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First record of *Corynosoma australe* (Acanthocephala, Polymorphidae) parasitizing seahorse, *Hippocampus* sp. (Pisces, Syngnathidae) in Patagonia (Argentina)

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Abstract
The present study is the first record of acanthocephalan parasites in fish of the genus *Hippocampus* and of the order Syngnathiformes. It also provides the first reference to *Corynosoma australe* in fish from San Matías Gulf, Argentina. Parasites analyzed in the present study were morphologically similar to previous records in other marine fishes from Argentine Sea, however, they were comparatively more irregular in their dimensions with respect to previous records. Taking account information about seasonal presence, prevalence and mean intensity observed for *C. australe* in this study, it could be claimed that Patagonian seahorse plays an accidental role as paratenic host to this helminth. Potential paths of infection and dispersion of this parasite in the ecosystem of San Antonio Bay are discussed regarding the trophic relationships among crustaceans, fishes and marine mammals.

Key words
Acanthocephala, *Corynosoma australe*, fish, *Hippocampus* sp., San Matías Gulf, Argentina

Introduction

The existing literature on *Corynosma australe* indicates that this parasite is typically found in temperate as well as in subantarctic waters of the South Hemisphere, and that its adult specimens sexually mature in several otarid species (Zdzitowiecki 1984, 1989). Its juvenile stages have been found encapsulated in the body cavity of several teleost species and they have been recorded in the Argentine Sea in *Micropogonias furnieri* (Zdzitowiecki 1989, Sardella *et al*. 1995), in *Engraulis anchoita* (Timi 1999), in *Porichthys porosissimus* (Tanzola *et al*. 1997), in *Scomber japonicus* (Cremonte and Sardella 1997), in *Sympterygia bonapartei* (Tanzola *et al*. 1998), and in *Conger orbignianus* (Tanzola and Guagliardo 2000). Pereira and Matos Neves (1993) described samples of juveniles parasitizing the white croaker *M. furnieri* in the littoral zone of Rio Grande do Sul, Brazil.

No records of Acanthocephala in fish of the order Syngnathiformes have been reported to date. The parasitological records corresponding to these teleostean fish include microsporidian parasites in *Hippocampus erectus* in Florida, USA (Blasiola 1979), myxosporidian parasites (*Ceratomyxa hippocampi* Cunha et Fonseca, 1918) in *H. punctulatus* (Gioia and Cordeiro 1996), and one unidentified nematode in both above-mentioned hosts and geographical region (Vincent and Clifton-Hadley 1989).

Throughout a biological study conducted on a population of the seahorse *Hippocampus* sp. in San Matías Gulf, Patagonia, Republic of Argentina, we found fishes parasitized by cystacanths of *Corynosoma australe* Johnston, 1937. The purpose of the present study is to describe as well as to compare *C. australe* found on seahorses from Patagonia with previous records in other fish. The intensity of infection of this parasite in Patagonian seahorse from San Antonio Bay is analyzed and the possible relations between this helminth and its potential hosts in the area of study are also discussed.

Materials and methods

The material for this study was collected in San Antonio Bay (40°47′S 64°54′W), an estuary system located in the inner part of San Matías Gulf (Argentina). The fish all along the 1 m band-width and 50–70 m long transects were collected on a monthly basis through autonomous diving at a depth ranging between 3 and 6 m. Once killed, the fish were dissected and

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the body cavity, the stomach, and the intestine were examined in detail under binocular stereomicroscope in search of parasites. The worms found were fixed in cold 4% formaldehyde solution, conserved in alcohol (70%), and made transparent for their morphometrical study in Hoyer's medium as well as in polyvinylic alcohol-lactophenol (L-PVA). Drawings were made with the aid of a drawing tube and measurements were performed using a micrometrical ocular lens.

Results

Thirteen samplings were carried out between October 2001 and January 2003 (42 transects) and 88 seahorses (47 females and 41 males) were collected. The size (total length) of the fishes analyzed in the present study ranged from 21 to 151 mm. Cystacanths of *C. australe* were found in 6 of the samples analyzed (Table I), exclusively in the samplings carried out during summer (December and January). Prevalence reached 6.81% and average intensity was 2 (DE = 1.26). Samples of cystacanths (three specimens) were deposited in the Helminthological Collection of the Museo de La Plata, Argentina (serial number 5422).

Description of cystacanth male: Pyriform body, dilated in its anterior region with a cylindrical proboscis (Fig. 1). The proboscis receptacle is double. The proboscis hooks are arranged in 18 longitudinal rows, each of which is composed of 13–14 hooks. From the superior end to the base of the proboscis, 10 hooks are large and each row contains 3 to 4 smaller basal hooks (Fig. 2). The neck is trapezoid and has no

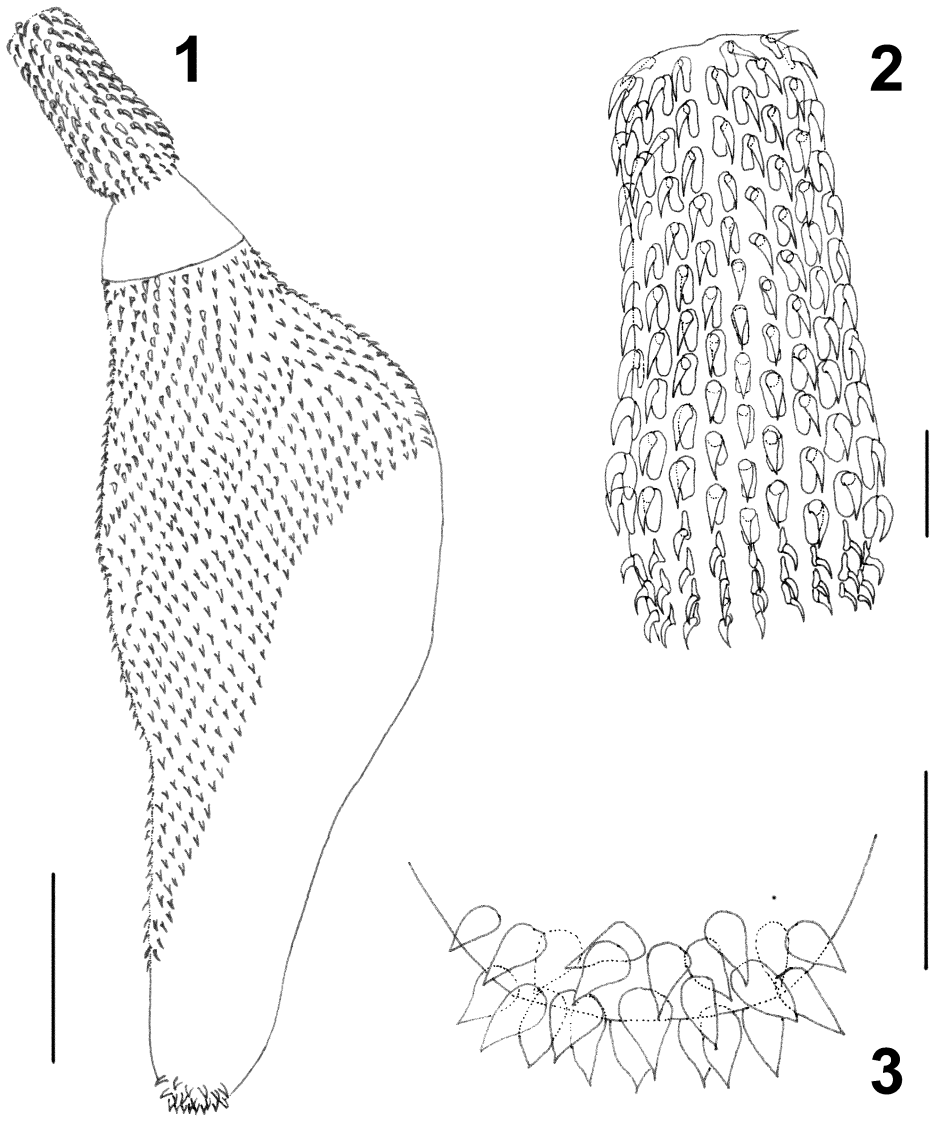

Fig. 1. Cystacanth of *Corynosoma australe* found in *Hippocampus* sp. Male, general view. Scale bar = 0.5 mm. **Fig. 2.** Details of the proboscis and rows of hooks. Scale bar = 0.1 mm. **Fig. 3.** Details of the tail and genital spines. Scale bar = 0.01 mm

Table I. Data regarding parasitized fish, quantity and location of *C. australe* in the host

Date	Total length (in mm)	Total weight (in g)	Sex	Number of parasites	Site of infection
26/12/2001	135.3	9.2	M	1	digestive tract
	89.9	3.0	F	1	digestive tract
16/12/2002	94.6	3.1	F	4	body cavity
	137.6	8.5	M	3	body cavity
	120.9	6.4	M	2	body cavity
28/01/2003	116.3	4.6	M	1	digestive tract

spines. The lemnisci are flattened, approximately 40% of the length of the proboscis receptacle. It is difficult to identify them in the cleared material. The trunk is covered by spines, dorsally in the anterior area of the bulb and ventrally towards the posterior end, without reaching the genital spines. It has 23 genital spines (Fig. 3).

Measurements (in mm): Length of the body 2.38, maximal width 0.87; length of the proboscis 0.55, maximal width 0.23; length/width ratio 3.39; length of the proboscis receptacle 0.77; length of the trunk 0.21, basal width 0.35, width of the posterior trunk 0.42; distance between the ventral, posterior, somatic spines and the distal end 0.34; distance between the posterior, dorsal, somatic spines and the distal end 1.7; maximal length of the somatic spines 0.04, maximal width 0.024; triangularly-shaped genital spines 0.031–0.048 long and 0.020–0.022 wide.

Observations: The shape and dimensions of the body, the proboscis, which is composed of 3–4 basal hooks of a different size and shape, the distribution of the somatic spines, particularly in the posterior end of the male, and the trapezoidally shaped neck, without spines, lead to conclusion that parasites of examined genus *Hippocampus* belong to the species *Corynosoma australe* Johnston, 1937.

Discussion

Corynosoma australe was firstly described from adult of *Neophoca cinerea* in South Australia and was subsequently recorded in several pinnipeds from subantarctic waters (Zdzitowiecki 1984) as well as temperate regions, similarly to *Otaria flavescens* from the coasts of Montevideo, Uruguay (Zdzitowiecki 1989). Morini and Boero (1960) described *Corynosoma otariae* in *O. flavescens* in the southern seas of Argentina although Zdzitowiecki (1989) considered it as synonym to *C. australe*.

The morphometric and meristic variation of this species is noteworthy, even among individuals from the same host. In samples of adults collected from the intestine of the final host *Hydrurga leptonyx*, Zdzitowiecki (1984) identified 16–18 rows with 11–12 to 14–15 hooks, sometimes 12 or 12–13, including 9–11 hooks of a larger size and 2–3 or 3–4 smaller in the base of the proboscis. In parasite samples of the white croaker *M. furnieri* from the littoral zone of Rio Grande do Sul, Brazil, Pereira and Matos Neves (1993) observed that the armature of the proboscis was made up of 18 rows with 13 hooks in each one, the three or four basal ones being smaller and having a reduced root. In parasite samples of *Engraulis anchoita* from the Argentinean shelf, Timi (1999) reported that the hooks of the proboscis were arranged in 18 to 19 longitudinal rows made up of 12 to 13 hooks in each one, of which, the three basal ones were the smallest. In juveniles from the stomach and spiral valve of Chondrichthyes, Knoff *et al*. (2001) found a similar pattern with 18 rows of 12–14 hooks each, the basal ones were less in number. Guagliardo (2003) described cystacanth larvae in the body cavity of *Cynoscion guatucupa* from Bahía Blanca estuary. They had 18 to 19 longitudinal rows, each one was made up of 9 to 11 hooks of a larger size and with a series of 3 to 4 small hooks in the base.

The samples collected for the present study regarding *C. australe* are morphologically similar to previous records in other marine Argentine fish. However, they are comparatively more irregular in their dimensions with respect to previous records. The samples studied by Zdzitowiecki (1984) evidenced a marked uniformity in the large hooks (between 44–45 µm length of the spine) similarly to what was reported by Guagliardo (2003), in which case, hooks were larger. In the specimens studied by Pereira and Matos Neves (1993), the spine of the apical and medium hooks tended to become slightly smaller towards the posterior end. However, in the specimens studied by Timi (1999) the spine of such hooks became larger in the direction of the base of the proboscis.

Amin (1975) attributed the variations in the body size as well as in the number, size and arrangement of hooks on the proboscis, length of the proboscis and its receptacle and length of the lemnisci of *Acanthocephalus parksidei* Amin, 1974, to the age and sex of the parasite as well as to the host species. Amin and Redlin (1980) found a relationship between the variability of the above-mentioned morphological features and the fish species that parasitizes *Echinorhynchus salmonis*. Shostak *et al*. (1986) claimed that the variability in the morphological characteristics such as the size and shape of the body and the proboscis, the size, number and distribution of the hooks depend on the age of the worm, the host species, and the geographical location. To them, the geographical variability could be a consequence of the restricted genetic flow among isolated populations, thus provoking the geographical isolation of the morphological variants. Skryabina (1978) analyzed the geographical variability in parasite species of the genus *Neoechinorhynchus* of ten fish species from the Arctic Ocean, and found an important intraspecific variability, which she attributed mainly to the geographical distribution of hosts rather than to the host species. Popov and Fortunato (1987) found a marked geographical component in the morphological variability of *C. strumosum* in different localities of Siberia, and identified at least three morphologically different populations.

Comparing previous records of *C. australe* in other fish with those of the present study, it could be observed that the distribution, the arrangement, and the measurements of the hooks are more constant in those fish acting as paratenic hosts than in marine mammal definitive hosts. This may indicate that the different fish species used as transportation induce morphometrical as well as meristic variations.

The present study is the first record of acanthocephalan parasites in fish of the genus *Hippocampus* and of the order Syngnathiformes. It also provides the first reference to *C. australe* in fish from San Matías Gulf, Argentina. In previous studies (Tanzola *et al*. 1997, Timi 1999, Tanzola and Guagliardo 2000), the juvenile cystacanth stages of *C. australe* were found encapsulated in the body cavity of teleost fish. In the present study, some cystacanth stages were found free in the digestive tract of the parasitized fish.

Seahorses from San Antonio Bay have been described as opportunistic predators in the natural environment, and it has been claimed that they feed on a large variety of crustacean species, mainly amphipod (Gammaridae and Caprellidae), juveniles of brachiura decapods (Grapsidae) and some Caridea (Storero 2004).

In contrast, no evidence has been reported to date indicating that seahorses are usually consumed by other species in this environment (Perier 1997). It seems likely that the low population abundance and the remarkable camouflage ability of seahorses restricts the number of their predators to a few fish, bird or mammalian species as it can be also observed in other species of the genus *Hippocampus* (Kuiter 2003).

Taking this information into account, and besides the strong seasonal presence (summer) and the low prevalence and average intensity observed in *C. australe* in this study, it could be claimed that *Hippocampus* sp. plays an accidental role as paratenic host to this helminth in Patagonia. As a result, the dispersion of this parasite in the ecosystem of San Antonio Bay seems to result from trophic relationships among some of the above-mentioned crustaceans, other fish species acting as potential hosts and South American sea lions.

In this respect, it is noteworthy that several fish species, such as *Diplodus argenteus* (Sparidae) and *Eleginops maclovinus* (Nototheniidae), massively used San Antonio Bay as a spawning and nursery area during spring and summer. The juvenile stages of these species, as well as the juvenile and adult stages of seahorses, mainly include amphipod crustaceans and juveniles of decapods in their diet (Perier 1997). In advanced stages of their life cycle, these fish become important prey items in the diet of the South American sea lion *O. flavescens* in San Matías Gulf.

According to Alves and Luque (2001), the infections by acanthocephalan parasites in marine fish are influenced by the diet of the fish as well as by the distribution and density of hosts. The presence of *C. australe* in the ecosystem of San Antonio Bay seems to be related with trophic relationships among microcrustaceans, the above-mentioned species, and pinnipeds. These relationships could be the main dispersion mechanism of *C. australe* and other helminths in this ecosystem.

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References

Alves D.R., Luque J.L. 2001. Community ecology of the metazoan parasites of white croaker, *Micropogonias furnieri* (Osteichthyes: Sciaenidae), from the coastal zone of the state of Rio de Janeiro, Brazil. *Memorias do Instituto Oswaldo Cruz*, 96, 145–153.

Amin O.M. 1975. Variability in *Acanthocephalus parksidei* Amin, 1974 (Acanthocephala: Echinorhynchidae). *Journal of Parasitology*, 61, 307–317.

Amin O.M., Redlin M.J. 1980. The effect of host species on growth and variability of *Echinorhynchus salmonis* Müller, 1784 (Acanthocephala: Echinorhynchidae), with special reference to the status of the genus. *Systematic Parasitology*, 2, 9–20.

Blasiola G.C. 1979. *Glugea heraldi* n. sp. (Microspora, Glugeidae) from the seahorse *Hippocampus erectus*. *Journal of Fish Diseases*, 2, 493–500.

Cremonte F., Sardella N.H. 1997. The parasite fauna of *Scomber japonicus* Houttuyn, 1782 (Pisces: Scombridae) in two zones of the Argentine Sea. *Fisheries Research*, 31, 1–9.

Gioia I., Cordeiro N.D. 1996. Brazilian myxosporidians' check-list (Myxozoa). *Acta Protozoologica*, 35, 137–149.

Guagliardo S. 2003. Estudio sistemático, biológico y ecológico de los cestodes tripanorrincos (Eucestoda; Trypanorhyncha) parásitos de peces marinos en el área de Bahía Blanca. Tesis Doctoral, Universidad Nacional del Sur, Bahía Blanca, Argentina.

Knoff M., Clemente S.C.D., Pinto R.M., Gomes D.C. 2001. Digenea and Acanthocephala of elasmobranch fishes from the southern coast of Brazil. *Memorias do Instituto Oswaldo Cruz*, 96, 1095–1101.

Kuiter R. 2003. Seahorses, pipefish and their relatives. TMC Publishing, UK. CD ROM Edition.

Morini E., Boero J. 1960. *Corynosoma otariae* n. sp. (Acanthocephala; Polymorphidae) parásito de un lobo marino (*Otaria flavescens*). *Actas y Trabajos del Primer Congreso Sudamericano de Zoología*, *La Plata*, *Argentina*, Tomo II, Sección III, 229–234.

Pereira Jr. J., Matos Neves L.F.M. 1993. C*orynosoma australe* Johnston, 1937 (Acanthocephala, Polymorphidae) em *Micropogonias furnieri* (Desmarest, 1823) (Perciformes, Sciaenidae) do litoral do Rio Grande do Sul. *Comunicaçoes del Museo de Ciéncias PUCRS*, *Sér*. *Zoologia*, 6, 51–61.

Perier M.R. 1997. La fauna íctica del litoral de la Bahía de San Antonio, golfo San Matías, Provincia de Río Negro, República Argentina. Tesis Doctoral, Universidad Nacional de la Plata, Argentina, Facultad de Ciencias Naturales y Museo.

Popov V.N., Fortunato M.E. 1987. Geographic variability of *Corynosoma strumosum* (Acanthocephala: Polymorphidae), a parasite of marine mammals. *Zoologicheskiy Zhurnal*, 66, 12–18 (In Russian).

Sardella N.H., Etchegoin J.A., Martorelli S.R. 1995. Las comunidades parasitarias de *Micropogonias furnieri* (corvina) en Argentina. *Boletín del Instituto Oceanográfico de Venezuela*, *Universidad de Oriente*, 34, 41–47.

Shostak A.W., Dick T.A., Szalai A.J., Bernier L.M.J. 1986. Morphological variability in *Echinorhynchus gadi*, *E. leidyi*, and *E. salmonis* (Acanthocephala: Echinorhynchidae) from fishes in northern Canadian waters. *Canadian Journal of Zoology*, 64, 985–995.

Skryabina E.S. 1978. Morphological variability of thorny-headed worms of the genus *Neoechinorhynchus* (Acanthocephala: Neoechinorhynchidae), parasites from fishes of waterbodies of the glacial province in USSR. *Parazitologiya*, 12, 512–522 (In Russian).

Storero L.P. 2004. Hábitos alimentarios y comportamiento trófico del caballito de mar *Hippocampus* sp. en la Bahía de San Antonio (Río Negro). Tesis de Grado. Facultad de Ciencias Exactas, Físicas y Naturales. Universidad Nacional de Córdoba, Argentina.

Tanzola R.D., Guagliardo S.E. 2000. Helminth fauna of the Argentine conger, *Conger orbignyanus* (Pisces: Anguilliformes). *Helminthologia*, 37, 229–232.

Tanzola R.D., Guagliardo S.E., Brizzola S.M., Arias M.V. 1997. Helminth fauna of *Porichthys porosissimus* (Pisces: Batrachoidiformes) in the estuary of Bahía Blanca, Argentina. *Helminthologia*, 34, 221–227.

Tanzola R.D., Guagliardo S.E., Brizzola S.M., Arias M.V., Botte S.E. 1998. Parasite assemblage of *Sympterygia bonapartei* (Pisces: Rajidae), an endemic skate of the Southwest Atlantic. *Helminthologia*, 35, 123–129.

Timi J. 1999. Estudios parasitológicos de *Engraulis anchoita* (anchoita). Aspectos taxonómicos, biológicos, zoogeográficos y su aplicación a las pesquerías. Tesis Doctoral. Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Mar del Plata.

Vincent A.C.J., Clifton-Hadley R.S. 1989. Parasitic infection of the seahorse (*Hippocampus erectus*) – a case report. *Journal of Wildlife Diseases*, 25, 404–406.

Zdzitowiecki K. 1984. Some antarctic acanthocephalans of the genus *Corynosoma* parasitizing Pinnipedia, with descriptions of three new species. *Acta Parasitologica Polonica*, 29, 359–377.

Zdzitowiecki K. 1989. New data on the morphology and distribution of two acanthocephalans, *Andracantha baylisi* (Zdzitowiecki, 1986) comb. n. and *Corynosoma australe* Johnston, 1937. *Acta Parasitologica Polonica*, 34, 167–172.

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