

Parasites of Healthy and Diseased Juvenile Grouper (*Epinephelus malabaricus* (Bloch and Schneider)) and Seabass (*Lates calcarifer* (Bloch)) in Floating Cages in Penang, Malaysia

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Abstract

One hundred eighty healthy juvenile grouper, *Epinephelus malabaricus* (Bloch and Schneider), and 642 healthy juvenile seabass, *Lates calcarifer* (Bloch), purchased by fish farmers, either locally or imported for stocking in floating cages in Penang, were examined for parasites. Diseased grouper ($n = 211$) and seabass ($n = 102$) showing symptoms of hemorrhage on the body, fin rot and scale loss, were also examined for parasites. Grouper and seabass from Malaysia, Thailand and the Philippines each had the same parasite species which were numerically abundant, regardless of source of origin of the fish host. Both species of marine finfishes imported into Malaysia carried with them a large variety of parasites, some of which, such as *Cryptocaryon irritans* Brown, 1951 and *Trichodina* sp., are known pathogens.

The most common parasite recovered from healthy and diseased grouper was *Pseudorhabdosynochus epinepheli* (Yamaguti, 1938). The prevalence and mean intensity of infection of *P. epinepheli* in healthy grouper originating from Malaysia were 86.0% and 39.6 helminths per infected fish, respectively; from the Philippines: 92.0% and 51.1 helminths per infected fish, respectively; and from Thailand: 92.9% and 29.5 helminths per infected fish, respectively. The diseased grouper originating from Malaysia had a prevalence of 88.5% for this monogenean with a mean intensity of 17.4, whereas those originating from Thailand were not infected. A large proportion of healthy (97.0%) and diseased (90.0%) grouper from Thailand were infected with *Trichodina* sp. A major factor that may cause the disease outbreaks in grouper originating from Malaysia was the high intensity of *P. epinepheli* together with the infection of the protozoans *Cryptocaryon irritans* and *Trichodina* sp., whereas *Trichodina* sp. was likely the primary cause of disease outbreaks in grouper originating from Thailand.

Both healthy and diseased juvenile seabass from Thailand were heavily infected by *C. irritans*, *Trichodina* sp., *Pseudorhabdosynochus latesi* (Tripathi, 1957) and *Diplectanum* sp. The prevalence of *C. irritans* in healthy and diseased seabass from Thailand was 20.4% and 22.5%, respectively, whereas it was 62.8% and 37.3% for *Trichodina* sp. The prevalence and mean intensity of *P. latesi* for healthy seabass were 14.8% and 9.5, respectively, and for diseased seabass, 78.4% and 10.8, respectively. A

large proportion (20.5%) of diseased seabass was also infected by *Diplectanum* sp., with a mean intensity of 15.1. Heavy infections of protozoans and monogeneans in seabass from Thailand were the primary cause of disease outbreaks in these fish. In contrast, juvenile seabass originating from Malaysia had very few parasites and no disease outbreaks were observed after their introduction into the floating cages.

Introduction

Two species of marine finfishes are commonly cultured in floating cages in Southeast Asia; greasy grouper (*Epinephelus malabaricus* (Bloch and Schneider)) and silver seabass (*Lates calcarifer* (Bloch)). Grouper fingerlings for culture in floating cages are obtained entirely from the wild, whereas those of seabass are obtained from hatcheries. Thailand exports considerable numbers of grouper and seabass fry to various Southeast Asian countries.

The parasite fauna and bacteria flora of juvenile seabass imported from Thailand for culture in floating cages in Malaysia have been reported by Leong and Wong (1986) and Wong and Leong (1986). The common parasites and bacteria recovered were the protozoans *Cryptocaryon irritans* Brown, 1951 and *Trichodina* sp., the monogenean *Pseudorhabdosynochus latesi* (Tripathi, 1957), and bacteria belonging to the genus *Vibrio*. However, the parasite faunas of diseased seabass, and healthy and diseased juvenile grouper have not been reported.

This paper presents data on the parasite faunas of healthy and diseased juvenile grouper and hatchery-reared seabass which were cultured in floating cages in Penang, Malaysia.

Materials and Methods

The majority of seabass juveniles stocked for cage culture in Malaysia were imported from Bangkok and Songkhla, Thailand, with a small number being from local hatcheries. Most juvenile grouper were also imported from Songkhla; some were also imported from the Philippines or caught from local coastal waters. The majority of fish farmers surveyed did not give any prophylactic treatment to the fish before stocking them in the floating net cages. Both species of healthy fish examined in this study were purchased from the fish farmers soon after their arrival, prior to any prophylactic treatment and before placing them in the floating cages.

Disease outbreaks usually occurred two to three weeks after the fishes were introduced into floating net cages. These diseased grouper and seabass were obtained from the fish farmers as soon as a disease outbreak occurred. All diseased fishes showed signs of hemorrhage on the body, fin rot and were moribund. Diseased seabass fry were obtained for examination in June and October 1985, whereas diseased grouper fry from Malaysia were obtained for examination in August and November 1985 and November 1986, and those from Thailand in December 1986.

The fork length and weight were recorded and the fish were then examined macro- and microscopically for ecto- and endoparasites. The mucus from the body and gills was scraped and microscopically examined for Protozoa. Monogenea, Trematoda and Cestoda were fixed and preserved in 70% alcohol, stained in Semichon's acetocarmine and mounted in Canada balsam. Nematoda, Acanthocephala, Isopoda and Copepoda were preserved in 2% glycerine in 70% alcohol, cleared in glycerine and examined in the same medium under a compound or dissecting microscope. The parasite specimens are deposited in the authors' collection.

Results

Parasites of Healthy and Diseased Juvenile Grouper

Healthy juvenile grouper imported from Thailand ($n = 100$), the Philippines ($n = 50$) and taken from Malaysian coastal waters ($n = 30$) were examined for their parasites upon arrival at the fish farm. The grouper from Thailand, with an average fork length of 3.6 cm were the smallest, whereas those from Malaysia and the Philippines averaged 6.2 cm and 15.4 cm in length, respectively (see Table 1).

A total of 11 species of parasites were recorded from healthy grouper. The numerically abundant parasites of grouper were similar regardless of whether the fish originated from Thailand, Malaysia or the Philippines. Nearly all healthy juvenile grouper (97.0%) imported from Thailand were infected with the protozoan *Trichodina* sp., some species of which are known to be pathogenic (Table 1). This protozoan was not found in samples of healthy grouper from the Philippines or Malaysia. Healthy grouper originating from all three countries were heavily infected with the monogenean *Pseudorhabdosynochus*

Table 1. Prevalences and mean intensities of infection (in parentheses) of parasites in healthy and diseased juvenile grouper, *Epinephelus malabaricus* from Malaysia, the Philippines and Thailand.

Parasites	Source of juvenile grouper				
	Healthy		Philippines	Diseased	
	Malaysia	Thailand		Malaysia	Thailand
Protozoa					
<i>Cryptocaryon irritans</i>	-	6.0	-	3.7	-
<i>Trichodina</i> sp.	-	97.0	-	0.7	90.0
Monogenea					
<i>Megalocotylonides epinepheli</i>	-	-	-	0.7(1.0)	-
<i>Pseudorhabdosynochus epinepheli</i>	86.0(39.6)	92.9(29.5)	92.0(51.1)	88.5(17.4)	-
Trematoda					
<i>Cardicola</i> sp.	-	-	-	-	33.3(1.1)
<i>Ectenurus</i> sp.	3.3(1.0)	-	-	3.4(1.0)	-
<i>Helicometrina nimia</i>	3.3(1.0)	-	-	12.2(1.0)	-
<i>Lecithochirium neopacificum</i>	-	1.0(1.0)	14.0(1.4)	-	-
<i>Proserhynchus pacificus</i>	-	-	90.0(4.0)	0.7(1.0)	3.0(0.0)
Cestoda					
Cestoda gen. sp. (metacystode)	-	2.0(33.5)	2.0(1.0)	-	3.0(1.0)
Nematoda					
<i>Raphidascaris</i> sp. (larva)	3.3(1.0)	-	6.0(1.3)	2.0(1.0)	12.1(1.0)
Acanthocephala					
<i>Acanthocephalus</i> sp.	3.3(1.0)	1.0(1.0)	-	-	-
Copepoda					
<i>Caligus</i> sp. (juvenile)	6.7(24.0)	-	-	0.7(1.0)	-
No. of fish examined	30	100	50	148	63
Average fork length (cm) (range)	6.2 (2.8-10.0)	3.6 (1.5-4.8)	15.4 (12.2-18.0)	4.5 (3.2-9.2)	3.4 (2.2-4.0)
Average weight (g) (range)	4.8 (0.3-15.0)	0.6 (0.7-1.4)	55.7 (25.0-90.0)	1.4 (0.6-9.2)	0.4 (0.2-0.9)

epinepheli. The prevalence and mean intensity of this monogenean in grouper from the Philippines were 92.0% and 51.1, respectively; from Malaysia, 86.0% and 39.6, respectively; and from Thailand, 92.9% and 29.5, respectively.

A total of 211 diseased juvenile grouper were examined for their parasites. The average fork length of diseased grouper originating from Malaysia was 4.5 cm while that for those from Thailand was 3.4 cm. A total of 11 species of parasites were recovered. The diseased grouper from Malaysia had nine species of parasites whereas those from Thailand had only five (see Table 1). A large proportion of the diseased grouper from Thailand (90.0%) were infected by *Trichodina* sp. whereas only 0.7% of the diseased grouper from Malaysia were infected with this protozoan. Diseased grouper from Malaysia had a high prevalence (88.5%) and mean intensity (17.4) of *P. epinepheli*, a species which was not found on diseased grouper from Thailand.

Parasites of Healthy and Diseased Juvenile Seabass

A total of 501 healthy juvenile seabass imported from Thailand and 141 fish originating from a Malaysian hatchery were examined for their parasites upon arrival at the fish farm. The average fork length of healthy seabass from Thailand and from Malaysia was 5.9 cm and 6.0 cm, respectively (Table 2).

In all, ten species of parasites infected healthy seabass from Thailand and Malaysia. The most frequently encountered parasites infecting juvenile seabass imported from Thailand were *Trichodina*

Table 2. Prevalences and mean intensities of infection (in parentheses) of parasites in healthy and diseased juvenile seabass, *Lates calcarifer* from Thailand and Malaysia.

Parasites	Source of juvenile seabass		
	Healthy		Diseased
	Malaysia	Thailand	Thailand
Protozoa			
<i>Cyrtocaryon irritans</i>	-	20.4	22.5
<i>Trichodina</i> sp.	3.5	62.8	37.3
Monogenea			
<i>Pseudorhabdosynochus latesi</i>	-	14.8(9.5)	78.4(10.8)
<i>Diplectanum</i> sp.	-	4.0(3.9)	20.5(15.1)
Trematoda			
<i>Cardicola</i> sp.	-	-	2.0(2.0)
<i>Ectenurus</i> sp.	-	-	10.8(1.4)
<i>Bucephalus margaritae</i>	0.7(1.0)	0.2(51.0)	-
<i>Pseudometadina celebsensis</i>	-	0.6(4.7)	-
<i>Rhipidocotyle</i> sp.	-	0.2(20.0)	3.9(1.3)
<i>Lecithocladium grandulosum</i>	0.7(1.0)	-	-
<i>L. neopacificum</i>	-	-	1.0(5.0)
Cestoda			
Cestoda gen. sp (metacestode)	-	1.4(8.0)	11.8(4.3)
Nematoda			
<i>Anisakis</i> sp. (larva)	-	-	3.9(2.0)
<i>Raphidascaris</i> sp. (larva)	6.4(1.4)	0.6(1.3)	40.2(4.9)
Isopoda			
<i>Aegathoa</i> sp.	-	-	4.9(1.2)
<i>Cymothoa</i> sp.	-	-	1.0(1.0)
No. of fish examined	141	501	102
Average fork length (cm) (range)	6.0 (5.1-8.3)	5.9 (4.0-12.5)	5.8 (4.8-9.5)
Average weight (g) (range)	2.6 (1.4-7.3)	3.3 (0.7-20.5)	3.3 (0.7-20.5)

sp. (62.8%) and *Pseudorhabdosynochus latesi* (14.8%) (Table 2). In contrast, healthy locally reared juveniles originating from a hatchery in Kedah had very few parasites. *Pseudorhabdosynochus latesi* was not recovered from the locally reared seabass.

One hundred and two diseased juvenile seabass from Thailand were examined for parasites. Their average fork length and weight were 5.8 cm and 3.3 g, respectively. A total of 13 species of parasites were recovered. The variety of parasites was similar to that found in juveniles imported for culture in floating cages.

A large proportion of diseased seabass were infected by the protozoans *Cryptocaryon irritans* (22.5%) and *Trichodina* sp. (37.3%), the monogeneans *Pseudorhabdosynochus latesi* (78.4%) and *Diplectanum* (20.5%), and the nematode *Raphidascaris* sp. (40.2%) (Table 2). The mean intensities of *P. latesi* (10.8) and *Diplectanum* sp. (15.1) were rather high for the size of these fishes. Diseased seabass had patches of scales dropping off from their bodies.

Discussion

Marine finfishes have been commercially cultured in floating net cages in Southeast Asia for about 14 years. Leong and Wong (1986) reported 90.2% of seabass juveniles imported from Bangkok and 95.7% imported from Songkhla for culture in floating cages were infected with one or more species of parasites. The most common species were *Cryptocaryon irritans*, *Pseudorhabdosynochus* (= *Cycloplectanum*) *latesi*, *Diplectanum* (= *Cycloplectanum*) sp. and *Raphidascaris* sp. The parasite fauna of wild and diseased juvenile golden snapper, *Lutjanus johni* (Bloch), cultured in floating cages in Penang has also been reported (Leong and Wong 1987). Other than these two studies, no other quantitative baseline study of the parasite fauna of juvenile marine finfishes for culture in floating cages in Southeast Asia has been reported.

Grouper, regardless of origin, have similar types of numerically dominant parasites. Such phenomenon is not uncommon for species of fishes that are widely distributed in the temperate region (see Kennedy 1974; Margolis and Arthur 1979). Dogiel (1964) has suggested that the same species of fish may have similar parasite fauna regardless of the habitat and that fish species within the same family also may have many parasites in common. It appears that fish in the tropical region may also exhibit such phenomena.

Although *Pseudorhabdosynochus latesi* was the most common parasite recovered in healthy grouper, its low intensity in grouper from Thailand might be due to the small size of the fish. Small fish were more susceptible to infection by *Trichodina* sp., as indicated by the high prevalence in fish from Thailand. No infections were observed in healthy fish from Malaysia and the Philippines. Both *Cryptocaryon irritans* and *Trichodina* sp. are known to infect young fishes more often than older ones.

There are great differences in the parasite fauna of healthy seabass from Thailand and Malaysia, even though the size of the fish from the two countries was similar. Very few parasites were recovered from seabass produced from the local hatchery in Malaysia. The most noticeable differences were the high infection of *Cryptocaryon irritans*, *Trichodina* sp. and *Pseudorhabdosynochus latesi* in seabass from Thailand, and the near absence of all these parasites in seabass from Malaysia. It is possible that these parasites have established themselves in the hatcheries in Thailand and that the long duration (up to 48 hours) of transportation of juveniles from Thailand to fish farmers in Malaysia may induce higher susceptibility, enabling protozoans to reproduce easily on the transport-stressed fish. The short distance between the local hatchery and the fish farmer may also have stressed the fish through handling, but the duration of transportation was so short (up to three hours) that populations of the protozoan did not have a chance to build up.

The parasite fauna of both diseased grouper and seabass was similar to that of the healthy fishes. However, there were some differences, particularly in terms of intensities of infection by individual parasite species. A large number of diseased grouper caught from coastal waters were heavily infected with *P. epinepheli* considering the small size of the fish. High intensities of this monogenean on the small fish may have caused the observed disease outbreaks. The majority of diseased grouper from Thailand were infected by *Trichodina* sp. Considering the small size of these fish and the known pathogenicity of members of this genus to small fish, this protozoan would most likely be the cause of disease outbreaks in grouper imported from Thailand.

It was noted that diseased seabass originating from Thailand had higher prevalences and intensities of infection of monogeneans (*P. latesi* and *Diplectanum* sp.) than did healthy fish. Also fewer diseased seabass were infected by *Trichodina* sp. Considering the size of the fish and the high intensities of the monogeneans, it is most

likely that these parasites were the primary cause of the disease outbreak, and that vibriosis was a secondary infection which eventually killed the seabass imported from Thailand.

The intensity of monogenean infection in relation to the size of the fish may be an important cause of disease outbreaks in cultured fish. The smaller size fish may succumb more easily than larger ones. Epizootic infection and possible mortalities caused by the monogeneans *Heteraxine heterocerca* (Goto, 1894) have been reported for cultured yellowtail (*Seriola quinqueradiata* Temminck and Schlegel) in Japan (Eugusa 1983), for *Bicotylophora terachinoti* (MacCallum, 1921) in cultured pompano (*Trachinotus carolinus* (L.)) in North America (Sinderman 1977), and for *Benedenia monticelli* (Parona and Perusia, 1895) in cultured grey mullet (*Mugil cephalus* L.) in Israel (Paperna 1983). From these studies, it would appear that prophylactic treatments need to be devised so as to reduce intensities of infection by monogeneans during the first few weeks after young fish are introduced into the floating cages.

Acknowledgements

We would like to thank Dr. J. R. Arthur, International Development Research Centre of Canada (IDRC) for his review of the manuscript. Thanks are also due to many technical assistants, especially Liang Kok Seng, Lim Siew Yeok, Vijayakumari Seevaratnam, Tan Siew Hwa, Helen Teh, Chong Woi Keong and Goh Geok Hwa, Chieng Lay Fang and Ooi Ah Hee for their support, both in the laboratory and in many of the field trips. This study was supported by an IDRC grant to the Marine Fish Diseases (Malaysia) Project.

References

- Dogiel, V.A. 1964. General parasitology. Oliver and Boyd Ltd., Edinburgh. (English translation by Z. Kabata).
- Eugusa, S. 1983. Disease problems in Japanese yellowtail *Seriola quinqueradiata*, culture, a review. Rapp. P.-V. Réun. CIEM 182: 10-78.
- Kennedy, C. R. 1974. A checklist of British and Irish freshwater fish parasites with notes on their distribution. J. Fish Biol. 6: 613-644.
- Leong, T. S. and S. Y. Wong. 1986. Parasite fauna of seabass, *Lates calcarifer* Bloch, from Thailand and from floating cages in Penang, Malaysia, p. 251-254. In J.L. Maclean, L.B. Dizon and L. V. Hosillos. (eds.) The First Asian Fisheries Forum. Asian Fisheries Society, Manila, Philippines.

- Leong, T.S. and S.Y. Wong. 1987. Parasites of wild and diseased juvenile golden snapper, *Lutjanus johni* (Bloch), in floating cages in Penang, Malaysia. Asian Fish. Sci. 1: 83-90.
- Margolis, L. and J.R. Arthur. 1979. Synopsis of the parasites of fishes of Canada. Bull. Fish. Res. Board Can. 199. 269 p.
- Paperna, I. 1983. Review of diseases of cultured warm water marine fish. Rapp. P.-V. Réun. CIEM 182: 44-48.
- Sinderman, C.J., editor. 1977. Disease diagnosis and control in North American marine aquaculture. Developments in Aquaculture and Fisheries Science. Elsevier, Amsterdam.
- Wong S.Y. and T.S. Leong. 1986. Bacterial flora of seabass, *Lates calcarifer* imported from Thailand for culture in floating cages in Penang, p. 243-246. In J.L. Maclean, L.B. Dizon and L.V. Hosillos (eds.) The First Asian Fisheries Forum. Asian Fisheries Society, Manila, Philippines.