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in the Eastern Pacific (Galápagos and Costa Rica)**

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NEW RECORDS OF FISH-PARASITIC ISOPODS (CYMOTHOIDAE) IN THE EASTERN PACIFIC (GALÁPAGOS AND COSTA RICA)

By: Ernest H. Williams, Jr. and Lucy Bunkley-Williams

Brusca (1981) published a monograph of the fish-parasitic isopods (Cymothoidae) of eastern Pacific fishes. We have observed and collected additional samples of cymothoid isopods from this region. *Anilocra meridionalis* Richardson is tentatively synonymized with *Anilocra gigantea* (Herklots), and the latter species is reported in the eastern Pacific for the first time. Three new host records and two new family records for *Nerocila californica* Schioedte and Meinert from the Galápagos Islands, and two new host records for *Cymothoa exigua* Schioedte and Meinert from Costa Rica are noted.

Fish hosts and their associated isopods in the Galápagos Islands were observed underwater; those in Costa Rica were collected with fish traps. Isopod specimens were preserved in 70% ethanol individually in vials for each host specimen. All isopod specimens collected were deposited in the U.S. National Parasite Collection (USNPC), Beltsville, Maryland, USA.

ANILOCRA GIGANTEA (HERKLOTS, 1870)

This isopod is one of the largest, if not the largest, cymothoid isopod with females reaching 10 cm in length. Little is known about the biology of this parasite that infects deep slope snappers and groupers. It has been found on the Ruby Snapper, *Etelis carbunculus* Cuvier in New Caledonia (Trilles 1972); the Golden Eye Jobfish, *Pristipomoides flavipinnis* Shinohara; and on an unidentified grouper, *Epinephalus* sp. (Bruce and Harrison-Nelson 1988) in Fiji in the southwestern Pacific. We previously found it on *E. carbunculus* in Hawaii in the northern Pacific, which extended the known range approximately 5000 km (Bunkley-Williams and Williams 1996, 1998).

Anilocra meridionalis was described in Galápagos waters from a single, distorted, immature female specimen in the process of molting (Richardson 1914). Two additional juvenile specimens caught in a mid-water trawl of unknown depth between the Hawaiian and Clipperton Islands were identified as *A. meridionalis* by Brusca (1981). Species of *Anilocra* are difficult to identify using distorted immature females and impossible using juveniles, but *A. meridionalis* appears to be the same as *A. gigantea*, and hence should be synonymized. This identification would extend the known range of *A. gigantea* from Hawaii halfway to the Clipperton Islands (approximately 2400 km) and then to the Galápagos Islands (approximately 7700 km total). This isopod is apparently a pan-Pacific species parasitizing deep-sea snappers and groupers.

NEROCILA CALIFORNICA SCHIOEDTE AND MEINERT, 1881

This isopod is found from off Los Angeles in southern California south to Peru, and in the Las Tres Marias, Galápagos, and Hawaiian Islands. It parasitizes a wide variety of fish hosts in two classes, 10 orders, 20 families, and 39 species in the eastern Pacific. This parasite tolerates a broad range of salinities and habitats from offshore oceanic to coastal fresh waters (Williams and Bunkley-Williams 1999). It has been reported from a few offshore pelagic species, but more commonly infects shallow water, near-shore species. It attaches on the external body surface and fins of fishes. Females are 14.0-25.0 mm long and 7.0-13.0 mm in maximum width; males are 10.0-20.0 and 3.0-10.0 mm (Brusca 1978, 1981).

We found *N. californica* on three new host species representing two new host families in the Galápagos Islands (Table 1). A female was attached to the caudal fin of an approximately 46 cm total length (TL) Ballonfish, *Diodon holocanthus* Linnaeus, at 4 m depth. In a group of four 10-13 cm TL adult White-tail Damsel fish, *Stegastes leucurus* (Gilbert) Pomacentridae, a new host family for this species, at 2.5-3.0 m depth, each specimen had one female *N. californica* attached to its fins (upper caudal fin lobe of two fish, and pectoral fin of two fish). Scale and tissue erosion occurred around all of the isopods, and the caudal fin of one fish was eroded and split. Algal growth was present on the telson (posterior shield) and pleon (abdomen) of one isopod. In another group of four *S. leucurus* 11-13 cm LT, at 3 m depth, each had one female isopod on the upper caudal fin. An Azure Parrotfish, *Scarus compressus* (Osburn and Nichols) Scaridae, a new host family for this species, approximately 46 cm in TL, and at approximately 5.5 m depth, had a female *N. californica* on the left side of the dorsal fin approximately 4 cm from the fin insertion.

CYMOTHOA EXIGUA SCHIOEDTE AND MEINERT, 1884

This isopod is of interest because it is shipped all over the world in commercial catches of snappers from the eastern Pacific. It was the subject of a lawsuit in Puerto Rico brought against a leading supermarket chain. The customer in the lawsuit claimed to have been poisoned by eating an isopod cooked inside a fish. Isopods are not known to be poisonous to humans, and some isopods are routinely consumed as human food. Thus, testimony was given stating that the isopod could not have been the

source of the illness. This parasite has a Panamic distribution extending from the Gulf of California south to just north of the Gulf of Guayaquil, Ecuador. Contrary to statements by Brusca (1981), Williams and Williams (1978) refuted Comeaux's (1942) record of this isopod from Louisiana. It has been collected from waters 2 m to almost 60 m in depth. This isopod is known to parasitize eight species in two orders and four families of fishes [7 species of Perciformes, 3 snappers (Lutjanidae), 1 grunt (Haemulidae), 3 drums (Sciaenidae), and 1 Antheriniformes grunion (Atherinidae)]. The female occurs on the tongue and the male on the gill arches beneath and behind the female. Females are 8.0-29.0 mm long and 4.0-14.0 mm in maximum width; males are 7.5-15.0 and 3.0-7.0 mm (Brusca 1981).

Females of this isopod occurred in the mouths of three species of snappers Perciformes: Lutjanidae (Table 1). A 23 cm TL Colorado Snapper, *Lutjanus colorado* Jordan and Gilbert, and a 24 cm TL Jordan's Snapper, *L. jordani* (Gilbert), both from Costa Rican Pacific waters, are new hosts for this isopod. Five 22-25 cm TL Pacific Red Snapper, *L. peru* Nichols and Murphy, have previously been noted as hosts for this isopod. We have been unable to determine the identity of "*Lutjanus maculatus*" listed as a host for this isopod by Brusca (1981) and Brusca and Iverson (1985). "*Lutjanus maculatus*" was listed in Froese and Pauly (2001) as a junior synonym of the Saddle Grunt, *Pomadasy maculatus* (Bloch 1793), which does not occur in the eastern Pacific. Brusca (pers. comm.) could provide no additional details to help correctly identify this host species. This species is not listed by Allen (1985), and the record could be for one of the new host species we list.

Information about these three isopod species is important because each infects and reduces the productivity of commercially important species of fishes. *Anilocra gigantea* was originally thought to have a rather limited distribution, but now appears to damage deep-slope snappers and groupers throughout the Pacific. *Nerocila californica* is controversial in the sense that Brusca (1981) synonymized it with the temperate Atlantic *N. acuminata* Schioedte and Meinert, 1881, while we chose, for various reasons, to consider them separate species (Bunkley-Williams and Williams 1999, Williams and Bunkley-Williams 1999). However, we consider *N. acuminata* to be a junior synonym of *N. lanceolata* (Say 1818). More information may be needed to resolve this question. *Cymothoa exigua* parasitizes a number of commercially important hosts, but the extent of the damage to the eastern Pacific snapper fishery, or even the exact species parasitized (e.g., "*L. maculatus*"), remains unknown.

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Table 1. Isopods from some marine fishes from the Galápagos and Costa Rica

Isopod Species	Location		Geographic	# Hosts/	Museum
Host Species	On Host	Date	Locality	# Parasites	Number
<i>Anilocra gigantea</i> (Herklots)					
no host recorded	unkown	—	off Galápagos Islands	-/1I	USNM 46400 ¹
no host recorded	unkown	—	between Clipperton & Hawaiian Islands	-/2J	AHF ²
<i>Nerocila californica</i> Schioedte and Meinert					
<i>Diodon holocanthus</i> ³	tail	7 May 1996	Gardner Bay, Hood Island, Galápagos	1/1F	—
<i>Stegastes leucurus</i> ^{3,4}	fins	11 May 1996	Puerto Egas, James Island, Galápagos	8/8F	—
<i>Scarus compressus</i> ^{3,4}	fin	11 May 1996	Puerto Egas, James Island, Galápagos	1/1F	—
<i>Cymothoa exigua</i> Schioedte and Meinert					
<i>Lutjanus colorado</i> ³	Mouth	16 Mar 1990	Pacific coast, Costa Rica	1/1F	USNPC 87849 ⁵
<i>Lutjanus jordani</i> ³	Mouth	17 Aug 1990	Pacific coast, Costa Rica	1/1F	USNPC 87850 ⁵
<i>Lutjanus peru</i>	Mouth	16 Mar 1990	Pacific coast, Costa Rica	3/3F	—
<i>Lutjanus peru</i>	Mouth	17 Aug 1990	Pacific coast, Costa Rica	2/2F	—

¹U.S. National Museum, ²Allan Hancock Foundation, University of Southern California, ³New Host Record,

⁴New Family Record, ⁵U.S. National Parasite Collection;

F = female, I = immature female, J = juvenile

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