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Taxonomy, host specificity and dietary implications of *Hurleytrematoides* (Digenea: Monorchiidae) from chaetodontid fishes on the Great Barrier Reef

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ABSTRACT

Five new and five previously described species of *Hurleytrematoides* are reported from 19 of 34 chaetodontid species examined from the Great Barrier Reef; new species are *H. faliexae* n. sp., *H. galzini* n. sp., *H. loi* n. sp., *H. morandi* n. sp., and *H. sasali* n. sp. Previously described species are *H. coronatum*, *H. fijiensis*, *H. prevoti*, *H. bartolii*, and *H. zebrasomae*. The genus is rediagnosed in the light of morphological variation of the new species; the degree of spination and shape of the terminal genitalia distinguish individual species. Species of *Hurleytrematoides* infect almost every clade of the family Chaetodontidae found on the Great Barrier Reef, but obligate corallivores are not infected. All ten species were found at Heron Island on the southern Great Barrier Reef, but only six at Lizard Island on the northern Great Barrier Reef. For three of the four species not present at Lizard Island, the absence appears to be statistically significant. Although all species are apparently restricted to chaetodontids on the GBR, specificity within the family varies from oioxenous to euryxenous; a core/satellite host paradigm explains the distribution of several species.

1. Introduction

The Monorchiidae Odhner, 1911 is a family of digenetic trematodes that mature in fishes. They have three-host life cycles, and available data indicate that asexual stages occur in marine bivalves, metacercariae infect a range of marine invertebrates, and adults mature in the guts of teleosts [1–13]. There are currently 40 genera of monorchiids recognized [1]. The subject of this study is the genus *Hurleytrematoides* Yamaguti, 1953. Species of *Hurleytrematoides* have been reported from fishes from the waters off Florida [14], Hawaii [15], Curacao and Jamaica [16], Japan [17], India [18], China [19], Fiji [20], Indonesia [21] and Australia [22], and most commonly infect chaetodontids (butterflyfishes).

Butterflyfishes are brightly colored fishes found primarily on tropical coral reefs in the Atlantic, Indian and Pacific Oceans. There are approximately 130 species in 11 genera [23]. Relationships within the family are relatively well known, as they have been the subject of several phylogenetic studies [24–30]. The family is divided into the bannerfishes (*Heniochus*, *Johnrandallia*, *Hemitaurichthys*, *Forcipiger*, *Chelmon*, *Chelmonops*, *Coradion* and *Amphichaetodon*) and butterflyfishes (*Chaetodon*, *Parachaetodon* and *Roa*) (see [23]). The predominant "butterflyfish" genus is *Chaetodon*, which has 89 nominal species and is divided into 12 subgenera based upon phylogenetic analysis [30,31].

Knowledge of the diet of chaetodontids is important to the present study because they are presumably infected with monorchiids by the ingestion of infected intermediate hosts. The Chaetodontidae is the only reef fish family in which the majority of species feed exclusively or partially on coral tissue [32]. Diets vary widely in the family, however, and some species feed on benthic invertebrates, zooplankton, or parasites on other fish [31,33–38].

Here we report the complex of *Hurleytrematoides* from chaetodontid fishes of the Great Barrier Reef based on examinations of chaetodontids made over 23 years.

2. Materials and methods

Fishes were caught by spear at Heron Island (HI) (23°26′S, 151°54′E), Lizard Island (LI) (14°40′S, 145°27′E) and the Swain Reefs complex (21°30′S, 152°00′E), Great Barrier Reef (GBR), Australia between 1986 and 2009. Parasites were collected as described by Cribb and Bray [39], fixed unflattened in hot saline and then stored in formalin. Whole mounts were stained with Mayer's haematoxylin, dehydrated in a graded alcohol series, cleared in methyl salicylate, and mounted in Canada balsam. Measurements were made on an Olympus BH-2 microscope with a calibrated eye piece micrometer and Spot Insight™ digital camera (Diagnostic Intruments, Inc.) using SPOT™ imaging software. Twelve gravid specimens of each species were measured.

Figures were made using a drawing tube, Intuos3 9×12 and Intuos4 6×9 graphics tablets and Adobe Illustrator and Photoshop CS5 software. All measurements are in micrometers.

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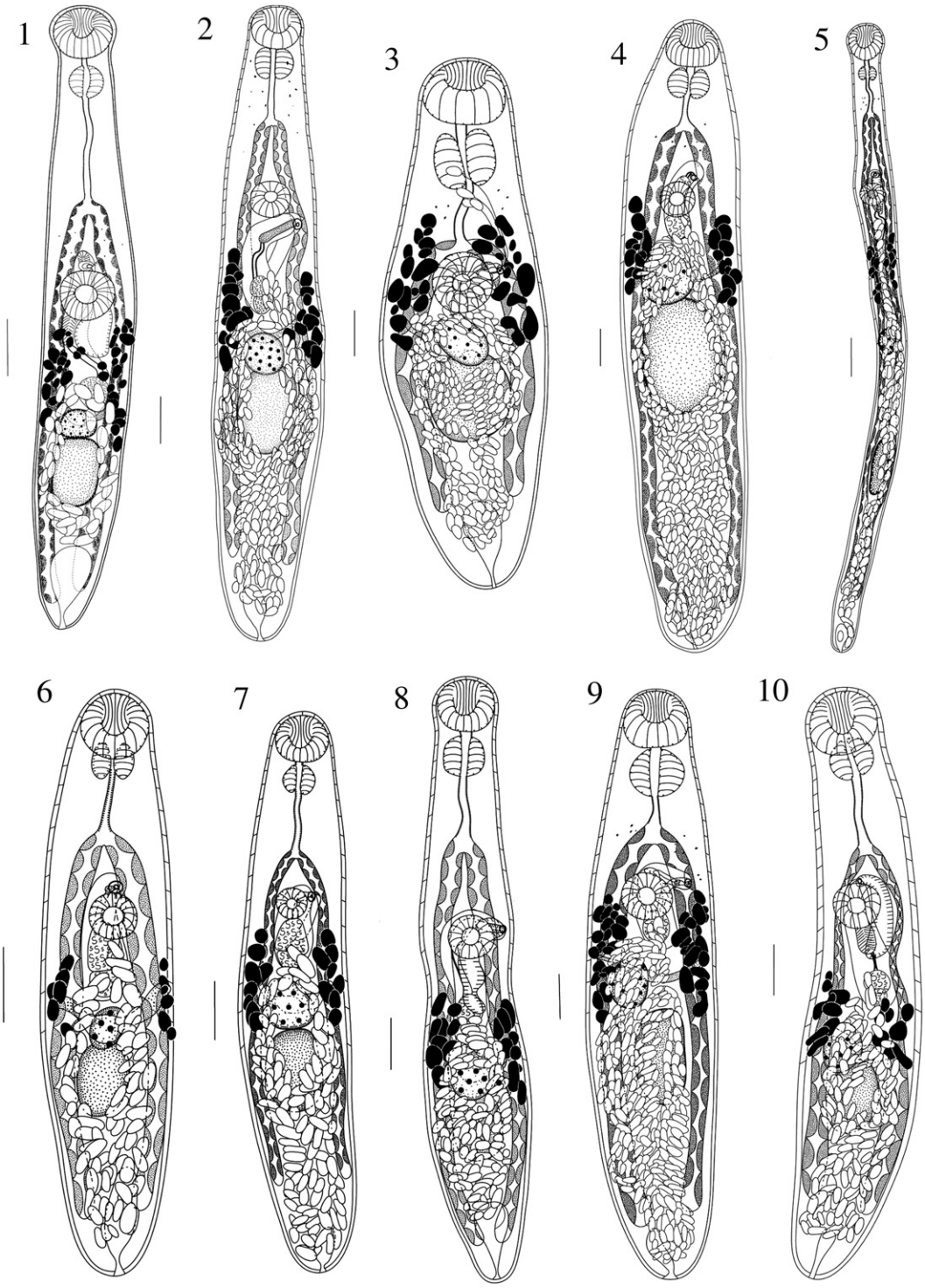
A phylogenetic supertree of chaetodontid species was created by combining taxa from topologies published by Bellwood et al. [30], Fessler and Westneat [28] and Littlewood et al. [27] using the Matrix Representation with Parsimony method [40]. Using Baum and Ragan's method of scoring [41,42], each tree was converted into a data matrix, using only the taxa from each tree that have been sampled on the GBR. All three matrices were combined into a supermatrix. A supertree was generated using the Maximum Parsimony method in MEGA version 4 [43].

Diet categories were assigned to chaetodontid species using three studies from the GBR [33,34,36], as well as the general reference by Allen et al. [31]. We divided chaetodontid species into just two categories: obligate corallivores and omnivores. When dietary data conflicted, we gave precedence to the studies done on



Figs. 1-10. Five new species and five previously described species of *Hurleytrematoides* from the Great Barrier Reef, Australia. 1. *H. morandi* n. sp. 2. *H. sasali* n. sp. 3. *H. galzini* n. sp. 4. *H. faliexae* n. sp. 5. *H. loi* n. sp. 6. *H. coronatum*. 7. *H. prevoti*. 8. *H. zebrasomae*. 9. *H. fijiensis*. 10. *H. bartolii*. Scale bars: 100 μm.