First record of *Amphipolycotyle chloroscombrus* Hargis, 1957 (Monogenea, Polyopisthocotylea, Gastrocotylidae) in the South Atlantic Ocean

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Monogeneans are a group of largely ectoparasitic members of the phylum Platyhelminthes. These worms are considered to be among the most host-specific parasites in fish, commonly found on fins, body skin, gills, gill chambers, buccal cavity, cornea and nostrils of their host (BUCHMANN et al., 2004). However, the monogenean Polyopisthocotylea are generally found attached to the gill filaments of their hosts in all the seas of the world, occurring from littoral zones to open oceanic waters, from the poles to the tropics, and from surface waters to the depths of the sea (ROHDE, 2005). They have high host specificity, containing the greatest number of species in the group of marine parasites (LAMBERT, 1990; WILLIAMS JÚNIOR; BUNKLEY-WILLIAMS, 1996; BUSH et al., 2001; ROHDE, 2005).

Chloroscombrus chrysurus (LINNAEUS, 1766) (Osteichthyes: Carangidae), commonly known as the Atlantic bumper, has a wide distribution range in the tropical coastal region where it can reach 30 cm in total length. In the Western Atlantic there are records of this species from Massachusetts, USA, to Northern Argentina (MENEZES; FIGUEIREDO, 1980). The distribution of juveniles and adults occurs from coastal waters to depths of 200 m, with schoolings inhabiting mostly shallow waters (both marine and estuarine areas) and mangrove-lined lagoons (WEISS et al., 1976; CARPENTER, 2002). The occurrence of ectoparasites on *C. chrysurus* from the Brazilian coast line has been reported by CARVALHO-SOUZA et al. (2009); COSTA et al. (2010); COSTA and CHELLAPPA (2010) and LIMA et al. (2013).

This study reports on the occurrence of the parasite *Amphipolycotyle chloroscombrus* on the host *Chloroscombrus chrysurus* (LINNAEUS, 1766) (Osteichthyes, Carangidae) captured in the coastal waters of Rio Grande do Norte, Brazil, and is the first recorded finding in the South Atlantic Ocean.

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Samples of Atlantic bumper, *C. chrysurus*, were netted in the coastal waters of Rio Grande do Norte, northeastern region of Brazil (Figure 1). The fish were captured on a monthly basis, with the help of local fishermen using a beach seine, from January to December 2006 (COSTA et al., 2010; COSTA; CHELLAPA, 2010). After capture, the branchial filaments of each fish were examined for gill parasites. The parasites found were carefully removed and fixed in 5% formaldehyde solution following the methodology proposed by EIRAS et al. (2006). The parasites were identified following HARGIS (1957). The identification was made based on the main characteristics of the species which distinguish it from all other genera belonging to the family Gastrocotylidae, such as (1) the general body shape with the opisthaptor as two unequal, posterior, lateral flanges; (2) different types of clamps in two opposite clamp rows one row being open and sessile, the other closed and pedunculated, and (3) the nature of the cirrus armament. The parasitological indices (prevalence, intensity and abundance) were calculated following BUSH et al. (1997). Chi-square test (χ^2), at the significance level of 0.05, was applied to compare the number of males and females of *C. chrysurus*, as well as the parasitological indices between males and females of the host.

During the study period a total of 203 specimens of *C. chrysurus* were captured. Of this total, 136 were males and 67 females ($\chi^2 = 23.45$, $p < 0.05$). The size and weight of males and females ranged from 8.1 to 26 cm (14.8 ± 3.03) TL and 5.8 to 134.8 g (31.6 ± 18.0) in weight, respectively. A total of 46 parasites were collected from the gill filaments. A specimen of *C. chrysurus* and *A. chloroscombrus* are shown in Figure 2. Of the total number of fish sampled, 32 were infected by *A. chloroscombrus* (15.8%). A mean intensity of 1.44 parasites per host and abundance of 0.23 parasites per fish sampled were registered. The parasitological indices did not differ significantly between males and females of *C. chrysurus* (Table 1).

Figure 1. Sampling area: Rio Grande do Norte State, Brazil.

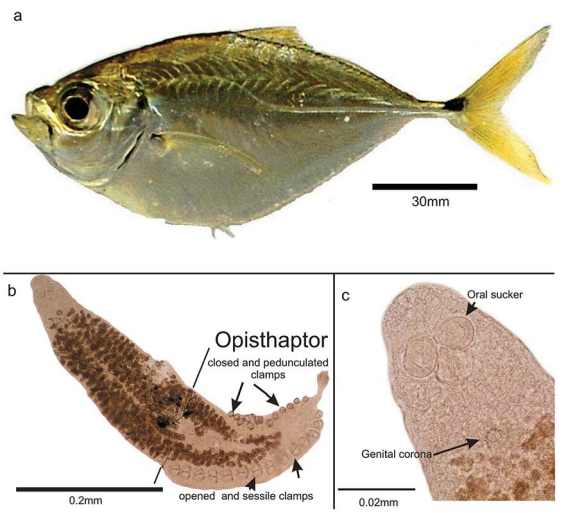

Figure 2. Specimen of *Chloroscombrus chrysurus* (a) and the ventral view of the gill parasite *Amphipolycotyle chloroscombrus* (bc).

The present study reports, for the first time, the occurrence of *A. chloroscombrus* on *C. chrysurus* in the South Atlantic Ocean, Brazil. So far, the occurrence of this parasite has been registered in the North Atlantic Ocean on the gill filaments of the host *C. chrysurus* (BRAVO-HOLLIS, 1984) and *C. orqueta* (LAMOTHE-ARGUMEDO et al., 1997) in Mexican waters. The monogenea Polyopisthocotylea, such as *A. chloroscombrus*, has high host specificity and its distribution tends to correspond closely to the distribution and migratory ability of their hosts (ROHDE, 2005).

Levels of infestation by monogenean gill parasites (Polyopisthocotylea), ranging from 8.7% to 81%, have been reported for fishes inhabiting marine and estuarine ecosystems (Table 2). According to ROHDE (2005), large hosts represent potential habitats with greater resources for parasites than smaller ones, thus being able to support high rates of infestation. Moreover, environmental factors such as temperature and salinity which influence the reproduction of the monogeneans also affect their abundance and occurrence in some areas during the year (ERNST et al., 2005; LUO; YANG, 2010; KHIDR et al., 2012). Therefore, the low prevalence of *A. chloroscombrus* on *C. chrysurus* must be attributed to the reproductive cycle of the parasite and/or the influences of environmental factors, as has also been reported by MUÑOZ and RANDAHAWA (2011) and ÖZER and KIRCA (2013) (Table 2).

In some cases, the differences between the numbers of male and female fish parasitized can be related to the comparative physiological conditions of the sexes of hosts. Accordingly, ROHDE (1984) reported that sometimes one of the host sexes is more vulnerable than the other. Although the male specimens predominated in the sampled population of *C. chrysurus*, the infection caused by *A. chloroscombrus* was similar in both sexes, corroborating the results published by LUQUE et al. (1996) and AZEVEDO et al. (2007), who found no relationship between the prevalence of metazoan parasites, including monogenea, and their hosts.

Table 1. Parasitological indices of the gill parasite *Amphipolycotyle chloroscombrus*, mean (± standard deviation), minimum and maximum values of the total length and weight of the hosts *Chloroscombrus chrysurus*. The results of the chi-squared test (χ^2) applied to compare the parasitological sex ratio are also given.

	Both sexes	Males	Females	χ^2	*p*-value
Prevalence (%)	15.8	9.9	5.9	1.01	0.31
Intensity*	1.44	1.00	2.17	0.43	0.51
Abundance**	0.23	0.10	0.13	0.00	0.95
Total length (cm)	14.5 ± 3.1	14.0 ± 3.3	15.4 ± 2.5		
Total weight (g)	32.7 ± 16.8	30.0 ± 17.3	37.3 ± 15.4		

* Number of parasites per host. ** Number of parasites per fish sampled.

Table 2. Prevalence of monogenean parasites (Polyopisthocotylea) in the gills of fishes sampled in different ecosystems

Region	Host	Parasite	Prevalence (%)	Authors
Coastal waters of Peru	*Cheilodactylus variegatus* (Cheilodactylidae)	*Microcotyle nemadactylus*	75%	Oliva and Luque (1998)
Coastal waters of Rio de Janeiro State	*Peprilus paru* (Stromateidae)	*Microcotyle sp.*	81%	Azevedo et al. (2007)
Segara Anakaran Lagoon, Indonesia	*Eleutheronema tetradactylum* (Polynemidae)	*M. polinemi*	67%	Rueckert et al. (2009)
Rocky shores of El Tabo, Chile	*Scartichthys viridis* (Blenniidae)	*Mcrocotyle sp.*	18.4%	Muñoz and Randhawa (2011)
Kizilirmak Delta in Samsun, Turkey	*Liza aurata* (Mugilidae)	*M. mugilis*	8.7%	Özer and Kirca (2013)
Coastal waters of Rio Grande do Norte	*Chloroscombrus chrysurus* (Carangidae)	*Amphipolycotyle chloroscombrus*	15.8%	Present study

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