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NEOBENEDENIA PARGUERAENSIS N. SP. (MONOGENEA: CAPSALIDAE) FROM THE RED HIND, *EPINEPHELUS GUTTATUS*, AND COMMENTS ABOUT *NEOBENEDENIA MELLENI*

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ABSTRACT: *Neobenedenia pargueraensis* n. sp. from *Epinephelus guttatus* of Puerto Rico differs from all known species in possessing scoop-shaped accessory sclerites with pointed tips. It is most similar to *Neobenedenia melleni* and *Neobenedenia longiprostata* but differs from the former in having a fenestrate ovary and from the latter in that the ducts of the accessory glands are short, terminating just anterior to the vitelline reservoir rather than reaching the caudal end of the body. It differs from both species in having smooth rather than lobate testes. *Neobenedenia melleni* occurs throughout the tropical and subtropical western North Atlantic including Bermuda. It kills aquarium and aquaculture fishes with massive infestations and is a severe restraint on the culture of tilapia in sea water in the Caribbean.

Although numerous studies on digeneans of marine fishes from Puerto Rico have been conducted, little is known about the monogeneans and especially those of *Epinephelus guttatus*, the most common species of grouper in the West Indies. Herein, we report on a new species of *Neobenedenia* from the gills of this host and the problems caused by *Neobenedenia melleni* (MacCallum, 1927) Yamaguti, 1963, in the West Indies.

MATERIALS AND METHODS

Two *E. guttatus* were taken by means of spearfishing off the coast of La Parguera, Puerto Rico, on 14 April 1984. Fish were kept in plastic bags containing sea water and transported to the laboratory where they were examined for helminths under a dissecting microscope. Monogeneans were fixed in 5% formalin, stained with Harris' hematoxylin, dehydrated in a graded ethanol series, cleared in beechwood creosote, and mounted in neutral Canada balsam. Prepared specimens were examined under a compound microscope, and illustrations were made with the aid of a camera lucida and a microprojector. Measurements of the holotype and the paratype are in micrometers unless otherwise stated. For comparative purposes, the following type specimens were examined: 2 paratypes, *Neobenedenia longiprostata* Bravo-Hollis, 1971 (UNAM no. 225-12); holotype, 5 paratypes *Neobenedenia manilae* Valasquez, 1982 (USNM no. 76333); holotype *Neobenedenia isabellae* (Meserve, 1938) Yamaguti, 1963 (USNM no. 9178); 1 paratype *Neobenedenia adenea* (Meserve, 1938) Yamaguti, 1963 (USNM no. 9181); 1 paratype *Neobenedenia girellae* (Hargis, 1955) Yamaguti, 1963 (USNM no. 49329); and holotype *Benedenia malaboni* Valasquez, 1982 (USNM no. 76344).

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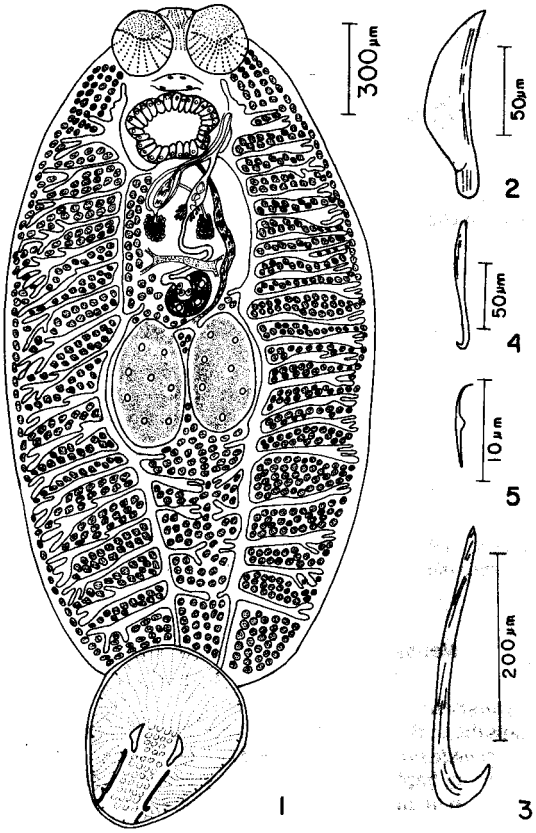
DESCRIPTION

Neobenedenia pargueraensis n. sp.

(Figs. 1–4)

Diagnosis (based on 2 adult worms from 2 red hinds): Capsalidae Baird, 1853; Benedeniinae Johnson, 1931; *Neobenedenia* Yamaguti, 1963. Body elliptical, length including haptor 2.85–2.97 mm, greatest width 1.30–1.75 mm at anterior end of testes. Anterior discs suckerlike, each 230–300 long, 210–270 wide. Haptor oval, smooth, shallow, 670–870 long, 550–830 wide, aseptate, with 1 pair of accessory sclerites, 1 pair of anterior hamuli and 1 pair of posterior hamuli in linear series and 14 marginal hooklets. Accessory sclerites stout, scoop-shaped with pointed tips directed anteriorly, 130–180 long; anterior hamuli long, slender, posterior terminus recurved forming hook with anteriorly directed point, 200–300 long; posterior hamuli short, with recurved posterior terminus forming sharp hook, 90–101 long. Marginal hooklets arranged radially 6–8 long. Pharynx glandular, 5-lobed, 258–260 long, 330–340 wide; esophagus not observed. Intestinal crura dendritic medially and laterally, not confluent posteriorly. Nervous system with crescent-shaped ganglionic mass anterior to pharynx. Four eyes embedded in ganglionic mass. Two testes side by side, equatorial, smooth, ellipsoidal, fenestrated (pierced by bands of muscle fibers that extend throughout the organ in a dorsoventral direction as described for *N. melleni* by Jahn and Kuhn [1932]), 260–450 long, 260–300 wide. Vasa efferentia anastomosing to form sinuous vas deferens. Male copulatory complex 550–572 long, 100–110 wide, obliquely situated posterior to pharynx, consisting of a penis and a large pear-shaped muscular sac containing a seminal vesicle and an accessory reservoir. Penis 200–264 long, 13–20 wide; accessory reservoir a pyriform sac 220–264 long, 35–70 wide; seminal vesicle a pyriform sac 210–220 long, 48–52 wide posterior to accessory reservoir. Accessory gland cells in 2 nearly symmetrical groups posterior to muscular sac, ducts opening into opposite ends of accessory reservoir. Glands of Goto



FIGURES 1–5. *Neobenedenia pargueraensis* sp. n. **1.** Ventral view of holotype. **2.** Accessory sclerite. **3.** Anterior hamulus. **4.** Posterior hamulus. **5.** Marginal hooklet.

absent. Common genital opening ventral, submarginal, on left near anterior level of pharynx. Ovary pretesticular, oval, fenestrated (penetrated by muscle bundles as in the testes) 136–143 long, 189–279 wide, containing an expanded ventral chamber; oviduct passes out of ventro-anterior part of ovary and proceeds anteriorly to ootype. Ootype surrounded by numerous Mehlis' gland cells; uterus short, leading to common genital opening. Vitellarium occupying almost entire available space of body proper, vitelline ducts uniting medially to form a transverse vitelline reservoir just anterior to ovary. Egg (only 1 observed) polyhedral, 66 long, 64 wide with long filament at 1 angle.

Taxonomic summary

Type host: Red hind, *Epinephelus guttatus* (Linnaeus).

Type locality: La Parguera, Puerto Rico, 67°02′45″W, 17°58′30″N.

Site: Gills.

Etymology: Named for the type locality.

Type specimens: United States National Museum, Helminthological Collection, holotype no. 82120, paratype no. 82121.

Remarks

In a study of North American capsalids of the genus *Benedenia*, Price (1939) stated that *B. melleni, B. adenea, B. isabellae,* and *B. muelleri* (Meserve, 1938) Price, 1939, differ from other species of *Benedenia* in lacking a vagina and in possessing similar haptoral hooks and that these 2 characters taken together may ultimately be found adequate for the establishment of a separate genus to contain them. Yamaguti (1963) concurred and remarked that additional criteria such as the nearly symmetrical arrangement of prostatic cells and the presence of the prostatic reservoir in the cirrus pouch warranted establishment of a new genus called *Neobenedenia* for those species of *Benedenia* possessing this combination of unique characters. Yet, Yamaguti (1968) later described many species of several genera of benedeniines with the prostatic reservoir either enclosed or outside the cirrus pouch. Thus this character probably is not important in generic diagnosis (Byrnes, 1986).

Neobenedenia comprises 10 described species parasitic on marine teleosts, namely, *N. melleni* on *Spheroides annulatus* (Jenyns), *Chaetodipterus faber* (Broussonet), *Holacanthus isabelita* (Jordan and Rutter), and *Pomacanthus arcuatus* (Linnaeus) from the New York Aquarium; *N. adenea* on *Mycteropera* sp. from Socorro Island, Mexico (Pacific); *N. girellae* on *Girella nigricans* (Ayres) from California; *N. isabellae* on an undetermined spotted grouperlike fish from Isabel Island, Mexico; *N. muelleri* (Meserve, 1938) Yamaguti, 1963, on *Cratinus agassizii* Steindachner from the Galapagos Islands; *N. pacifica* Bravo-Hollis, 1971, on *Mugil cephalus* Linnaeus from La Paz, Baja California, Mexico; *N. longiprostata* on an unidentified serranid, possibly *Epinephelus analogus* Gill from Rasa Island, Gulf of California, Mexico; *N. vermiculariacola* Gupta and Khanna, 1975, on *Siganus vermicularis* (Valenciennes) from Port-Blair (Andaman and Nicobar islands, India); *N. manilae* on *Platax obicularis* (Forskäl) from Manila Bay, Luzon Island, and *N. pargueraensis* n. sp. on *E. guttatus* from Puerto Rico.

The possession of scoop-shaped accessory sclerites with pointed tips differentiates the new species from other species of *Neobenedenia. Neobenedenia pargueraensis* is closely allied to *N. melleni* and *N. longiprostata.* It is similar to *N. melleni* in possessing fenestrated testes and in the absence of glands of Goto but differs in that the margins of the testis are smooth rather than lobed and in possessing a fenestrated ovary. It is similar to *N. longiprostata* in having fenestrated testes and ovary but differs in that the margins of the testes are smooth and the ducts of the prostate glands do not reach the posterior end of the body proper.

Of the 22 red hinds examined from 1974 to 1985, only 2 were infected with *N. pargueraensis.* Other ectoparasites collected on red hinds in La Parguera include *Haliotrema* sp. (Monogenea), *Trachelobdella lubrica* (Grube, 1840) (Hirudinea), *Hatschekia insolita* Wilson, 1913, *Pseudolernanthropus angulatus* (Kroyer, 1863), and *Sagum flagellatum* Wilson, 1913 (copepods), *Anilocra haemuli* Williams and Williams, 1981, and *Excorallana* sp. (isopods).

Neobenedenia melleni originally was described from tropical fishes from Florida held in the New York Aquarium and was thought (MacCallum, 1927) to have

been introduced from the Pacific Ocean on the bullseye puffer, *S. annulatus*. The Nigrelli (1947) report of this worm on wild marine fishes in Bimini, and our Caribbean Aquatic Animal Health Project case records from aquarium and aquaculture fishes from Bermuda, the Bahamas, Jamaica and Puerto Rico, suggest that this species must have been brought into the New York Aquarium from the Florida fishes. It seems to occur throughout the tropical and subtropical areas of the western North Atlantic.

It has been studied extensively because of the damage that it does to aquarium fishes: life cycle and control of infestations (Nigrelli, 1932, 1935a), susceptibility and immunity of hosts (Breder, 1933; Nigrelli, 1935b, 1935c, 1937, 1947; Nigrelli and Breder, 1934), and redescription, more detailed life history with morphology of all stages, and susceptibility of aquarium fishes (Jahn and Kuhn, 1932). More recently *N. melleni* has been found to cause severe problems in blue tilapia, *Tilapia aurea* (Steindachner); red tilapia, *Tilapia* sp.; and Florida red tilapia, *Tilapia* sp. cultured in sea water in the Bahamas, Jamaica and Puerto Rico (Robinson et al., 1989; Mueller et al., 1992). Tilapia held in sea water reach a level of infestation of 300 or more worms (up to 2,000/host in aquarium fishes) in a few weeks and die. *Neobenedenia melleni* seems to attack a wide variety of captive and aquarium fishes. It often damages the eyes of hosts and may encourage bacterial infection. The introduced tilapia seem to have little or no resistance to this species. Formalin, potassium permanganate, trichlorfon, movement of cages to deeper water, and fresh and brackish water have been used in attempts to control this parasite. Cage movement and brackish water (18‰/72 hr) in ponds seemed to be the most practical control methods (Breder, 1933; Nigrelli, 1935a, 1935b, 1935c; Robinson et al., 1989; Mueller et al., 1992; W. O. Watanabe, S. J. Smith, and R. I. Wicklund, Caribbean Marine Science Center, pers. comm.). It remains a serious obstacle to the culture of red tilapia in sea water in the Caribbean.

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