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Corynosoma australe Johnston, 1937 and *C. cetaceum* Johnston & Best, 1942 (Acanthocephala: Polymorphidae) from marine mammals and fishes in Argentinian waters: allozyme markers and taxonomic status

Norma H. Sardella[1,*], Simonetta Mattiucci[2], Juan T. Timi[1,3], Ricardo O. Bastida[3,4], Diego H. Rodríguez[3,4] & Giuseppe Nascetti[5]

[1]*Laboratorio de Parasitología, Departamento de Biología, Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Mar del Plata, Funes 3350, 7600, Mar del Plata, Argentina*

[2]*Department of Public Health Sciences, (Section of Parasitology), University of Rome "La Sapienza", P. le Aldo Moro, 5, 00185, Rome, Italy*

[3]*Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Funes 3350, 7600, Mar del Plata, Argentina*

[4]*Laboratorio de Mamíferos Marinos, Departamento de Ciencias Marinas, Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Mar del Plata, Funes 3350, 7600, Mar del Plata, Argentina*

[5]*Department of Ecology and Sustainable Economic Development (DECOS), Tuscia University, Via S. Giovanni Decollato, 01100, Viterbo, Italy*

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Abstract

Genetic and morphological studies were carried out on acanthocephalans belonging to *Corynosoma* Lühe, 1904 and referable to the species *C. cetaceum* Johnston & Best, 1942 and *C. australe* Johnston, 1937, which were recovered from both definitive and intermediate hosts in Argentinian waters. The aims were to estimate the level of genetic differentiation between the two taxa at any stage of their life-cycle, to provide genetic (allozyme) markers for their recognition and to analyse the systematic status of both taxa. Acanthocephalans were collected from the stomach and intestine of *Arctocephalus australis* (Zimmerman), the intestine of *Mirounga leonina* (Linnaeus) and the stomach of *Pontoporia blainvillei* Gervais & D'Orbigny (definitive hosts) in Argentinian waters. Alternative alleles at all the 13 enzymatic loci studied were observed for *C. australe* and *C. cetaceum*. The specimens from the stomach of both *P. blainvillei* and *A. australis* were identified, on the basis of the great number of diagnostic loci found, as *C. cetaceum*; those from intestine of both *A. australis* and *M. leonina* as *C. australe*. A high level of genetic differentiation ($D_{Nei}=\infty$: $I_{Nei}=0.00$) between the two taxa was found, suggesting a generic distinction between the two species. Cystacanths of the two species from the body-cavity of the fish *Cynoscion guatucupa* (Cuvier) collected from the same geographical area were identified genetically. Morphological patterns, such as the number of hooks and hook rows on the proboscis, the distribution of somatic and genital armature, and other morphometric and meristic differences, in addition to ecological data, enabled the identification of these two species at cystacanth, juvenile and adult stages. However, a number of morphological and morphometric features of the Argentinian material were different to those of *C. australe* and *C. cetaceum* described from other regions of the world.

Introduction

Corynosoma Lühe, 1904 (Acanthocephala: Polymorphidae) presently comprises numerous species which utilise pinnipeds, cetaceans and fish-eating

*Author for correspondence (E-mail: sardella@mdp.edu.ar)

birds as definitive hosts, and crustaceans and fishes as intermediate hosts (Delyamure, 1968). Despite their wide distribution among vertebrates, the systematic status of several species is still not clear. Currently, there is a long list of synonymies and misidentifications (see e.g. Amin, 1985), including the type-species, *C. strumosum* (Rudolphi, 1802) Lühe, 1904, whose description has recently been amended (Nickol et al., 2002a). This is probably due to two main reasons: (1) the systematics of this genus is presently based on a few variable morphological features (such as the number of hook rows and of hooks per row on the proboscis, and the distribution patterns of somatic and genital spines) and general morphometry; and (2) several sources of intraspecific variability within populations of *Corynosoma* spp. (such as the effect of parasite age and size, host-induced effects and geographical influence) which migth affect morphological features (George-Nascimento & Marin, 1992; Aznar et al., 1999a). Similarly, confusion has been reported between genera of the Family Polymorphidae Meyer, 1931 (Schmidt, 1973, 1975; Amin, 1992; Aznar et al., 1999a; Nickol et al., 1999), which arose for the same reasons as problems at the specific level.

Records of adult *Corynosoma* in marine mammals from the South-West Atlantic Ocean present a similar state of taxonomic uncertanty. Indeed, along the Argentinian coast, Morini & Boero (1960) recorded *C. otariae* Morini & Boero, 1960, based upon six specimens from the South American sea lion *Otaria flavescens* (Shaw), which was differentiated from the original description of *C. australe* Johnston, 1937 from the Australian sea lion *Neophoca cinerea* (Péron) in Australian waters (Johnston, 1937) by the similar size of the sexes, the number of proboscis hook rows (20 instead of 18), a larger body and embriophore size, and the distribution of the somatic armature in both sexes. However, Zdzitowiecki (1989), comparing the description of Morini & Boero (1960) with his redescription of *C. australe* (Zdzitowiecki, 1984a), synonymised *C. otariae* with *C. australe* without any mention of the differences reported by Morini & Boero (1960). Later, George-Nascimento & Marin (1992) were unable to identify at the specific level specimens from *O. flavescens* and the South American fur seal *Arctocephalus australis* Zimmerman on the Uruguayan coast; later specimens from *A. australis* off Uruguay were identified as *C. australe* by Aznar et al. (2004). *C. australe* was also recently recorded from a cetacean, the dusky dolphin *Lagenorhynchus obscurus* (Gray), also from Argentinian waters (Dans et al., 1999).

C. cetaceum has commonly been reported as a parasite of the franciscana *Pontoporia blainvillei* Gervais & D'Orbigny off the Uruguayan (Schmidt & Dailey, 1971; Kagei et al., 1976; Aznar et al., 1994a) and Argentinian coasts (Aznar et al., 1994a, b), and from the short beaked common dolphin *Delphinus delphis* Linnaeus off Argentina (Aznar et al., 2002a). Unidentified species of this genus have also been reported from *P. blainvillei* (see Dailey & Brownell, 1972). A geographical comparison of samples of *C. cetaceum* showed several differences (such as the number of hooks per row on the proboscis and the distribution patterns of the somatic spines) between South American and South Australian specimens (Aznar et al., 1999a). The generic status of *C. cetaceum* has also been a matter of controversy (see Schmidt & Dailey; 1971; Smales, 1986; Aznar et al., 1999a). This taxon was transferred to *Polymorphus* Lühe, 1911, due to the absence of genital spines in both sexes, but was reinstated as *C. cetaceum* by Aznar et al. (1999a); however its generic status remains unresolved (García-Varela et al., 2005).

Records of cystacanths belonging to *Corynosoma* from fishes off Argentina are: *C. australe* (see Zdzitowiecki, 1989; Sardella et al., 1995; Tanzola et al., 1997; Cremonte & Sardella, 1997; Tanzola & Guagliardo, 2000; Timi, 2003); and *C. hammani* (Linstow, 1892) (see Tanzola et al., 1997; Tanzola & Guagliardo, 2000). Unidentified cystacanths of *Corynosoma* have also been reported (Szidat, 1949, 1969; Suriano, 1966; Ivanov, 1996; Sardella & Timi, 1996; Sardella et al., 1998). From the numerous reports listed above, it is clear that the systematic status of material of *Corynosoma* at the cystacanth stage in the South-West Atlantic Ocean also remains uncertain.

On the other hand, genetic markers obtained from multilocus allozyme electrophoresis have been demonstrated to be a useful tool for answering questions related to the systematics of several parasites and for detecting various cryptic or sibling species, as well as establishing genetic relationships between congeneric taxa of endoparasites (Andrews & Chilton, 1999), including those from marine mammals (Nascetti et al., 1986, 1993; Mattiucci