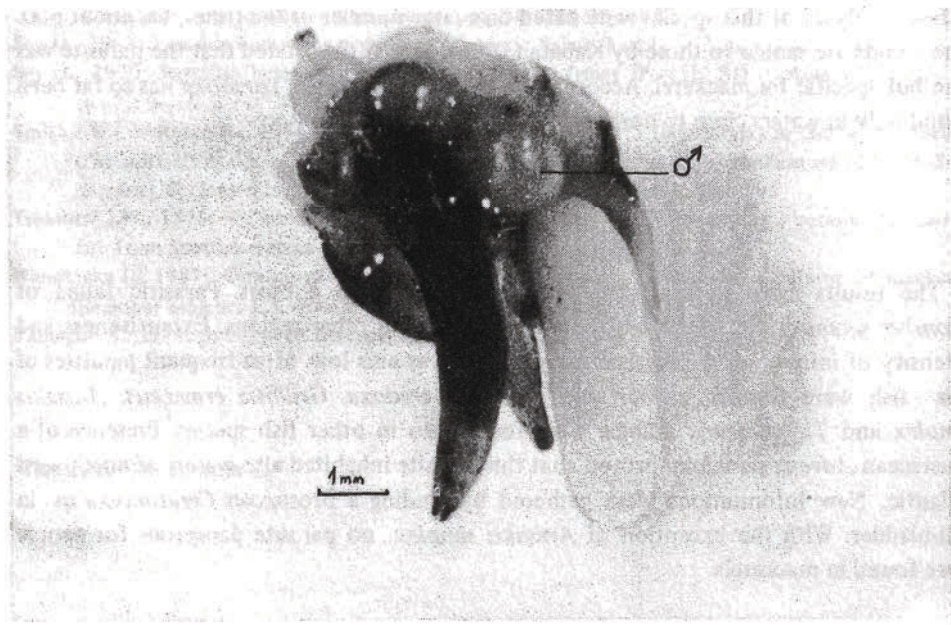


Fig. 8. Female *A. paradoxa*; thorax in dorsal view

dangerous also for humans. I have found its larvae only in the body cavity and not in the fish muscles. They were not numerous (intensity of the infestation was 1.36 on the average). Nevertheless, attention should be given to proper fish processing before their consumption by humans.

Cestoda gen. sp. and *Didymozoida* gen. sp. larvae were rare in the material under study (Tab. 1). Larval forms of the tapeworms (with the exception of *Grillotia* genus) were noticed in mackerels only by Orecchia and Paggi (1978). The authors classified these parasites as belonging to the order *Tetraphyllidea* and *Trypanorhyncha* (syn. *Tetrarhynchidea*). However, the larvae were not described, so no comparisons could have been made with my material. As regards *Didymozoida*, three species were found in mackerel. Yamaguti (1971) mentioned *Nematobothrium faciale* (Baylis, 1938) on the head, and *N. scombri* (Taschenberg, 1879) in the gills. The latter species was found also by Orecchia and Paggi (1978). Grabda (1981) discussed infestation of mackerel from the fishing grounds of Georges Bank near Atlantic shores of North America with *Atalastrophion*. Lopez-Roman (1979) described a new *Digenea* species in the intestines of mackerel from the waters of Canary Islands. *Didymozoida* gen. sp. found in my study usually occurred on fish heart. This suggests that they were accidental parasites of mackerel.

Parasitic crustaceans in mackerel were described by Kabata (1979). This author listed six species of these parasites. One, *Caligus pelamydis* Krøyer, 1863, was found also by Cressey and Cressey (1980) in the Mediterranean Sea and North Atlantic. In my material only one parasitic crustacean was found. *Advena paradoxa* was found in 0.5% of the fishes. Analyses of this species were based on a large number of the fishes, i.e. about 600. The results are similar to those by Kabata (1979). This author stated that the parasite was rare but specific for mackerel. According to the same author, *A. paradoxa* has so far been found only in waters close to north-east Atlantic.

CONCLUSIONS

The results agree in part with the findings by other authors. Parasitic fauna of *Scomber scombrus* was relatively poor, similarly as in other regions. Extensiveness and intensity of infestation with particular parasites was also low. Most frequent parasites of this fish were *Kuhnina scombri* and *Advena paradoxa*. *Grillotia erinaceus*, *Anisakis simplex* and *Thynnascaris adunca* were found also in other fish species. Presence of a crustacean *Advena paradoxa* proved that this parasite inhabited also waters of north-west Atlantic. New informations were gathered by finding a protozoan *Ceratomyxa* sp. in gall-bladder. With the exception of *Anisakis simplex*, no parasite dangerous for people were found in mackerels.

References

- Cressey R., Cressey H.B., 1980: Parasitic Copepods of mackerel and tuna-like fishes (Scombridae). – *Smithson. Contr. Zool.*, 311: 32–33
- Dollfus E. Ph., 1942: Études critiques sur les Tétrarhynques du Muséum de Paris. – *Arch. Mus. Nat., Hist. Natur.*, VI Série, 19: 1–466
- Gaevskaja A.V., Umnova B.A., 1977: Parazitofauna nekotoryh ryb Atlantičeskogo okeana v rajone Georges Bank. – *Biol. Morja, Vladivostok*, 4: 40–48. (in Russian)
- Grabda J., 1981: *Zarys parazytologii ryb morskich*. PWN, Warszawa
- Johnston M.R.L., 1975: Distribution of *Pirhemocytos* Chatton and Blanc and other, possibly related, infections of poikilotherms. – *J. Protozool.*, 22 (4): 529–535
- Kabata Z., 1979: Parasitic Copepoda of British fishes. The Ray Society, London
- Kudo R., 1919: Studies on Myxosporidia. A synopsis of genera and species of Myxosporidia. – 111. *Biol. Monogr.*, 5 (3–4): 243–503
- Lopez-Roman R., 1979: *Acanthocolpoides guevarai* n.sp. parasito intestinal de *Scomber scombrus* L. capturados en aguas de las Islas Canarias. – *Revista Iberica Parasitol.*, 39: 485–492
- MacLean A.S., 1980: Study of *Haematractus* scombrus in atlantic mackerel *Scomber scombrus*. – *Can. J. Fish. Aquatic Sci.*, 37(5): 812–816
- Margolis L., Arthur J.R., 1979: Synopsis of the parasites of fishes of Canada. – *Bull. Fish. Res. Board Can.*, 119: 1–270
- McKenzie K., 1980: First report of the plerocercus of *Grillotia angeli* Dollfus, 1969 (Cestoda: Trypanorhyncha). – *J. Parasitol.*, 66 (1): 175–176
- Orecchia P., Paggi L., 1978: Aspetti di sistematica e di ecologia degli elminti parassiti di pesci marini studiati presso l'Istituto di Parassitologia dell'Università di Roma. – *Parassitologia*, 20 (1–3): 73–89
- Prost M., 1966: Comparison of Monogenea fauna of some species of fishes from the Mediterranean, Adriatic and Baltic Seas. – *Acta parasit. pol.*, 14 (32): 309–312
- Sey O., 1968: Parasitic helminths occurring in adriatic fishes (Part I). – *Acta Adriatica*, 13(4): 3–15
- Sey O., 1970: Parasitic helminths occurring in adriatic fishes (Part II, III). – *Acta Adriatica*, 13 (6–7): 3–16
- Smith J.W., Wootton R., 1984: *Anisakis* larvae ("herringworm") (Nematoda) in fish. – In: *Fiches d'identification des maladies et parasites des poissons, crustacés et mollusques* (Ed. C.J. Sinderman), 8, Conseil Intern. pour l'Exploration de la Mer, Copenhague: 1–5
- Treasurer J.W., 1976: An annotated survey of some monogenean (Platyhelminth) parasites of marine fish from Scottish waters. – *The Glasgow Naturalist*, 19(4): 325–333
- Wierzbicka J., 1987: *Ceratomyxa americana* n.sp. (Myxospora, Bivalvulida) a parasite of mackerel (*Scomber scombrus* L.). – *Acta Ichthyol. Piscat.* XVII (1): 93–96
- Yamaguti S., 1971: *Synopsis of Digenetic Trematodes of Vertebrates*, Tokyo, 1(2)

Dariusz Romuk-Wodoracki

PARAZYTOFAUNA MAKRELI ATLANTYCKIEJ (*SCOMBER SCOMBRUS* L.)
Z ŁOWISK PRZYLĄDKA HATTERAS

STRESZCZENIE

Badaniom parazytologicznym poddano makrelę atlantycką *Scomber scombrus* z wód przylądka Hatteras u wschodnich wybrzeży U.S.A. Znaleziono 8 gatunków pasożytów. Najczęściej stwierdzano przywry monogenetyczne *Kuhnia scombri* (45%), które występowały na skrzelach oraz spory pierwotniaka *Ceratomyxa* sp. (40%) w woreczku żółciowym. Także na skrzelach zaobserwowano *Advena paradoxa*, skorupiaka, który nie był wcześniej notowany u makreli z zachodniego Atlantyku. Wewnątrz jamy ciała znaleziono plerocerkoidy tasiemca *Grillotia erinaceus* oraz larwy nicieni III stadium rozwojowym *Anisakis simplex* i *Thynnascaris adunca*, a także larwy *Cestoda* gen. sp. natomiast na sercu przywry *Didymozoida* gen. sp. Ekstensywność i intensywność zarażenia poszczególnymi pasożytami była niewielka (od 0,5 do 45%). Wyniki pracy porównano z badaniami innych autorów.

Author's address:

Received: 87.03.11

Mgr Dariusz Romuk-Wodoracki
Zakład Parazytologii i Ochrony Środowiska
Uniwersytet Szczeciński
ul. Felczaka 3a
71-412 Szczecin (Poland)