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The trypanorhynch cestode fauna of Borneo

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Abstract

Borneo is considered a centre for biodiversity in both the terrestrial and aquatic environments. However, information on the diversity of parasites and trypanorhynch cestodes infecting sharks and rays in particular is rather limited at present. During a large-scale study focusing on the parasite diversity of elasmobranchs from Malaysian and Indonesian Borneo a total of 520 spiral intestines of elasmobranchs were collected during seven years of extensive sampling. Trypanorhynch cestodes were discovered in 163 specimens belonging to 43 different elasmobranch species (i.e. 17 species of sharks and 26 species of rays). Overall, 50 species of trypanorhynchs were recovered from the hosts' spiral intestines, some of which represented new species and genera that have been subsequently described. Numerous new host records are added for previously described species. Of the 50 trypanorhynch species present in waters off Borneo 30 (= 60%) were recovered from rays, while 20 species (= 40%) were found in sharks. The geographical distribution of these cestode species was dominated by taxa that occur in the Indo-west Pacific (= 30%) followed by species endemic to Borneo (= 28%). Nine species (= 18%) are found both in Borneo and Australia or have a cosmopolitan distribution. The present study also assessed the host specificity for 16 species belonging to three prominent trypanorhynch genera recovered from elasmobranchs from Borneo (i.e. *Dollfusiella* Campbell & Beveridge, 1994, *Prochristianella* Dollfus, 1946 and *Parachristianella* Dollfus, 1946). Most species (= 63%) were euryxenous utilizing hosts from different orders or even classes, with only a single species (i.e. *Dollfusiella imparispinis* Schaeffner & Beveridge, 2013) being oioxenous utilizing a single host species. The remaining species (= 31%) were mesostenoxenous utilizing different host species from a single genus. The least host specific taxa were the three representatives of *Parachristianella* and *Prochristianella clarkeae* Beveridge, 1990.

Key words: parasites, cestodes, tapeworms, Trypanorhyncha, host specificity, geographical distribution, elasmobranchs, South-East Asia, Borneo

Introduction

The East Indies triangle in the Indo-West Pacific Ocean is regarded as a major centre for biodiversity (Briggs 2005). The high diversity of teleosts in the region is well established (Allen & Werner 2002; Briggs 2005) while recent studies have also highlighted the diversity of elasmobranchs, particularly those of Borneo (Fowler *et al.* 1999; Yano *et al.* 2005; Last *et al.* 2010). However, there have been few studies of the diversity of parasites in these hosts, particularly of the trypanorhynch cestodes which utilize elasmobranchs as definitive hosts. Early reports of trypanorhynchs from the region include those collected from elasmobranchs in the New York Aquarium but which originated in the Java Sea off Indonesia (MacCallum 1917) [e.g., *Nybelinia narinari* (MacCallum, 1917) as *Taenia narinari*]. Opportunistic collections have also been reported from the Celebes Sea by Yamaguti (1954) while a limited number of trypanorhynchs from elasmobranchs has been reported from southern Java by Palm (2004). Consequently, there has been very little information on the trypanorhynch fauna of elasmobranchs from Borneo until recently.

As part of a comprehensive study of the parasites of elasmobranchs of Borneo funded by the National Science Foundation and undertaken by Janine Caira and Kirsten Jensen between 2002 and 2008, the trypanorhynch fauna of these hosts was also investigated. New species of trypanorhynch cestodes encountered during this survey have been published elsewhere (Beveridge 2008; Schaeffner 2014; Schaeffner & Beveridge 2012a, b, c; 2013a, b, c; Schaeffner *et al.* 2011). In this paper, we present the results of the survey and compare the diversity of trypanorhynch species found in the waters surrounding Borneo with other regions of the world.

Specificity values for species in the present study may be altered in the future if more material becomes available, especially in larger-scale sampling studies.

Geographical associations. The pattern of geographical distributions observed among trypanorhynch species indicated a relatively high degree of endemism (28%). By far the largest category was the one classified as having an 'Indo-west Pacific' distribution, while a further group of species was distributed between Borneo and Australia. Equal in size to the latter group was the group of cosmopolitan species. The marked differences between the parasites of sharks and those from rays, with the ray cestodes suggesting a higher degree of endemism and relatively few cosmopolitan species may be explained by the distributions of the hosts, with many of the shark species being pelagic with global distributions, while most of the ray species are coastal water inhabitants and have more restricted geographical distributions.

Summary

This study represents the most extensive examination of elasmobranchs and their trypanorhynch parasites in South-east Asia. The number of elasmobranch species examined in waters off Malaysian and Indonesian Borneo revealed an extraordinary diversity of trypanorhynch cestodes. However, the number of species recovered is correlated to the numbers of hosts examined and while some host groups have been extensively sampled (e.g., 114 specimens of 27 species of the Dasyatidae) most of the other elasmobranch groups were less frequently collected and fewer species of trypanorhynchs were recovered (see Table 2). Comparing the actual diversity of trypanorhynchs from Borneo to other regions in the world in which trypanorhynchs have been more or less exclusively observed (e.g. the Mediterranean, Australia, Gulf of Mexico), the fauna encountered in Borneo is comparable to the tropical trypanorhynch fauna recorded from Australia, with 50 and 56 species (respectively). However, the number of host species observed in Australia was much higher than in Borneo, which is why the actual diversity of Borneo could reveal an even higher number of taxa if the same sampling effort could be applied. The predominant group of trypanorhynchs found in Borneo was the Eutetrarhynchidae. This is not surprising because most host species observed for trypanorhynchs were members of the Dasyatidae, which serve as the typical definitive hosts of the Eutetrarhynchidae. Overall, the trypanorhynch fauna of Borneo revealed 13 species and two genera new to science, which have been subsequently described. Numerous new host records have been added for described species and the sampling localities from which those species were found can be regarded as new geographical records. The present study also revealed varying degrees of host specificity of 16 eutetrarhynchid species belonging to three genera. Most representatives showed a low host specificity, while others had a higher host specificity infecting several species from the same genus. A single species was highly host specific and was recovered from a single host species.

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