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Pathology

ANATOMICAL AND FUNCTIONNAL EFFECTS OF THE PARASITIC COPEPOD *LERNAEOCERA BRANCHIALIS* (L.) ON *POLLACHIUS POLLACHIUS* (L.) (PISCES: *GADIDAE*)

WPŁYW PASOŻYTNICZEGO WIDŁONOGA *LERNAEOCERA BRANCHIALIS*(L.) NA ANATOMIĘ I FUNKCJE RDZAWCA *POLLACHIUS POLLACHIUS* (L.)

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The paper discribes aquarian and laboratory observations of the influence of the copepod, *Lernaeocera branchialis*, on tissue changes in three species of gadid fishes taken from Gullmar Fjord, on the west coust of Sweden.

The most extensive infestation by the parasite was noted in *Merlangius merlangus* (8.7%), in *Gadus morhua* (3.0%) and *Pollachius pollachius* (2.2%). The most extensive deformation of tissue occurred, however, in *P. pollachius*. This included a deformed left gill cover, perforation of the ventral artery and possibly deformation of certain bones of the viscerocranium. The changes in *M. merlangus* and *G. morhua* did not differ from those (hitherto known from the literature) reported previously.

INTRODUCTION

The literature concerning *L. branchialis* is relatively copious, covering the development cycle of the parasite, as well as its effect on the condition and growth of the host:

* Editorial board do not share the author's conclussion on the *Lernacoerra branchialis* parasite presence to be responsible for the described morphological changes. It could have take place at the juvenille stage of growth, however, there is no evidence to that.

Nevertheless, we regarded it proper to present information on the pathological changes.

Sproston and Hartley, 1941; (Schuurmans Stekhoven 1936; Desbrosses 1948; Mann 1952–1953; Kabata 1958; Sundnes 1970; Templeman et al. 1976; Van den Broek 1978) after Kabata 1984; Khan 1984. Less known are the anatomo-patological changes in the blood-vascular and osseous systems of infested fish in *Pollachius pollachius* that was observed by Gouillart (1937), Sproston and Hartley (1941).

MATHERIALS AND METHODS

All field samples were collected in the outer part of the Gullmar Fjord (18°18.6'N, 11°32.4'E), on the west coast of Sweden (Fig. 1). Fish, for examination, were landed by means of a trawl, by the KMBS research vessels "Oscar von Sydow" and "Arne Tiselius". To carry out intravital obserwations, some fish were kept in an aquarium. Three species of fish of the gagid family: *Merlangius merlangus* (L.), *Gadus morhua* L. and *Pollachius pollachius* (L.) were examined from the point of view of the occurrence of *L. branchialis,* in August and the beginning of September 1986. To separate certain elements of bones, the material was treated with potassum hydroxide (3% KOH).

RESULTS

During the period of investigations, *M. merlangus* harboured the highest prevalence with *L. branchialis*, than the remaining two species of fish (Table 1). The most extensive tissue deformation being noted in *P. pollachius.* Of 45 fishes of this species examined,

Table

Numerical distribution of fish examined and infested

Host species	No. of fishes		Incidence %	Range of intensity
	examined	infested		
Merlangius merlangus	184	16	8.7	1–2
Gadus morhua	98	3	3	1–5
Pollachius pollachius	45	1	2.2	

only one (L. 18.5 cm, weight 50.6 g. age 2 years) harboured a single specimen of a female of *L. branchialis.* During observations of the fish in an aquarium, it was found that during respiratory movements, the left operculum failed to close (Fig. 2). A small part of a copepod was found to protrude from a 4–5 mm aperture. The parasite was located at the base of the first gill arch and occupied a substantial part of the gill cavity. The head, together with the attachment processes was found in the wall of the ventral aorta close to

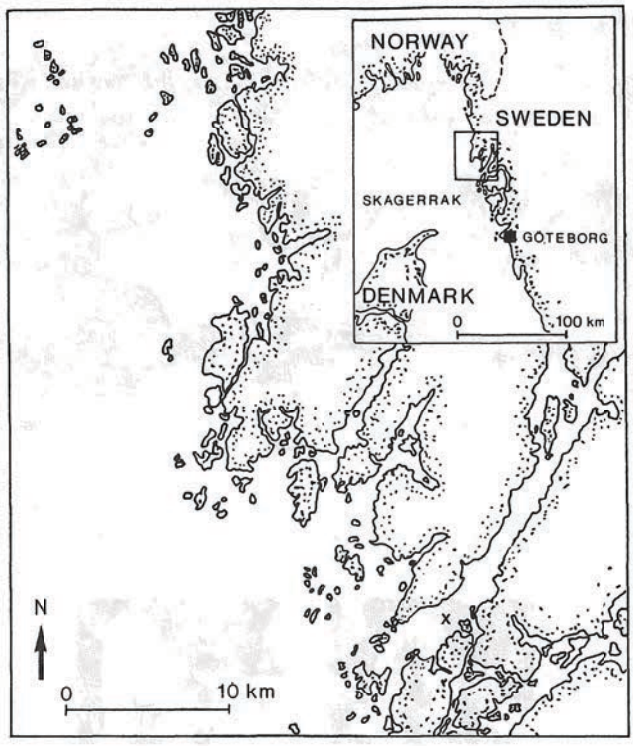

Fig. 1. Location of the Gullmar Fjord – (x) marks the point where fish were caught

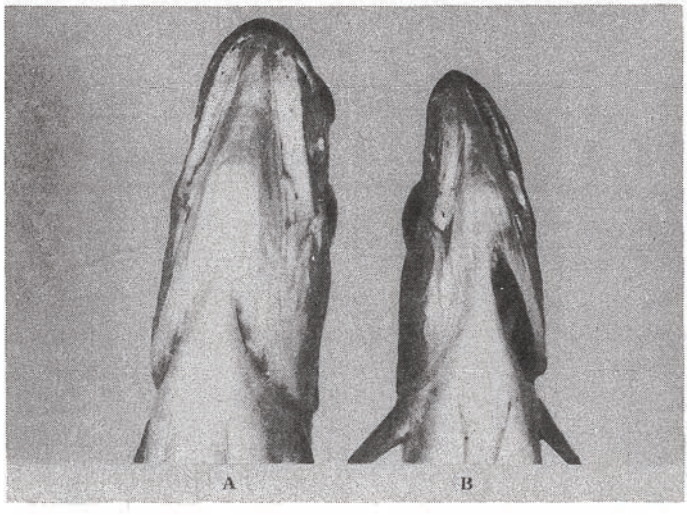

Fig. 2. Pollachius pollachius: A normal fish, B – fish with Lernaeocera branchialis under left operculum

the arterial bulb. Damage to the ventral aorta wall caused the forming of a haematoma (Fig. 3).

In the *P. pollachius* the mandible protrudes before the maxilla, whereas in infested fishes, it was twisted to the right (Fig 2B), so that the mouth could not be closed. Some

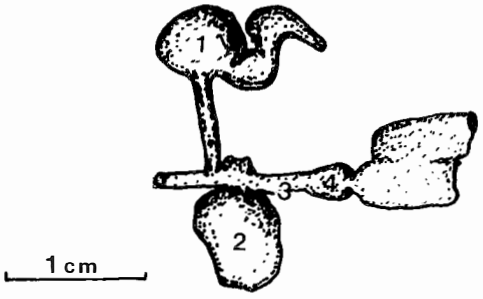

Fig. 3. Pollachius pollachius – penetration of arterial trunk by Lernaeocera branchialis: 1 – parasite, 2 – haematoma, 3 – arterial trunk, 4 – arterial bulb

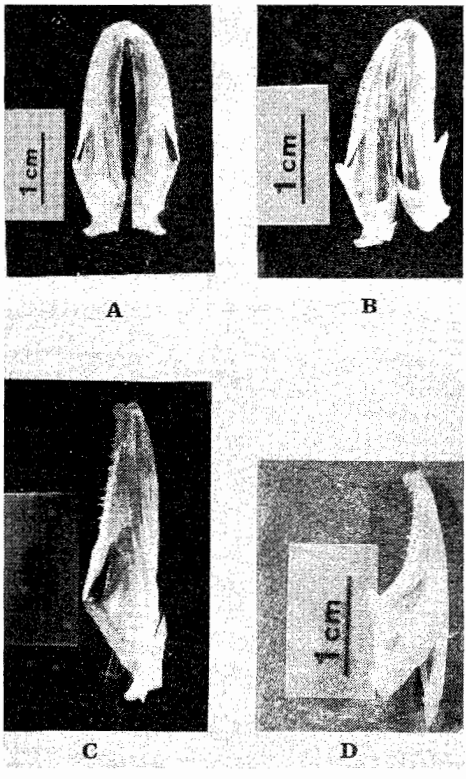

Fig. 4. Pollachius pollachius, mandible: A, C – normal, B, D – twisted to the right, D – right side bent

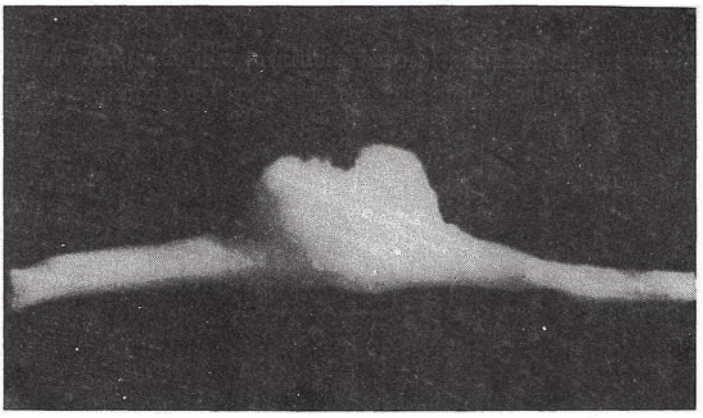

Fig. 5. Gadus morhua – arcus branchialis with lesion

bones of the viscerocranium in infested fish were bent to the right. This mainly appertained to the os dentale dextra and sinistra and the articulare dextra. The dentale dextra and sinistra bones are bent to a graater degree (Fig. 4B) than in the analogical bones of noninfested fish (Fig. 4A). The teeth in the dentale dextra were set more centripetal than normally. The os articulare dextra, being connected to the os dentale dextra is higher (Fig. 5D) in relation to its counterpart on the opposite side (Fig. 4C). It is possible that this arose due to the joint effect of the parasite on the left gill cover and this in turn on the os articulare and quadratum forming the left hinge of the mouth, as the result of whitch the mandible was declined to the side in relation to the maxilla.

In *G. morhua* the head of the *L. branchialis* remained within the gill cavity and its lateral processes penetrated the lumen of the gill artery. Bone changes appeared as a transverse groove in relation to the axis of the gill arch (Fig. 5).

DISCUSSION

Lernaeocera branchialis moving forward from the gill cavity of *P. pollachius* was the cause of the incomplete closure of the operculum and as a result, disruption of the respiratory rhythm. This defect in gaseous exchange was further intensified by damage to the gill lobes by the parasite. Prolonged action of *L. branchialis* on the host tissuue gives rise to various anatomical deformations, mainly in the blood-vascular and skeleton. The blood vessels of the gill arch or the ventral aorta are perforated by the lateral processes of the parasite's head and may be the cause of the forming of a haematoma, as observed in the *P. pollachius* (Table). According to Kabata (1958) *L. branchialis* attache various organs depending on fish species. It seems, that this parasite penetrate arteria branchialis, and behaves similarly in *P. pollachius* and in Melanogrammus. The most destroying operation has got *L. branchialis* on the *M. merlangus* fish, where attaches to heart

chamber musculature. Osseous changes appertain to the gill arch and probably some bones of the viscerocranium. It is still an open question whether the deformation of the maxilla was the result of a trauma, other teratological factor, or the presence of the parasite. The parasite may have been the cause of the deformation of the cranium of *Pollachius pollachius*. This can not exclude of the rarity of occurrence of *Lernaeocera branchialis* in this species of fish. The image formed is highly suggestive but may be misleading in respect of happen similirar cases in the sea invironment (Rokicki and Wrzesiński, 1984). *L. branchialis* could fill up the volume of gill cavity of fish soon after earlier deformation of its bones of the cranium. Similarly Isopod find out by Maksimov (1969) on the bottom of craterlike injuries was not causd by its arising (Rokicki and Wrzesiński, 1984) but by its presence it made slovlier healing of the wound. *Lernaeocera branchialis* made an obstacle in shutting well of the operculum by this yet small and young (L. 18.5 cm, age 2 years) fish. It seems, this is justified because the observations of other kind of fishes, *Merlangius merlangus* and *Gadus morhua* inhabited in aquarium infested by *L. branchialis* did demonstrate shutting well properties. But the infested *P. pollachius* possesed not ahutting well operculum and screwed mandibula. It could be the problem just touched in the paper will be more correct and precize enlighten in the future in the case of facing new evidences during further investigations.

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REFERENCES

Gouillart M., 1937: Rechearches sur les copépodes parasites (biologie, spermatogénése, ovogénése). Trav. Stn. zool., Wimereaux, 12: 308–457.

Kabata Z., 1958: Lernaeocera obtusa n.sp. its biology and its effects on the haddock. Mar. Ser. Scotl. 3: 1–26.

Kabata Z., 1984: Diseases caused by Metazoans: Crustaceans. In: Diseases of marine animals pp. 321–399. vol.IV/1/. Ed. by O. Kinne. Hamburg. Biologische Anstalt Helgoland.

Khan R.A., 1984: Concurrent infection of two parasites, Lernaeocera branchialis (Copepoda) and Trypanosoma murmanensis (Protozoa) in Atlantic cod. Bilgehan publishing house, Izmir (Turkey), 189.

Maksimov V.N., 1970: Nekotorye dannye o poraženii krupnych pelagičeskich ryb parazitičeskimi Isopoda. Nauč Dokl. Vys. Škol. Biol. Nauk. 12: 7–9. (in Russian)

Rokicki J., Wrzesiński)., 1984: Rany powierzchniowe u ryb wywołane przez pasożytnicze Isopoda lub niektóre ryby drapieżne. [Surface wounds on fish caused by the parasitic Isopoda or some predatory fishes]. Wiad. Parazytol., 30: 229–240.

Sproston N.G., Hartley P.H.T., 1941: The ecology of some parasitic copepodes of gadoids and other fishes. J. mar. biol. Ass. U.K. 25: 361–392.

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STRESZCZENIE

U trzech gatunków ryb dorszowatych: witlinka *Merlangius merlangus* (L.); dorsza *Gadus morhua* L. i rdzawca *Pollachius pollachius* (L.) stwierdzono występowanie widłonoga *Lernaeocera branchialis*. Z tego najrozleglejsze zmiany funkcjonalne i anatomiczne wystąpiły u rdzawca. Obejmowały one niedomykanie się pokrywy skrzelowej, uszkodzenie części płatków skrzelowych i ściany aorty brzusznej przez pasożyta. Równocześnie stwierdzono deformacje kości zębowej prawej i lewej oraz stawowej prawej. Ze względu na pojedynczy przypadek deformacji kości trzewioczaszki u rdzawca nie można powiedzieć jednoznacznie jaka była ich przyczyna. Autor pozostawia tę sprawę otwartą.

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