Coral-Associated Exosymbionts of Northeast Madagascar

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Chapter 5

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INTRODUCTION

Our best estimates of global biodiversity are poor. Even getting within the correct order of magnitude has proven to be a difficult goal. Entomologists working in rainforests have provided the best working estimates of terrestrial diversity. Based on the correlation between structural species (trees) and host specific symbionts (herbivorous insects), they have estimated global insect abundance at 2-50 million species. Symbioses are ubiquitous on coral reefs, yet a similar approach has not been taken with regard to estimating the numbers of host-specific reef associates, and the further extrapolation to estimates of reef diversity. This work will build up a working collection of marine structural species (hexacorals, octocorals, etc.) and their associated species (families of crabs, shrimp, barnacles, gastropods, bivalves, amphipods etc.) that in the future may contribute to deriving a total biodiversity estimate for the region.

METHODS

Standard collecting methods were used - searching structural species in the field for externally visible exosymbionts or anomalies in the surface texture. Sampling sites are shown on Table 1 in the "Report at a Glance" section on page 13. If visible exosymbionts or anomalies were seen, samples of the host were collected and later rinsed in ethanol and preserved for museum collections. Coral genetic samples were preserved in 95% ethanol and dimethyl sulphoxide (DMSO). Skeletal specimens were dried in the sun. Octocorals were preserved in ethanol. The associated fauna separated from the skeletons was preserved using ethanol. Sampling was opportunistic throughout the RAP survey, creating one database, not site-specific inventories.

RESULTS

In all, 105 samples were taken, comprising approximately 51 structural species (i.e. Operational Taxonomic Units, OTUs), of which 6 were Antipatharia (black corals), 16 were Octocorallia (soft corals) and 83 were Hexacoralia (hard corals) (see appendices A, B and C). Among these, a preliminary list of 66 different exosymbionts was distinguished. Preliminary sorting in the field showed a high degree of specificity of hosts and symbionts (figure 5.1), with a small number of hosts and symbionts being highly polyvalent. Of the 66 exosymbionts, 51 (77 %) were found in a single host species (fig. 5.1, left), with only 2 taxa being found in more than 5 host taxa. Of the 51 host taxa, 30 (59 %) were found with a single symbiont species (fig. 5.1, right), with only 5 host taxa having more than 5 symbiont taxa. More detailed taxonomic sorting will require several years of work to achieve satisfactory assignment to species.

Several of the most well known families of exosymbionts proved to be of interest. Both *Trapezia* (Pocilloporid associated crabs) and *Tetralia* (*Acropora* associated crabs) were abundant,

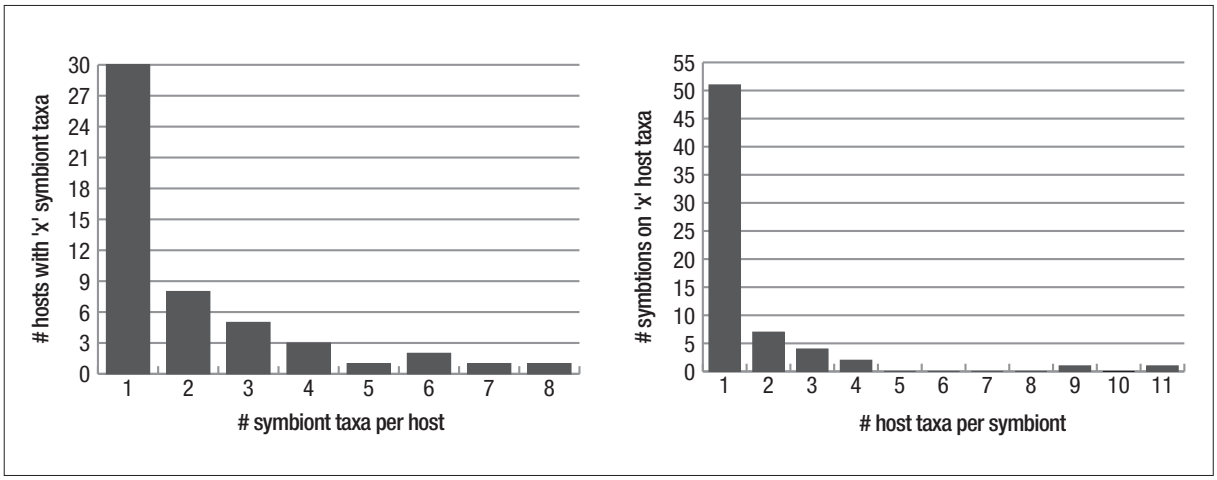

Figure 5.1. Association of exosymbionts with host taxa.

and revealed unexpected diversity in color and pattern. Genetic methods will be used to untangle the taxonomic issues, and verify the presence of undescribed taxa. As these crabs provide essential services for their coral hosts, an understanding as to the patterns present in the Western Indian Ocean is of importance in the conservation of the area's reef systems. Cryptochirid crabs were also abundant, and exceeded the numbers of species previously known for the region.

CONSERVATION RECOMMENDATIONS

At present no specific recommendations can be given for exosymbionts – as they are highly specific to their host species, conservation actions for those will be applicable to the symbionts as well.

As has been found in other regions, exploring a new area for coral exosymbionts has yielded a large number of undescribed forms and likely new species. Predictions of total biodiversity based on these new forms are high, emphasizing the need for conservation measures to prevent loss of habitat and host species before these unknown species are described. They provide a potent indicator of the loss of unknown species that occurs when habitat loss occurs.

Table 5.1. List of host and symbiont taxa.

Host Taxon	Symbiont Taxa
Antipatharia	
Cirripathes A	*Bryaniopsis* sp.
Cirripathes A	Pontoniinae sp.
Cirripathes B	Pontoniinae sp.
Cirripathes C	Pontoniinae sp.
Cirripathes D	*Bryaniopsis* sp.
Cirripathes D	Pontoniinae sp.
Hexacorals	
Acropora abrotanoides	*Tetralia* "blue eyes" *
Acropora abrotanoides	*Tetralia glabberima*
Acropora cf. *apressa*	*Tetralia glabberima*
Acropora hyacinthus	*Coralliocaris* cf. *superba*
Acropora hyacinthus	*Cymo* sp.
Acropora hyacinthus	*Jocaste* sp.
Acropora hyacinthus	*Tetralia* "blue eyes" *
Acropora hyacinthus	*Tetralia* "obscura"*
Acropora hyacinthus	*Tetralia glabberima*
Acropora hyacinthus	*Tetralia rubridactyla*
Acropora muricata	Pyrgomatidae
Acropora palifera	Lithophagidae sp. A
Acropora palifera	Pontoniine sp. A.
Acropora palifera	*Tetralia nigrolineata*
Acropora sp. 'mayote'	*Tetralia* "blue eyes" *
Acropora summerensis	*Tetralia* "obscura"
Acropora tenuis	*Coralliocaris* cf. *superba*
Acropora tenuis	*Coralliocaris* cf. *viridis*
Acropora tenuis	*Reliquicava* sp.

table continued on next page

Table 5.1. *continued*

Host Taxon	Symbiont Taxa
Hexacorals (continued)	
Acropora tenuis	*Tetralia* "blue eyes" *
Acropora tenuis	*Tetralia* "obscura"*
Acropora tenuis	*Tetraloides* "gogators"
Alveopora	*Coralliophila neritoides*
Coscinaria crassa	Cryptochiridae sp.
Coscinaria crassa	Pyrgomatidae sp.
Coscinaria monile	Cryptochiridae sp.
Echinopora gemmacea	Cryptochiridae sp.
Favites A	Cryptochiridae sp.
Galaxea astreata	Pontoniine sp.
Galaxea fascicularis	*Ischnopontonia lophos*
Galaxea fascicularis	*Racilius compressus*
Goniastrea pectinata	Cryptochiridae sp.
Gyrosmilia interrupta	*Synalpheus* sp.
Leptoria phrygia	Cryptochiridae sp.
Merulina ampliata	Cryptochiridae sp.
Oxypora 'lacera'	Cryptochiridae sp.
Pavona clavus	*Opercarcinus* sp. F
Pavona duerdeni	*Opercarcinus* sp. E
Pavona maldivensis	*Opercarcinus* sp. D
Playtgyra daedelae	Cryptochiridae sp.
Pleurogyra sinuosa	*Vir phillipensis*
Pocillopora damicornis	*Alpheus lottini* 'spots'
Pocillopora damicornis	*Alpheus lottini* "stripe"
Pocillopora damicornis	*Hapalocarcinus* sp. A
Pocillopora damicornis	*Paragobiodon* cf. *lacunicolus*
Pocillopora damicornis	*Synalpheus charon*
Pocillopora damicornis	*Trapezia guttata*
Pocillopora eydouxi	*Hapalocarcinus* sp. C*
Pocillopora eydouxi	*Harpiliopsis beaupressi*
Pocillopora eydouxi	*Trapezia digitalis*
Pocillopora eydouxi	*Trapezia rufopunctata*
Pocillopora eydouxi	*Utinomiella* sp. B
Pocillopora verrucosa	*Alpheus lottini* 'spots'
Pocillopora verrucosa	*Paragobiodon echinocephalus*
Pocillopora verrucosa	*Synalpheus charon*
Pocillopora verrucosa	*Trapezia* cf. *bidentata**
Pocillopora verrucosa	*Trapezia* cf. *lutea*
Pocillopora verrucosa	*Trapezia* cf. *speciosa*
Pocillopora verrucosa	*Trapezia cymodoce*
Pocillopora verrucosa	*Trapezia richtersi*
Pocillopora woodjonesi	*Hapalocarcinus* sp. B*
Pocillopora woodjonesi	*Quoyula* sp. A
Pocillopora woodjonesi	*Trapezia tigrina*
Pocillopora woodjonesi	*Utinomiella* sp. A
Porites lobata	Lithophagidae sp. B
Porites lobata	*Paguritta* sp.
Porites lobata	*Pedum spondyloideum*
Porites rus	*Coralliophila* sp.
Seriatopora hysterix	*Alpheus lottini* "stripe"
Seriatopora hysterix	*Hapalocarcinus* sp. D*
Seriatopora hysterix	*Trapezia guttata*
Stylophora pistillata	*Alpheus lottini* "stripe"
Stylophora pistillata	*Hapalocarcinus* sp. E*
Stylophora pistillata	*Trapezia* cf. *lutea*
Stylophora pistillata	*Trapezia cymodoce*
Stylophora pistillata "little"	*Alpheus lottini* 'spots'
Stylophora pistillata "little"	*Hapalocarcinus* sp. F*
Stylophora pistillata "little"	*Trapezia guttata*
Tubastrea micrantha	Xanthoidea sp.
Turbinaria B	*Opercarcinus* sp. B.*
Turbinaria C	*Opercarcinus* sp. C.*
Turbinaria mesenterina	*Opercarcinus* sp A.*
Wandering Coral	Wandering Coral Worm
Octocorals	
Gorgonia sp. A	*Galathea* sp.
Gorgonia sp. A	*Mysida* sp.
Gorgonia sp. A	*Pontoniinae* sp.
Gorgonia sp. B	*Pontoniinae* sp.
Lobophyton sp.	*Ovulidae* sp.
Sarcophyton sp.	*Pontoniinae* sp.
Scleronephthea 1	*Galathea* sp.
Scleronephthea 1	*Mysida* sp.
Scleronephthea 1	*Ovulid* A
Scleronephthea 1	*Pontoniinae* sp.
Scleronephthea 2	*Mysida* sp.
Scleronephthea 2	*Pontoniinae* sp.
Sinularia	*Mysida* sp.
Sinularia	*Pontoniinae* sp.
Tubipora musica	*Alpheidae* sp.
Tubipora musica	*Pontoniinae* sp.