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VERSITA

Description of *Neolepidapedoides subantarcticus* sp. nov. (Digenea, Lepocreadiidae) from sub-Antarctic notothenioid fishes

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Abstract

Neolepidapedoides subantarcticus sp. nov. (Digenea, Lepocreadiidae) is reported from the intestine, mainly the jejunum, of fishes in the eastern mouth of the Beagle Channel and in the harbour of Ushuaia in the Beagle Channel (Tierra del Fuego, Argentina) at a depth 7–30 m. The typical host is *Patagonotothen longipes*, other hosts are *P. tessellata*, *P. brevicauda* and *Champsocephalus esox*. The male terminal genitalia indicates that the new species belongs to the genus *Neolepidapedoides* (Lepocreadiidae, Lepocreadiinae). The most important taxonomic features are the presence of eye-spots, the spined tegument, the "*Opechona*-type" cirrus-sac, the external seminal vesicle free in the parenchyma, the gonads arranged in tandem, the vitelline follicles extending from the level of the oesophagus in the forebody to the posterior end of the body and an I-shaped excretory vesicle reaching to the intestinal bifurcation and the absence of a pseudoesophagus. Ten previously described species differ from the *N. subantarcticus* sp. nov. mainly in the extent of the vitelline fields and length of the excretory vesicle which reaches into forebody.

Keywords

Digenea, Lepocreadiidae, *Neolepidapedoides*, Nototheniidae, *Patagonotothen longipes*, Beagle Channel, Argentina

Introduction

According to Zdzitowiecki (1997), six species of the family Lepocreadiidae have been reported as parasites of Antarctic notothenioidei. Three of them, *Neolepidapedon macquariensis* Zdzitowiecki, 1993 (synonyms: *Neolepidapedon* sp. of Prudhoe and Bray (1973); *Lepocreadium trullaforme* sensu Parukhin and Lyadov (1981, 1982), Parukhin (1986, 1989 nec Linston, 1940), *Neolepidapedon magnatestis* (Gaevskaya et Kovaljova, 1976), (synonym: *Opechona magnatestis* Gaevskaya et Kovaljova, 1976) and *Lepidapedon garrardi* (Leiper et Atkinson, 1914), were found in fishes caught in the open sea of sub-Antarctica in the Kerguelen and Magellanic subregions (Prudhoe and Bray 1973; Gaevskaya and Kovaljova 1976, 1978; Parukhin and Lyadov 1981, 1982; Parukhin and Zaitsev 1984; Gaevskaya *et al*. 1985; Lyadov 1985; Parukhin 1986, 1989; Shandikov and Parukhin 1987; Gaevskaya *et al*. 1990; Rodriguez and George-Nascimento 1996; Zdzitowiecki 1990, 1993, 1997, 1999). The single specimen determined by Szidat (1950) as *Lepocreadium* sp. and re-determined as *N. macquariensis* by Zdzitowiecki (1993) was found near Beagle Channel. The description of Szidat (1950) was based on one strongly contracted specimen. It is clear that it is not conspecific with presently described species, but the main diagnostic features were not described. In such a situation *Lepocreadium* sp. of Szidat (1950) should not be considered *N. macquariensis* but a doubtful form and new material from its host, *Eleginops maclovinus*, is needed.

The present paper contains the description of a new species of Lepocreadiidae abundant in notothenioid fishes in the Beagle Channel. It is included to the genus *Neolepidapedoides* Yamaguti, 1971. This genus was firstly described at the subgenus of *Neolepidapedon* Manter, 1954 by Yamaguti (1971) and raised to full generic status by Bray and Gibson (1989).

It is the second of three new species found in Notothenioidea in the Beagle Channel during Seventh Ukrainian

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Antarctic Expedition in 2002. Description of one species was prepared by Jeżewski *et al*. (2009) and the description of the third species is in preparation.

Materials and methods

One hundred specimens of notothenioid fishes: *Patagonotothen longipes* (Steindachner, 1876) (40 specimens); *P. tessellata* (Richardson, 1845) (33 specimens); *P. brevicauda* (Lönnberg, 1905) (7 specimens) and *Champsocephalus esox* (Günther, 1861) (20 specimens), were caught using a fishing rod in two places: at the eastern mouth of the Beagle Channel (54º59´S, 66º45´W, depth 30 m) and in the harbour of Ushuaia in the Beagle Channel (54º48´S, 68º18´W, depth of 7–9 m), in January and March 2002, during the Seventh Ukrainian Antarctic Expedition. Examination was carried out using a stereomicroscope immediately after capture. All digeneans were collected alive, killed by heat in fresh water and preserved in 70% ethanol. In addition to other Digenea, 172 lepocreadiid specimens of an undescribed species were found. Some specimens were stained with alum carmine, dehydrated in graded ethanol series (50% to 99.8%), cleared in benzyl alcohol, and examined as temporary mounts in clearing solution and as permanent slides in Canada balsam using an Olympus BX 50 microscope. Most of measurements and figures are based on specimens collected from *P. longipes*. Digeneans were mounted in the dorso-ventral plane. Dimensions are given in micrometres. Three indices of infection of each host species are given: prevalence, intensity range and mean abundance. Mean diameters of organs are calculated as length + width/2.

Results

Description

***Neolepidapedoides subantarcticus* sp. nov.** (Figs 1–4)

Diagnosis (based on 20 specimens from *P. longipes* – type host). Body elongate oval 1428–2045 (1812 × 535), armed with spines throughout (Figs 1 and 2). Maximum length of spines in forebody 13, length of spines decreasing posteriorly to 11 at posterior extremity. Maximum body width at 2/3 of body length. Length to width ratio 2.64:4.03 mean 3.40. Forebody 23.53–34.85% mean 29.77% of body length. Eye-spots present between oral sucker and pharynx. Oral sucker globular, almost terminal 131–164 × 131–165 mean 147 × 144. Ventral sucker pre-equatorial, position of its center from anterior extremity 27.78–38.52% mean 33.29% of body length. Ventral sucker usually smaller than oral sucker, suckers ratio 1:0.90–1.01 mean 1:0.95. Oral sucker/pharynx ratio 1:0.51–0.64 mean 1:0.59. Prepharynx length 18–65 mean 43. Pharynx muscular, globular 86–107 × 65–90 mean 95 × 78. Oesophagus 57–149 mean 110 in length, longer than prepharynx. Pseudoesophagus absent. Intestinal bifurcation midway between pharynx and ventral sucker, at 17.66–27.17% mean 20.05% of body length. Intestinal caeca long, ending blindly close to posterior extremity.

Excretory pore terminal, excretory vesicle very long, I-shaped, reaching almost to intestinal bifurcation.

Testes tandem in hindbody, separated, anterior testis rounded 145–239 × 146–217 mean 199 × 181, posterior testis oval 179–280 × 143–217 mean 223 × 180. Distance between posterior testis and extremity of body 9.07–14.66% mean 11.20% of body length. External seminal vesicle free in parenchyma, accompanied with present but poorly visible prostatic gland cells. Proximal end of cirrus-sac reaching behind ventral sucker (Fig. 3). Cirrus-sac club-shaped, of "*Opechona*-type" (Bray and Gibson 1989), 80–215 × 54–86. Internal seminal vesicle short, pars prostatica vesicular, ejaculatory duct long, narrow. Details of cirrus-sac often poorly visible, obscured with eggs and vitelline glands. Distance between genital pore and anterior margin of ventral sucker 3.10–5.08% mean 3.78% of body length.

Ovary entire, pretesticular on right side of body 140–195 × 140–185 mean 172 × 159. Distance between ovary and ventral sucker 6.10–14.73% mean 11.29%. Canalicular seminal receptacle and vitelline receptacle dorsal to ovary. Laurer's canal opens dorsally. Vitelline follicles very numerous, lateral and confluent dorsally at oesophagus level and in post-testicular region; distance of follicles from anterior extremity 10.73–19.02% mean 14.84% of body length; from posterior extremity 1.89–3.89% mean 2.97%. Uterine coils intra caecal mainly between ovary and ventral sucker, distal part parallel to cirrus-sac. Eggs numerous, operculate 62–78 × 35–44 mean 70.4 × 40.6 (Fig. 4). Mean diameters of internal organs as percentages of body length: oral sucker 7.15–9.20% mean 8.15%; pharynx 4.32–5.70% mean 4.81%; ventral sucker 6.93–9.20% mean 7.80%; ovary 8.22–10.19% mean 9.19%; anterior testis 9.19–13.21% mean 10.51%; posterior testis 9.07–14.66% mean 11.20%.

Taxonomic summary

Type-host: *Patagonotothen longipes* (Steidachner, 1876) (type host), (Perciformes, Nototheniidae).

Other hosts: *P. tessellata* (Richardon, 1845) (Nototheniidae); *P. brevicauda* (Lönnberg, 1905) (Nototheniidae); *Champsocephalus esox* (Günther, 1861) (Perciformes, Channichthyidae).

Site of infection: Lumen of intestine, mainly jejunum.

Type locality: Eastern mouth of the Beagle Channel (54º59´S, 66º45´W), Argentina.

Other locality: Harbour of Ushuaia in the Beagle Channel (54º48´S, 68º18´W), Argentina.

Prevalence: *P. longipes* 50%, *P. tessellata* 15%, *P. brevicauda* 14%, *Ch. esox* 30%.

Intensity range: *P. longipes* 1–9; *P. tessellata* 1–2; *P. brevicauda* 1; *Ch. esox* 1–50

Fig. 1. *Neolepidapedoides subantarcticus* sp. nov., holotype from *Patagonotothen longipes*, dorsal view

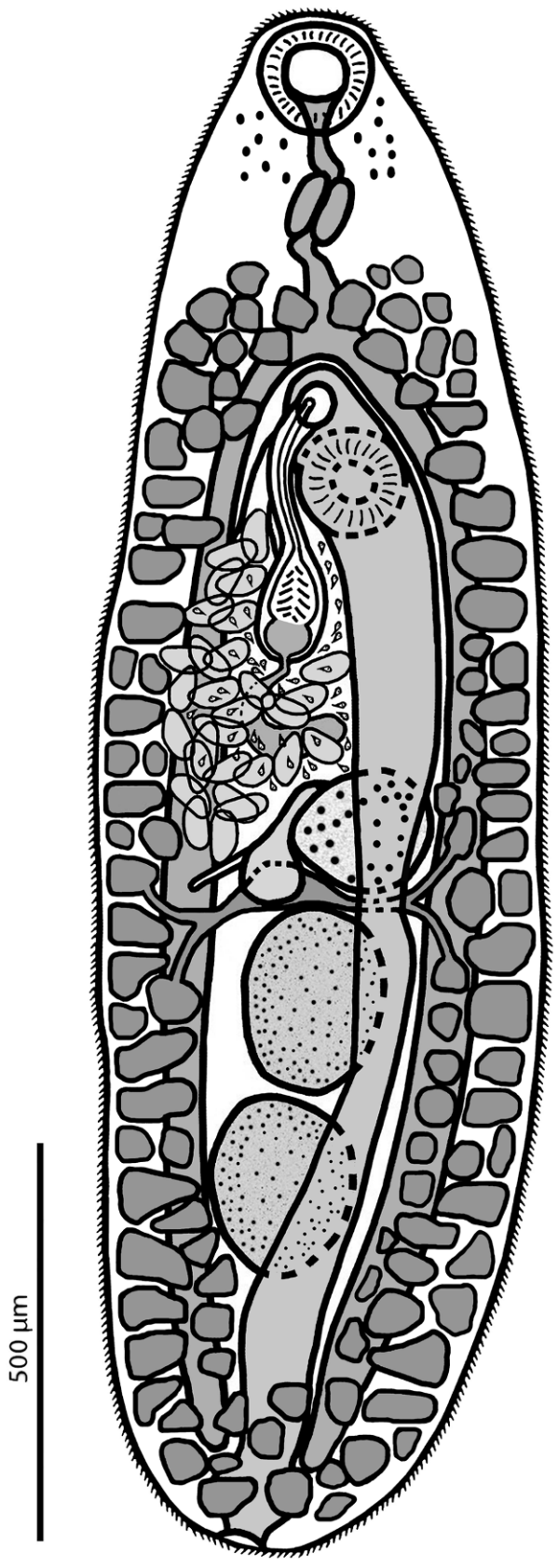
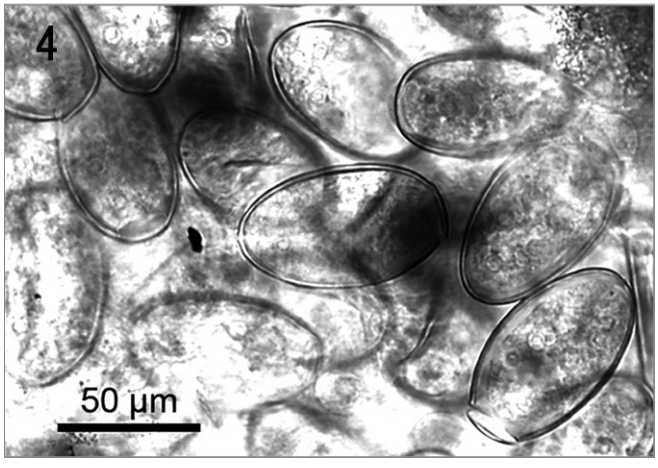


Fig. 2. *Neolepidapedoides subantarcticus* sp. nov., dorsal view

Mean abundance: *P. longipes* 1.32, *P. tessellata* 0.18, *P. brevicauda* 0.14, *Ch. esox* 5.60.



Figs 3 and **4.** *Neolepidapedoides subantarcticus* sp. nov. **3.** Male terminal genitalia. **4.** Eggs. **Abbreviations:** ed – ejaculatory duct, esv – external seminal vesicle, gc – gland cells, gp – genital pore, isv – internal seminal vesicle, pp – pars prostatica

Type specimen: Holotype (BMNH NHMUK 2011.6.13.1) and paratypes (BMNH NHMUK 2011.6.13.2-4) in the Natural History Museum in London, U.K.

Etymology: The specific name is given for the area of the occurrence of parasites.

Discussion

The genus *Neolepidapedoides* was erected by Yamaguti (1971) as the subgenus of *Neolepidapedon* Manter, 1954 and raised to the generic level in the family Lepocreadiidae by Bray and Gibson (1989). The main features of taxonomic values are: blind caeca, cirrus-sac of "*Opechona*-type" extending to hindbody, external seminal vesicle free in parenchyma, excretory vesicle I-shaped reaching to forebody or to level of ovary or anterior testis (Bray and Gibson 1989, Bray 2005). One species listed by Bray and Gibson (1989), *N. dollfusi* described by Durio and Manter (1968), was redescribed by Bray *et al*. (1996) and transferred to the genus *Lepidapedoides* Yamaguti, 1970.

The morphology of new described species agrees with of diagnosis of the genus *Neolepidapedoides*. *N. subantarcticus* sp. nov. is the first representative of this genus occurring in cold sub-Antarctic water in fishes Notothenioidea. All species listed by Bray and Gibson (1989) occur exclusively in tropical and sub-tropical areas mainly in representatives of the family Serranidae. *N. subantarcticus* sp. nov. is similar to the type-species of the genus, *N. trachinoti* (Siddiqi and Cable 1960) in the extension of the vitelline follicles in the forebody, but differs in the extension of the excretory vesicle into the forebody, contrasting to the extension of the excretory vesicle to the posterior margin of anterior testis (hindbody) (Siddiqi and Cable 1960), and differs in the size of the eggs, 39–50 µm in length in *N. trachinoti* as against 62–78 µm in a new species. Only one species, *N. belizensis* (Fischthal 1977) have larger eggs 73–92 µm in length (Fischthal 1977). This species differs from *N. subantarcticus* sp. nov. in extension of the vitelline follicles, which are restricted to the hindbody. Some other species listed by Bray and Gibson (1989): *N. equilatum* (Siddiqi et Cable, 1960), *N. hypoplectri* (Nahhas et Cable, 1964), *N. israelense* (Fischthal, 1980), *N. mycteropercae* (Siddiqi et Cable, 1960) have eggs which are usually shorter than 60 µm (Siddiqi and Cable 1960, Nahhas and Cable 1964, Fischthal 1980). The other four species *N. epinepheli* (Siddiqi et Cable, 1960), *N. macrum* (Overstreet, 1969), *N. medialunae* (Montgomery, 1957) and *N. yamagutii* (Ramadan, 1987) have eggs of similar size to the new species, but the vitelline follicles are clearly restricted to the hindbody (Montgomery 1957, Siddiqi and Cable 1960, Overstreet 1969, Ramadan 1987).

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