ACANTHOCEPHALUS REUNIONENSIS N. SP. (ACANTHOCEPHA: ECHINORHYNCHIDAE), A PARASITE OF ANGUILLA SPECIES (ANGUILLIDAE) FROM REUNION ISLAND

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INTRODUCTION

The genus Acanthocephalus Koelreuther, 1771 (Echinorhynchida: Echinorhynchidae) is a cosmopolitan genus occurring in freshwater fish, including five species from eels (Anguillidae), amphibians and reptiles (Golvan, 1969; McAlpine, 1996; Crusz & Ching, 1975; Kennedy, 1982; Bursey & Goldberg, 2003. The type species Acanthocephalus anguillae (Müller, 1780) A. clavula (Dujardin, 1845) and A. lucii Müller, 1776 are found in Europe, A. dirus Van Cleave, 1931 in North America and A. gotoi Van Cleave, 1925 in Japan (Golvan, 1969).

In a survey of fresh water fishes from the French island of Reunion, one of the Mascarene Islands, in the western Indian Ocean, a new species of Acanthocephalus from the autochthonous eels Anguilla bicolor McClelland, 1884, Anguilla marmorata Quoy & Gaimard, 1824 and Anguilla mossambica (Peters, 1852) was found, and is described below.

MATERIALS AND METHODS

A total of 118 eels, comprising 23 A. bicolor, 15 A. mossambica and 80 A. marmorata were collected from rivers in Reunion Island, including 22 eels from Grande Rivière St-Jean (20° 930' S, 55° 640' E), 13 from Rivière St-Jean (20° 942' S, 55° 645' E) and five from Roche Bras-Panon (21° 006' S, 55° 653' E) (Table I) and examined for helminths.

All acanthocephalans so found were relaxed overnight in tap water, fixed in AFA and stored in 70 % ethanol. Prior to microscopic examination the worms were cleared in beechwood creosote and studied as temporary wet mounts. All figures were prepared with the aid of a drawing tube and all measurements are given in micrometres unless otherwise stated. The specimens collected for this study are registered in the collection of the Muséum National d’Histoire Naturelle, Paris (MNHN) or the South Australian Museum, Adelaide (SAM).

DESCRIPTION

ACANTHOCEPHALUS REUNIONENSIS N. SP. (Figs 1-7)

Type material: holotype male SAM AHC33910; allotype female SAM AHC33911, other paratypes one male, one female MNHN 307HG.

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Figs 1-7. – *Acanthocephalus reunionensis* n. sp. 1-5 female; 1, proboscis; 2, anterior extremity; 3, proboscis and trunk; 4, hooks; 5, genital apparatus; 6-7 male; 6, bursa; 7, posterior end.

Scales 1, 5, 6, 200 µm; 2, 500 µm; 3, 1,000 µm; 4, 50 µm; 7, 750 µm.

<table>
<thead>
<tr>
<th>Host taxon</th>
<th>Grande Rivière St Jean</th>
<th>Rivière St Jean</th>
<th>River Roche Bras-Panon</th>
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<tbody>
<tr>
<td></td>
<td>No</td>
<td>Prevalence</td>
<td>Intensity</td>
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<tr>
<td><em>A. bicolor</em></td>
<td>9</td>
<td>33</td>
<td>1-4</td>
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<tr>
<td><em>A. marmorata</em></td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>A. mossambica</em></td>
<td>3</td>
<td>0</td>
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Table I. – Number (No), prevalence (%), and intensity of infections with *Acanthocephalus reunionensis* in three species of *Anguilla* collected from three rivers in the Reunion Islands.
Type host: Anguilla bicolor McClelland, 1884 (Anguillidae).
Type locality: Grande Rivière St-Jean, Reunion Island, September 2005.
Site in host: Intestine.
Other material examined: from the Grande Rivière St-Jean, one male, two females from Anguilla bicolor SAM AHC33912; from the Rivière St Jean, two males, one female from Anguilla mossambica SAM AHC33913; from the river Roche Bras-Panon, two males, two females from Anguilla mossambica MNHN308HG; one female from Anguilla marmorata SAM AHC33914.
Prevalence: seven of 118 hosts; three of 23 Anguilla bicolor; one of 80 A. marmorata and three of 15 A. mossambica (Table I).

Trunk cylindrical, smooth, same width throughout. Proboscis cylindrical, armed with 19 longitudinal rows, 4-5 (usually 4) hooks. Proboscis receptacle cylindrical, double walled, cerebral ganglion at base. Lemnisci elongate, digitiform, same length or slightly longer than proboscis receptacle.

Male (n = 4): trunk 5.6-8.0 (6.65) mm long, 0.85-1.275 (1.025) mm wide. Proboscis 400-505 (435) long, 300-335 (335) wide. Proboscis hooks, thorn length I 82.5-89; II 95-105.6; III 79-95.5; IV 69-95.5; roots simple, length I 70.5-80; II 90-90.5; III 50.5-60.5; IV 40-50. Neck 134-175 (148) long, 375-470 (406) wide; proboscis receptacle 405-1,070 (720) long, 265-370 (295) wide; lemnisci 770-1,105 (885). Testes ovoid, tandem, in posterior half of body; anterior testis 535-657 (610) long, 335-450 (395) wide; posterior testis 470-665 (590) long, 340-450 (395) wide. Cement glands 6, filiform, arranged in three pairs 1,050-2,100 long.

Female (n = 6): trunk 6.5-10 (8.2) mm long, 0.87-1.275 (1.03) mm wide. Proboscis 470-540 (505) long, 300-400 (355) wide; proboscis hooks, thorn length I 82-105.6; II 115.5-128.7; III 105.6-122.1; IV 99-122.1; V 79.2. Neck 135-270 (185) long, 380-435 (405) wide; proboscis receptacle 645-905 (750) long, 120-400 (280) wide; lemnisci 670-1,275 (995) long. Uterine bell to vagina 1,005-1,530 (1,195); genital pore sub-terminal. No eggs seen.

DISCUSSION

The new species, Acanthocephalus reunionensis, with a cylindrical proboscis with many hooks, double walled proboscis receptacle, six cement glands, parasitic in freshwater fishes, keys down to the family Echinorhynchidae and having a cylindrical trunk without spines, to the subfamily Echinorhynchinae (see Amin, 1987).

Having only hooks, no spines, on the proboscis, hooks larger mid proboscis than anteriorly or posteriorly, lemnisci sacciform and testes in the posterior half of the trunk, the new species falls within the genus Acanthocephalus as defined by Golvan (1969). Golvan's generic diagnosis, however, lists the cement glands as short and pyriform, clustered together irregularly or more or less in three pairs. Although in three pairs, the six cement glands of A. reunionensis n. sp. are long and filiform rather than short or pyriform. When the descriptions of a series of Acanthocephalus species are examined, however, it can be seen that the cement glands of the congeners vary from a short, round cluster, as in A. echigensis Fujita, 1920 and A. falcatus Frölich, 1789, through more elongated, pyriform cement glands as in A. ula Lent & Portes-Santos, 1989, A. fluviatilis Paperna, 1964 and A. lucidus Van Cleave, 1925, to filiform as in A. bufonis (Shipley, 1903) (see Golvan, 1969; Kennedy, 1982, Lent & Portes-Santos, 1989). In this context the cement glands of A. reunionensis represent a continuation of the trend towards elongation. Acanthocephalus reunionensis n. sp. differs from all its congeners, except A. bufonis, therefore, in having filiform cement glands arranged in three pairs. There are also similarities in proboscis hook formulae, A. reunionensis having 19 rows of 4-5 hooks and A. bufonis 12-15 rows of 4-6 hooks (Kennedy, 1982) or 15-19 rows of 4-6 hooks (Van Cleave, 1957). Acanthocephalus reunionensis differs, however, in usually having four hooks and no more than five per row, the number of hooks per row being reported as a more consistent character for Acanthocephalus species than the number of rows of hooks in the proboscis (Kennedy, 1982). Acanthocephalus reunionensis further differs from A. bufonis in having a larger proboscis (males 400-505 compared with 310-440). Acanthocephalus reunionensis occurs in eels from the Reunion Islands, while A. bufonis occurs in frogs, toads and lizards from China and Indonesia (Kennedy, 1982). A. reunionensis is also similar to A. ula, which has a cluster of elongated cement glands and a proboscis armature of 16-20 rows of 7-8 hooks (Lent & Portes-Santos, 1989), but differs in having an armature of only five hooks per row, cement glands arranged in pairs, larger testes (anterior testis 535-565 by 335-450 compared with 270-440 by 270-300) and a longer female reproductive system (1,005-1,530 compared with 570-720). Further A. ula occurs in frogs from Venezuela (Lent & Portes-Santos, 1989). The proboscis armature of A. reunionensis is similar to that of A. madagascariensis Golvan, 1965 with 18-20 rows of 5-6 hooks but differs in having no more than five hooks, usually four. Acanthocephalus reunionensis further differs from A. madagascariensis in body shape, the female trunk is anteriorly dilated in A. madagascariensis and a longer female reproductive system, 1,005-1,530, despite the immaturity, compared with 1,000 for A. madagascariensis, and A. madagascariensis occurs in frogs from Madagascar.

The proboscis armatures of Acanthocephalus species known to occur eels, namely A. anguillae, with 10 rows
of 5-7 hooks (Golvan, 1969); A. clavula with 16-18 rows of 13-14 hooks (Graba-Kazubsa & Chubb, 1968; Outeland, 2002; Byrne et al., 2004); A. dirus with 11-16 rows of 7-10, 11-13 hooks (Amin, 1984, 1985); A. gotoi with 15-18 rows of 11-15 hooks (Golvan, 1969); A. lucii with 12-16 rows of 7-9 hooks (Golvan, 1969); are not congruent with that of A. reunionensis which has 19 rows of 4-5 hooks. Acanthocephalus reunionensis is the first species to be recorded from eels in the African Region. All the females of A. reunionensis collected for this study were immature, no eggs being present. This is indicative of either infections in which the worms had not been established long enough to reach maturity or, as most likely in this case, infections of worms unable to reach maturity because they were established in unsuitable hosts. Acanthocephala from fish hosts are occasionally reported as accidental infections in amphibia and vice versa (Flyunt & Lisitsyna, 1995; McAlpine, 1996) and this probably happened with A. reunionensis. On Reunion Island itself there is a dearth of possible alternative suitable indigenous hosts, as there are no fresh water fishes that include crustaceans in their diet and no amphibians (Institute for Environmental & Legal Studies, 1998). The cichlid fish Oreochromis niloticus niloticus (Linnaeus, 1758), which includes crustaceans in its diet, was introduced to Reunion Island in 1957 (Welcombe, 1988) but the cichlids examined in this study were not infected. The presence of exotic frogs and tadpoles was noted during this study but they were not collected. The species of Acanthocephalus morphologically closest to A. reunionensis, namely A. bufonis, and that biogeographically closest, namely A. madagascariensis, both occur in amphibian hosts, Racocephorus sp., from Madagascar (Golvan, 1969) and Bufo and Rana spp. from Indonesia. This could be indicative of introduced amphibian hosts being more suitable for A. reunionensis than eels. Potential amphibian hosts from Reunion Island as well as fishes and amphibians from other islands in the Mascarenes need to be examined before the hosts of A. reunionensis can be determined as required, suitable or unsuitable, respectively.

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