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Parasites of Marine Fishes off Langkawi, a Preliminary Report

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ABSTRACT A preliminary survey on the parasitofauna of marine fishes off Langkawi reveals that in most cases the monogenean species recovered are similar to those from the same fish species caught elsewhere, indicating that locality factors do not affect their distribution patterns. However locality differences do affect the absence or presence of some monogenean species, for example the platycephalids off Langkawi have monogeneans but monogeneans are absent on platycephalids from other areas of Peninsular Malaysia. Hyperparasitism is observed for the first time on Malaysian monogeneans. Some of the fish groups surveyed have not been examined. Descriptions and identifications of these parasites are on-going particularly the gut parasites. Making Langkawi as a national park will enable continuous uninterrupted monitoring to obtain ecological data for health-index and enable investigation of interesting phenomenon such as hyperparasitism.

ABSTRAK Kajian mengenai parasitofauna dalam ikan air masin dari Langkawi menunjukkan spesies monogenean yang dijumpai adalah sama untuk spesies ikan yang sama walaupun ditangkap dari tempat berlainan. Ini menunjukkan faktor tempatan tidak mempengaruhi corak distribusi monogenean. Walau bagaimanapun, localiti yang berbeza boleh mempengaruhi kehadiran sesetengah sepesies parasit seperti yang ditunjukkan oleh kehadiran monogenean dalam platycephalids dari Langkawi tetapi tidak dijumpai dalam platycephalids dari lain-lain tempat di semenanjung Malaysia. Hiperparasitisme telah dijumpai untuk kali pertama dalam monogenean dari Malaysia. Sesetengah kumpulan ikan adalah tidak dikaji sebelum ini. Oleh itu, pengenalpastian identiti parasit yang dijumpai masih sedang dijalankan, terutamanya untuk parasit daripada usus ikan. Menjadikan Langkawi sebagai satu taman negara akan membolehkan pengumpulan data ekologi dijalankan di bawah pengawasan yang beterusan tanpa gangguan untuk kajian indeks kesihatan dan fenomena menarik seperti hiperparasitisme.

(marine fishes, parasitofauna, monogenean species, hyperparasitism, Langkawi)

INTRODUCTION

Parasites are integral part of any ecosystem and all living organisms harbour parasites. Parasitological investigation is necessary for the formulation of effective sustainable management of ecosystem health. The recent outbreaks of emerging diseases such as avian flu, SARS and nipah virus amongst human populations indicate the potential risk of diseases from wildlife and livestock. Other zoonotic diseases include schistosomes from wild mammals and angiostronglosis from rats via snails. Fish too function as unwary carriers of zoonotic diseases such as Chinese liver fluke (*Clonorchis sinensis*) and *Anisaki* (nematodes), while frogs carry the zoonotic *Spirometra* in their thigh muscles [1].

Documenting the parasitofauna and understanding their ecology will provide the necessary baseline data to determine health status of the environment. Presently parasite species of many feral animals are still not known hampering investigation into the population dynamics of the parasites. The lack of ecological data prevented the development of parasite index for the ecosystem and the formulation of effective ecosystem health management strategies in wildlife conservation. Understanding the biology and ecology of the parasites is necessary to control and prevent diseases in intensive aquaculture, which tends to enhance parasitic diseases, lower production due to host mortalities or to lower economic returns due to unsightliness and lower weight gain. The position of the Island of Langkawi at the northern end of the straits of

Malacca provides a unique opportunity to study fish fauna of the Andaman Sea and to study island effect on the parasites of freshwater animals.

The documentation of the parasitofauna of aquatic organisms of Langkawi is part of a longterm research to document parasitofauna of aquatic organisms in and around Malaysia and Southeast Asian regions. Due to lack of time and manpower we could only examined marine fish and some frog species. This investigation is limited to the parasites found on the gills and alimentary system of the marine fishes caught off Langkawi as well as a preliminary investigation into the parasitofauna of frogs of Langkawi. In this paper the on-going frog parasites and fish gut parasites will not be discussed.

MATERIALS AND METHODS

Fish were collected using cast nets as well as gill nets off the Sungai Kilim area in N.E. Langkawi in April 2003, June 2004 and August 2004 and brought back to a makeshift laboratory for necropsy and collection of parasites. Parasites were collected from the gills and guts of fish. Frogs were caught around human habitation in Langkawi (around Hotel Legend) and also examined for parasites.

The parasites from fish and frogs were fixed accordingly to Lim [2] for later identifications. Parasites were fixed for morphological identifications as well as molecular characterizations. Whole parasites were fixed in 95% ethanol for molecular characterization. Fish and frog tissues were taken and fixed in 95% ethanol for molecular biology. Due to manpower and time constraint we are not able to complete the identifications of all the parasites collected and the descriptions of these parasites and extraction of their DNA are still on-going.

RESULTS AND DISCUSSION

A total of 193 fish belonging to 47 species, 41 genera and 34 families were examined. The fishes sampled are listed in Table 1 as well as Table 2. The fishes in Langkawi have yielded many interesting parasites but because the identifications of the parasites are not complete especially for new species only their parasitic groups will be given (see Table 1 and Table 2). The descriptions of the new species will be published in international systematic journals to ensure that the parasite species names are valid.

Table 1. Monogenean species found on marine fish species off Langkawi (* new species awaiting descriptions; # description currently being done)

Host Family	Host species	Monogeneans species	References
Carangidae	*Alepes melanoptera*	NIL	
	Carangoides armatus	NIL	
	Carangoides praeustus	*Monogeneans	
	Scomberoides commersonnianus	*Monogeneans	
	Scomberoides tol	NIL	
	Carangoides sp.	* Monogeneans	
Triacanthidae	*Triacanthus biaculeatus*	* Monogeneans	
Mugilidae	*Liza vaigiensis*	* Monogeneans	
	Valamugil seheli	* Monogeneans	
Gerreidae	*Gerres filamentosus*	* Monogeneans	
	Gerres abbreviatus	* Monogeneans	
Scombridae	*Rastrelliger kanagurta*	NIL	
Engraulididae	*Stolephorus* sp.	NIL	
Mullidae	*Upeneus sulphureus*	* Monogeneans	

Leiognathidae	*Leiognathus brevirostris*	* Monogeneans	
	Leiognathus equulus	* Monogeneans	
	Secutor sp.	* Monogeneans	
Clupeidae	*Anodontostoma chacunda*	NIL	
Pristigasteridae	*Ilisha megaloptera*	* Monogeneans	
Pomadasyidae	*Pomadasys hasta*	*Bravohollisia gussevi*	Lim, 1995
		B.kritskyi	Lim, 1995
		B.reticulata	Lim, 1995
		B.rosetta	Lim, 1995
		B.magna	Lim, 1995
		Caballeria liewi	Lim, 1995
		C.intermedius	Lim, 1995
		C.pedunculata	Lim, 1995
		C.robusta	Lim, 1995
Pomacentridae	*Abudefduf vaigiensis*	* Monogeneans	
Siganidae	*Siganus canaliculatus*	*Pseudohaliotrema* sp.	Lim, 2002.
	Siganus javus	*Pseudohaliotrema* sp.	Lim, 2002.
Sciaenidae	*Johnius carutta*	* Monogeneans	
	Gelama sp.	* Monogeneans	
	Dendrophysa russelli	* Monogeneans	
Lutjanidae	*Lutjanus johnii*	* Monogeneans	
	Lutjanus russeli	* Monogeneans	
	Lutjanus vitta	NIL	
Toxotidae	*Toxotes jaculator*	*Diplectanum jaculator*	Lim, in press
		D.toxotes	Lim, in press
		Diplectanum n. sp.	Lim, in press
		Heteroplectanum n. sp.	Lim, in press
Scatophagidae	*Scatophagus argus*	*#Metahaliotrema* sp.	Lim, in prep.
Serranidae	*Cephalopholis boenak*	NIL	
Hemiramphidae	*Hemiramphus far*	* Monogeneans	
Dasyatidae	*Dasyatis* sp.	* Monogeneans	
Centropomidae	*Lates calcarifer*	*Pseudorhabdosynchus latesi*	Lim, in prep.
		P.monosquamodiscusi	Lim, in prep.
Ephippidae	*Ephippus orbis*	* Monogeneans	
Tetraodontidae	*Tetraodon nigroviridis*	* Monogeneans	
	Lagocephalus spadiceus	NIL	
Nemipteridae	*Nemipterus* sp.	NIL	

Ariidae	*Arius venosus*	*Chauhanellus aspinous*	Lim, 1994
		Hamatopeduncularia isosimplex	Lim,1995
		H.longicopulatrix	Lim, 1995
		H.venosus	Lim, 1995
		Neocalceostoma elongatum	Lim, 1996
	Arius sagor	*Chauhanellus forcipis*	Lim, 1994
		C.intermedius	Lim, 1994
		C.malayanus	Lim, 1994
		C.trifidus	Lim, 1994
		Hamatopeduncularia isosimplex	Lim, 1995
		Neocalceostoma elongatum	Lim, 1996
	Arius maculatus	*Chauhanellus auriculatum*	Lim, 1994
		C.poculus	Lim, 1994
		C.pulutanus	Lim, 1994
		Hamatopeduncularia isosimplex	Lim, 1995
		H.malaccensis	Lim, 1995
		H.papernai	Lim, 1995
		Neocalceostoma elongatum	Lim, 1996
	Arius caelatus	*Chauhanellus caelatus*	Lim, 1994
		Hamatopeduncularia malayanus	Lim, 1995
	Osteogeneiosus militaris	*Chauhanellus osteogeneiosi*	Lim, 1994
		Hamatopeduncularia malaccensis	Lim, 1995
		H.simplex	Lim, 1995
Megalopidae	*Megalops cyprinoides*	*#Diplectanocotyla* spp.	Lim, in prep
Sphyranenidae	*Sphyraena jello*	* Monogeneans	
Drepanidae	*Drepane punctata*	* Monogeneans	
Platycephalidae	*Platycephalus indicus*	*#Haliotrema* sp.	Lim, in prep.
Sparidae	*Acanthopagrus berda*	* Monogeneans	
	Strongylura strongyloides	* Monogeneans	
Ambassidae	*Ambassis gymnocephalus*	* Monogeneans	
Polynemidae	*Eleutheronema tetradactylum*	NIL	
Belonidae	*Tylosurus crocodilus*	* Monogeneans	
Bothidae	*Pseudorhombus natalensis*	NIL	

Table 2. Parasites that found in the alimentary tract of some marine fish off Langkawi

Host Name	parasites	Alimentary system
Anodontostoma chacunda (5)	nil	
Anodontostoma chacunda (1)	Acanthocephalan (2)	Intestine
Liza vaigiensis (3)	Nil	
Triacanthus biaculeatus (2)	Nil	
Alepes melanoptera	Trematode (1)	Stomach
Leiognathus brevirostris	Nematode (1)	Intestine
Leiognathus brevirostris (25)	Acanthocephalan (143)	Intestine + stomach
Scomberoides commersomianus	Nematodes	Cysts outside stomach
Toxotes sp.(8)	nil	
Hemiramphus sp (1).	nil	
Hemiramphus sp.	nematode (1)	Stomach
Tylosurus crocodiles	acanthocephalan (6)	Stomach –
Tylosurus crocodiles(2)	nematode (3)	Stomach & intestine
Pomadasys hasta (4)	nil	
Arius sp.	No parasite	
Carangoides praeustus	trematodes (5)	Stomach
Carangoides praeustus	nematodes (2)	Stomach
Carangoides praeustus	No parasite	
Plotosus sp.	nematode (1)	Intestine
Plotosus sp.	acanthocephala (2)	Intestine
Ephippus orbis	No parasite	
Gelama ?	nematodes (7)	Cyst
Gelama ?	nematodes (2)	Intestine
Gelama?	Acanthocephala (1)	Intestine
Lagocephalus spadicous	No parasite	
Lutjanus russelli	trematodes (4)	Intestine
Lutjanus russelli	No parasite	
Megalops cyprinoides	trematodes (38)	Stomach + intestine
Platycephalus sp.	No parasite	
Triacanthus biaculeatus (2)	No parasite	
Triacanthus biaculeatus	nematode (1)	Stomach

Monogeneans from marine fish belonging to the Ariidae, Plotosidae and Siganidae in particular have been already been documented by Lim [2, 3, 4, 5, 6] from other parts of Peninsular Malaysia in particular the waters of the Straits of Malacca.

Although *Toxotes jaculatrix* could be found elsewhere, investigation on the parasites of this fish species began in Langkawi. Two previously described species, *Diplectanum jaculator* Mizelle & Kritsky, 1969 and *D. toxotes* Mizelle & Kritsky, 1969) and one new species of *Diplectanum* and *Heteroplectanum* were obtained from the gills of *T. jaculatrix*. The re-descriptions of the previously described monogeneans and description of the new species will be published soon in Systematic Parasitology [7].

Globally there are 67 species of Family Platycephalidae (Flatheads) and 54 valid *Platycephalus* species according to FISHBASE [8]. The diversity of monogeneans on *Platycephalus* species is rather low with only 5 species of monogeneans viz, *Ancyrocephalus platycephali* (Yin & Sproston, 1949) *Haliotrema indicum* Tripathi, 1959, *Haliotrema macassariensis* (Yamaguti, 1963). *Haliotrema platycephali* Yin & Sproston, 1948 and *Haliotrema swatowensis* Yao, Wang, Xia & Chen, 1998. However to date monogeneans are only obtained from *P. fuscus* and *P. indicus* from India, China and Macassar, Indonesia. A survey of more than 100 *Platycephalus indicus* from both the West and East coast of Peninsular Malaysia yielded no monogeneans but a recent collection from *P. indicus* from the waters off

Langkawi yielded monogeneans. However a detailed investigation is needed and we have materials for molecular investigations from our Langkawi collection as well as from Japan.

There is only one genus, *Megalops* in the Megalopidae, with two species, *Megalops cyprinoides* with a distribution within the Indo-Paciifc region (Indian Ocean, South China Sea and Pacific Ocean) and *Megalops atlanticus* from the Atlantic Oceans. Although the megalopids are mainly found in the marine environment they can enter freshwater environment. Yamaguti described one species, *Diplectanocotyla gracilis* from this fish. Rakotofiringa, Oliver & Lambert, [9] described *D. megalopis* from *M. cyprinoides* off Madagascar and later the same species was redescribed from *M. atlanticus* [10]. Our present collection yielded three *Diplectanocotyla* species, *D. gracilis, D. megalopis* and a new species of *Diplectanocotyla.*

The monogeneans found on tripod fishes (Triacanthidae) off Langkawi confirmed our suspicion that they too produce haptoral bioadhesives like the *Bravohollisia* and *Caballeria* species [11]. Table 1 shows that there are many other monogenean species which are new to Science requiring further investigations. In some cases more collections are necessary before descriptions could be done.

The gut is also an interesting habitat for other helminthes and the present collection (Table 2) indicates that indepth investigation is necessary. The parasites obtained are being processed for identification as well as for DNA extraction to determine their phylogenetic relationships.

There are still many fish species (see elsewhere in this volume) that we have not sampled and a more detailed investigation should be done to ensure that all the fish species available are investigated. There is also a need to look at the freshwater fish species and to increase our collection of frog parasites. The frog parasites once completed will give us an idea of how long the island has been separated from the mainland.

Langkawi is situated at the start of the Straits of Malacca, which means that this area will possess fish species that could be found in Andaman Sea and Indian Ocean as well as fishes making the route from the South China Sea. This could account for why no parasites were found on *Platycephalus* sp. from around the other parts of the Peninsular and this is the first location in the Peninsular that we found any monogeneans, although monogeneans were recorded in Makassar, Japan and India [12; Lim, pers. observation].

Many of the fish species caught in Langkawi have culture potentials and as such a complete documentation of their parasitofauna is important. Aquaculture is an important coastal activity in Langkawi and documentation of the parasites in/on culture and feral fish is important especially since the feral fish populations form the reservoir for potential parasitic pathogens in intensive culture. Most parasite species, in particular the monogeneans, are host specific and this specificity allows us to use parasites as indicators of the environmental status as well as host behaviour patterns and phylogenetic relationships as well as prevailing and past ecological conditions [13]. Studies have shown that most parasites on their original hosts do not cause diseases but these species can invade other hosts causing diseases in these naïve host species. There is thus a need to understand the parasites and an indepth study is truly necessary if one wants to control and prevent the occurrences of diseases.

The lament of many researchers is that the destruction of environment puts an end to the investigation of interesting phenomenon. We are currently seeking funds to study hyperparasitism in Langkawi as well as to develop our work on bioadhesive products further [14]. Making Langkawi a park will enable us to study in great depth phenomenon such as hyperparasitism and host specificity as well as to investigate in greater depth how parasites invade and attaches itself to the host – information which will help us control them without the use of chemicals which can be detrimental to the fish and also to us as consumers. We are also looking for Aspidogastrea [15] but we need time to find them and making Langkawi a national park will preserve the environment enabling such long term studies to be done.

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