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BOMFIM, CAROLINA N.C.; DE OLIVEIRA, RICARDO L.M.; DOS SANTOS, LEILANE  
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## ***Rocinela signata* (Isopoda: Aegidae) parasitizing the gills of the spotted goatfish *Pseudupeneus maculatus* (Actinopterygii: Mullidae) in Northeastern Brazil**

LUCAS CARDOSO<sup>1</sup>, MAURÍCIO L. MARTINS<sup>1</sup>, JÉSSICA E.S. DE AQUÍNO GOLZIO<sup>2</sup>, CAROLINA N.C. BOMFIM<sup>3</sup>, RICARDO L.M. DE OLIVEIRA<sup>3</sup>, LEILANE B.G. DOS SANTOS<sup>3</sup> and ANA CAROLINA F. LACERDA<sup>2</sup>

<sup>1</sup>Laboratório de Sanidade de Organismos Aquáticos/AQUOS, Departamento de Aquicultura, Universidade Federal de Santa Catarina/UFSC, Rodovia Admar Gonzaga, 1346, Itacorubi, 88040-900 Florianópolis, SC, Brazil

<sup>2</sup>Departamento de Sistemática e Ecologia, Universidade Federal da Paraíba/UFPB, Campus I, Cidade Universitária, s/n, 58051-900 João Pessoa, PB, Brazil

<sup>3</sup>Departamento de Engenharia de Pesca e Aquicultura, Centro de Ciências Agrárias Aplicadas, Universidade Federal de Sergipe /UFSE, Rua Marechal Rondon, s/n, Jardim Rosa Elze, 49100-000 São Cristóvão, SE, Brazil

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### ABSTRACT

Parasitic isopods of fishes usually show wide distribution and low host specificity. This study investigated the occurrence of gill parasites in 120 specimens of spotted goatfish *Pseudupeneus maculatus*, marine fish of great economic importance for fishery community. The fish were captured monthly in the Coast of Pernambuco State, Northeast Brazil, between October 2012 and September 2013. Eleven isopods were found and identified as *Rocinela signata*. We observed lower infections in the gills of *P. maculatus* (prevalence 8.3%, mean intensity  $1.6 \pm 0.3$  and mean abundance  $0.1 \pm 0.3$ ) when compared to other studies of different host fishes from geographically close locations. This parasite has been reported from a wide variety of fish species, not only in Brazil, but also in the eastern Atlantic and the Pacific oceans. This is the first report of *R. signata* in spotted goatfish.

**Key words:** coast of Pernambuco, crustacean, marine fish, parasitism.

### INTRODUCTION

Isopods are crustaceans that present a great variety of shapes and sizes, occurring in different habitats, from the bottom of the ocean to mountain regions (Wilson 2008); their marine representatives are important constituents of the invertebrate fauna of this ecosystem, especially considering their different roles in the marine foodchain (Riseman

and Brusca 2002). Among the isopods, members of the family Aegidae Dana, 1853 are known for its association to the body surface of fish and sponges (Porifera); comprising isopods with different modes of life, from free living organisms to obligatory parasites (Brusca 1983). Their species are widely distributed throughout the oceans, from tropical to polar waters, from shallow regions to great depths (Bruce 2001, 2009).

The family Aegidae comprises five genera and approximately 107 described species; the genus

Correspondence to: Ana Carolina Figueiredo Lacerda  
E-mail: [acflacerda@dse.ufpb.br](mailto:acflacerda@dse.ufpb.br)

*Rocinela* Leach, 1818 in this family is cosmopolitan and includes described 40 species (Brusca 1983). *Rocinela signata* (Schiodte and Meinert 1879) can be found either in the free-living form in the bottom of the ocean, or as a fish parasite. The species has a wide distribution on the West Atlantic Ocean, from Florida to Southern Brazil, and most of the records are from coastal regions (Brusca and France 1992). This species differs from its congeners by presenting the image of a pigmented and inverted “W” on its pleotelson, an important characteristic considered for its identification (Moreira 1977).

When parasitizing fish, *R. signata* is mostly found in the oral cavity, gills and tegument of several species, including some economically important hosts (Garzón-Ferreira 1990, Bunkley-Williams et al. 2006). Its attachment apparatus and feeding activity causes injuries to the fish and predisposes the hosts to secondary infections, and reducing its growth rate (Moreira 1977, Cavalcanti et al. 2012). In addition to the damages to the host fitness and health, the parasite affects the appearance of the fish and consequently their commercial value (Ravichandran et al. 2010).

Spotted goatfish known as “saramunete” in Northeastern Brazil *Pseudupeneus maculatus* (Bloch, 1793) (Mullidae) forages on the bottom, and is commonly found in coral reefs on the West Atlantic from the Bermudas through New Jersey, USA to Santa Catarina, South Brazil (Hostim-Silva et al. 2006). They are versatile predators that use their camouflage to capture small fishes and crustaceans on the substrates mixed by sand, gravel and stones (Krajewski et al. 2006, Sazima et al. 2006). *Pseudopeneus maculatus* is not considered to be threatened at present, being classified in the IUCN Category of Least Concern (Dooley et al. 2015). In Brazil, they are abundant in the Northeastern coast, mainly in the State of Pernambuco where they are commercially valued and have their exploitation destined to the internal

and external market (United States and Europe) (Santana et al. 2006, Lima et al. 2008).

*Pseudupeneus maculatus* is generally captured in the continental platforms in shallow waters, part of a coastal tropical system from which dozens of people depend (Campos and Oliveira 2001, Rocha et al. 1998). The stocks of *P. maculatus* have been impacted by the capture of immature specimens in hatchery areas, compromising the biological and fishery recruitment of the species (Lessa et al. 2004).

The aim of this study was to report for the first time the occurrence of *R. signata* on the gills of the spotted goatfish *P. maculatus* captured by artisanal fishermen in the Brazilian Northeast. The global and Brazilian distributions of the parasite are also discussed.

#### MATERIALS AND METHODS

A total of 120 fish with  $140.2 \pm 45.1$  g weight (47.5-262.1) and  $21.5 \pm 2.1$  cm total length (16-27) were collected by fishermen in three intervals of fishing of the Coast of Pernambuco State, Northeast Brazil for parasitological analysis: Site 1 ( $7^{\circ}37'28.43''S$   $34^{\circ}1'10.24''W$ ) - approximately 50 nautical miles (93 Km) from the municipality of Goiana; Site 2 ( $7^{\circ}50.34''S$   $34^{\circ}43'41.73''W$ ) – metropolitan region of Recife, always in the isobate of 45.7 m from the shore (15 to 20 m depth); Site 3 ( $8^{\circ}54'41.79''S$   $33^{\circ}57'23.45''W$ ) - approximately 70 nautical miles from the shore (130 Km) close to the municipality of São José da Coroa Grande.

Fish were individually identified and kept on ice in thermal boxes for biometry and posterior necropsy. The gonads were exposed and observed to determination of sex and the gills were collected and fixed in alcohol 70%, identified and shaken for parasite detachment according to Eiras et al. (2006) and Jerônimo et al. (2011).

The isopods found were analyzed under stereomicroscope and identified according

to Brusca and France (1992). Parasitological descriptors followed the recommendations of Bush et al. (1997).

#### RESULTS AND DISCUSSION

Among the 120 (64 males, 50 females and 6 indeterminate sex) specimens of *P. maculatus* that were examined (Figure 1), the gills of 10 were parasitized (6 on males, 4 on females and 1 on indeterminate sex) by at least one of the eleven individuals of *R. signata* (Figure 2), with prevalence 8.3%, mean intensity of infestation of  $1.1 \pm 0.3$  varying from 1 to 2 parasites per host and mean abundance of  $0.1 \pm 0.3$ . Measurements (mm) were based on seven specimens:  $11.0 \pm 3.6$  (4.0-13.0) long and  $3.0 \pm 1.2$  (1.5-4.0) wide.

The hosts reported for *R. signata* in Brazil are listed in Table I. In other countries, the parasite was reported from *Dasyatis americana* Hildebrand & Schroeder, 1928 and *Dasyatis guttata* (Bloch & Schneider, 1801) from Colombia (Williams Jr et al. 1994); in *D. guttata*, *Haemulon aurolineatum* Cuvier, 1830, *H. steindachneri* (Jordan & Gilbert, 1882), *Orthopristis ruber* (Cuvier, 1830) and *Heteropriacanthus cruentatus* (Lacépède, 1801) from Venezuela (Bunkley-Williams et al. 2006); in *Epinephelus itajara* (Lichtenstein, 1822) and *L. analis* from Tortugas; *L. analis* and *Mycteroperca venenosa* (Linnaeus, 1758) from the U.S. Virgin Islands; *Archosargus probatocephalus* (Walbaum,

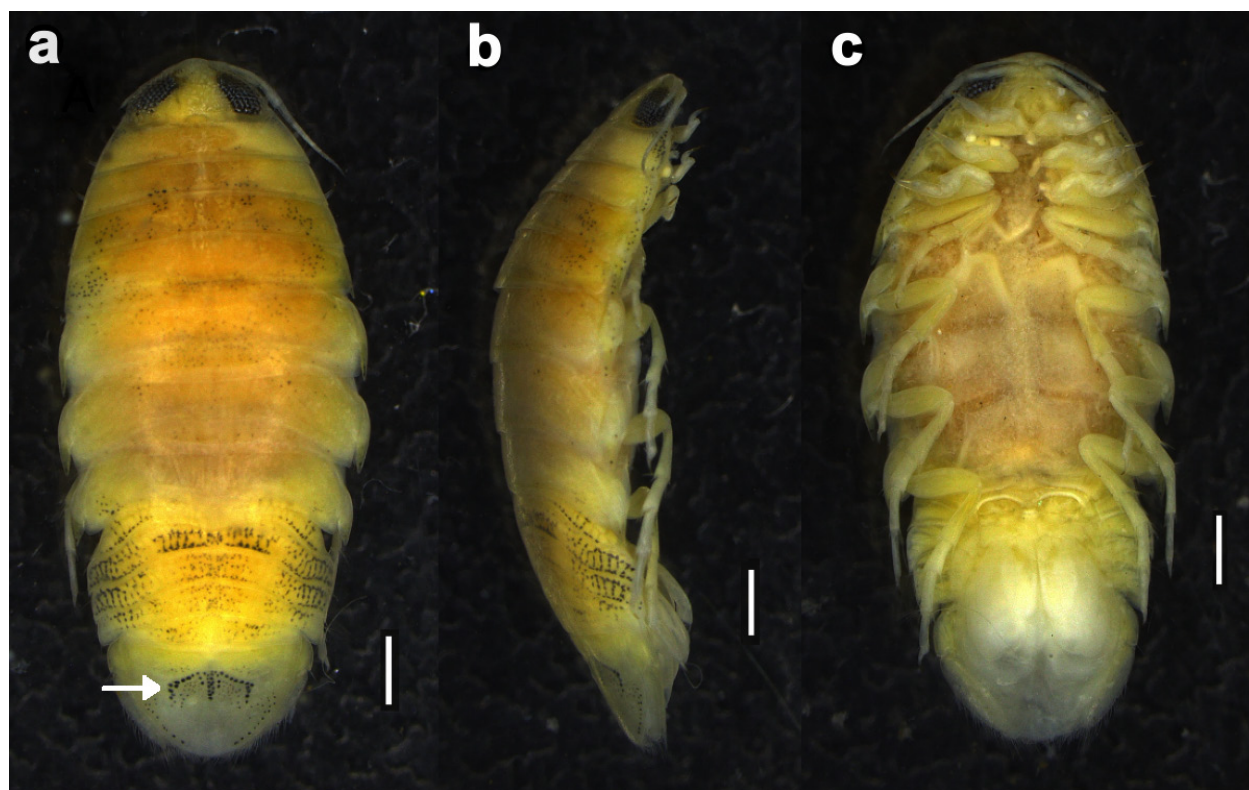
1792), *L. analis*, *Lutjanus buccanella* (Cuvier, 1828), *Balistes vetula* Linnaeus, 1758, *Calamus calamus* (Valenciennes, 1830) from Bahamas; *Haemulon flavolineatum* (Desmarest, 1823), *Lachnolaimus maximus* (Walbaum, 1792), *Sparisoma viride* (Bonnaterre, 1788) from Jamaica; *Galeocerdo cuvieri* (Péron & Lesueur, 1822) from Mexico; *Dasyatis americana*, *Ginglymostoma cirratum* (Bonnaterre, 1788) from Puerto Rico, *Calamus bajonado* (Bloch & Schneider, 1801), *Calamus penna* (Valenciennes, 1830), *Bothus lunatus* (Linnaeus, 1758), *B. vetula*, *Caranx* sp., *Sphyrnaena barracuda* (Edwards, 1771), *L. maximus*, *L. analis* from Belize; *O. ruber*, *H. steindachneri* from Venezuela; *C. penna* from Surinam and in *Epinephelus morio* (Valenciennes, 1828), *Lutjanus blackfordi* [= *Lutjanus campechanus* (Poey, 1960)], *Mycteroperca bonaci* (Poey, 1860) and *Raja eglanteria* Bosc, 1800 from the Gulf of Mexico (Kensley and Schotte 1989). These copepods were also found in the gills of *Haemulon sciurus* (Shaw, 1803) from Carrie Bow Cay, Belize (Williams Jr et al. 2009).

Regarding the levels of infestation, the present study found similar prevalence and intensities to those reported previously. The prevalence of the parasite found in this study was slightly higher than that reported by Luque et al. (2002), Cavalcanti et al. (2013), Hermida et al. (2014) and Carvalho-Souza et al. (2009) (Table I).



Figure 1 - The host *Pseudupeneus maculatus*, from the Coast of Pernambuco State, Northeast Brazil. Scale bar: 3 cm.





**Figure 2** - *Rocinela signata* from the gills of *Pseudupeneus maculatus*, Northeastern Brazil. **a** - dorsal view; **b** - lateral view; **c** - ventral view. The arrow indicates the pigmented inverted W on the pleotelson. Scale bar: 1 mm.

**TABLE I**

**Hosts, Locality, Prevalence (P), mean intensity (MI), and references of the records of *Rocinela signata* parasitizing fish in Brazil.**

Host	Locality (State)	P(%)	MI	Reference
<i>Archosargus rhomboidalis</i> (Linnaeus, 1758) (Sparidae)	Rio Grande do Norte	18.2	-	Lima et al. 2011
<i>Caranx crysos</i> (Mitchill, 1815) (Carangidae)	Bahia	5.8	2	Carvalho-Souza et al. 2009
<i>Chloroscombrus chrysurus</i> (Linnaeus, 1766) (Carangidae)	Rio Grande do Norte	4	-	Lima et al. 2011
<i>Cynoscion leiarchus</i> (Cuvier, 1830) (Sciaenidae)	São Paulo	-	-	Moreira 1972
<i>Lutjanus analis</i> (Cuvier, 1828) (Lutjanidae)	Alagoas	3.3	1	Hermida et al. 2014
<i>Lutjanus synagris</i> (Linnaeus, 1758) (Lutjanidae)	Rio Grande do Norte	4	1.2	Cavalcanti et al. 2013
<i>Mullus argentinae</i> Hubbs & Marini, 1933 (Mullidae)	Rio de Janeiro	3	1	Luque et al. 2002
<i>Oligoplites saliens</i> (Bloch, 1793) (Carangidae)	Bahia	4.6	1	Carvalho-Souza et al. 2009
<i>Pseudupeneus maculatus</i> (Bloch, 1793) (Mullidae)	Pernambuco	8.3	1.1	Present study
<i>Scomberomorus brasiliensis</i> Collette, Russo & Zavala-Camin, 1978 (Scombridae)	Rio Grande do Norte	44.4	-	Lima et al. 2005
<i>Sparisoma frondosum</i> (Agassiz, 1831) (Scaridae)	Rio Grande do Norte	37.5	2.9	Cavalcanti et al. 2012
<i>Trichiurus lepturus</i> Linnaeus, 1758 (Trichiuridae)	Bahia	8.3	1	Carvalho-Souza et al. 2009

Lima et al. (2005) reported higher prevalence (44.44%) of *R. signata* in *S. brasiliensis* from the Rio Grande do Norte, region close to Pernambuco, the same region where the present study was performed. Similarly to Lima et al. (2005), 37.5% prevalence was found by Cavalcanti et al. (2012) in *S. frondosum* from Rio Grande do Norte with mean intensity 2.58 and abundance 0.97 in male and female fish in both rainy and dry seasons. Apart from the highest prevalence of *R. signata* observed in *H. steindachneri* (20%), Bunkley-Williams et al. (2006) have reported the lowest ones in *H. aurolineatum* (0.45%), *O. ruber* (0.49%) and in *H. cruentatus* (0.22%).

Although the parasite can be found parasitizing several fish species, its preference for some species must not to be dismissed. Isopods of the family Aegidae are temporary or facultative parasites with low host specificity (Brusca 1983). They feed on blood and are generally found associated with the gill chamber of marine fish of economic importance (Hermida et al. 2014, Bunkley-Williams et al. 2006). In aquaculture, for example, fish parasitized by these isopods exhibit respiratory problems, low growth rate and are more susceptible to secondary infections due to opened wounds (Bunkley-Williams and Williams Jr 1998). However, the effects of these isopods on the host health and survival (e.g., increased predation) in the nature remains unknown, and it might be strongly associated to their modes of attachment and injury caused to the host tissue.

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