JSc- EUSL(2009) **Vol.6 No.1, p 68-77**

ISSN 1391-586X: © 2009 Published by Eastern University, Sri Lanka.

Comparison of parasites fauna of economically important fish from Batticaloa lagoon

[1]V. Sujarajini and [2]P. Vinobaba

[1]Faculty of Applied Sciences, South Eastern University, Sammanthurai

[2]Department of Zoology, Eastern University, Vantharumoolai, Chenkalady

Abstract

This study focused on a comparison of the parasite fauna in several different economically important fish such as Etroplus suratenscis, Tachysurus spp., Glossogobius giuri, Ophiocephalus striatus, Oreochromis mossambicus and Ambassis commersoni at two locations within Batticaloa lagoon. Ergasilus parvitergum, Dermoergasilus amplectens, Caligus curtus, Lernaenicus sparatte, Procamellanous lonis and Acanthocephala sp., were the most common, and the occurrence of parasites among the fin fishes of Batticaloa lagoon was wide spread. The parasite genera E. parvitergum were the most prevalent on Etroplus suratensis whereas P. lonis and C. curtus was more common on Glossogobius giuris, whilst L. sparatte was more common on Oreochromis mossambicus; C. curtus and D. amplectens on Ambassis commersoni, and Acanthocephala sp. and P. lonis were more common on Tachysurus.

Keywords: *Ambassis, Batticaloa lagoon, Economically, Ergasilus, Etroplus, Parasite*

INTRODUCTION

Fish are indispensible source of proteins for humans, not withstanding their importance as an object of sport fishery and pets in the case of ornamental fish development[1].

The assemblage of all the different parasite species in the same host individual, whether they interact or not, forms an infra community. Infra communities are subsets of the component

community, which consists of all parasites species exploiting the host population. Not all infra communities harbour the same number of parasites species; in the same component community, some infra communities may include only one or two species whereas others may harbour a large number (10+) species.

The variation in the patterns of diversity and richness of parasite infra communities has been examined by taking into account host related factors such as diet, age, sex, body size and geographic location [2-5]. Explanations of biological interactions and population differences among parasite species have also been considered [6-7]. Studies relating to host variables and their parasite composition have allowed the identification of ecological stocks and contributed to the understanding of the phylogenetic relationships between host species. Furthermore, these studies also contribute to understanding the biogeographical patterns of hosts, habitat use, food and feeding mechanisms of hosts, and their integration with other members of the host community [8-10].

There is at least one other factor influencing infra community structure. Infra communities are typically short lived, their maximum life span being equal to that of the host. There is also a constant turnover of parasite individuals, with new individuals being recruited and old ones dying out all the time. The probability of each parasite species being recruited into an infra community, and the way in which they join infra communities, will also affect the composition and size of infra communities.

In general, ectoparasitic species exhibit an aggregated distribution on their hosts with a small proportion of the host population infected by the majority of the parasite population [11-13]. This aggregated pattern can be generated through a number of mechanisms, although most can be classified as either a consequence of variability in the exposure to infection, possibly associated with spatio-temporal variation in infective stages, and / or heterogeneity between hosts in their susceptibility to infection [14-18].

Few studies have been able to demonstrate that one or more of these mechanisms are dominant, although there is increasing evidence from studies working with fish parasites that variation in host exposure is the dominant cause [19].

The aim of this study is to compare the parasite species within economically important hosts which are seen as a key part of the parasites environment and a major selection pressure [20]. In addition, the study set out to establish the abundant species on the selected hosts; to provide an objective measurement of the infection levels on farms; to investigate the structure of the infra communities; and, to gather information to develop effective parasite management and control strategies. This study was very much important since the fish species caught

from the lagoon are consumed by the public surrounding the lagoon and the lagoon has a potential for future aquaculture practices and management. Therefore the status of the parasitic prevalence and abundance with period of time is essentially required for the socio-economy of the fishermen who are full time fishermen of the lagoon.

MATERIALS AND METHODS

Sampling procedure

Live economically important fishes were sampled from Batticaloa lagoon at two locations Koddaikallar as location 1 and Thuraineelavanai as location 2 as these two sites provide new venture to study about parasites. Fish were obtained from fisherman using a cast net, in the sub-littoral region of the lagoon. Sampling was carried out by two fishermen who continued fishing in the same site taking extreme care with the landing and handling of fish. Both sites were sampled once a week. Fish were brought to the laboratory at the South Eastern University in oxygenated polythene bags and held in aquaria in the same water in which they were collected and then processed the same day. After all the fish were sampled, the aquarium tanks were emptied and were left to dry until the next sampling.

Prevalence (usually expressed as a percentage)

Number of individuals of a host species infected with a particular parasite species ÷ Number of host examined × 100

Statistical analysis

The parasitic populations were not normally distributed. Thus non parametric statistical tests were carried out. Kruskal Wallis test was performed using MINITAB 14 version for the statistical analysis of the collected data.

RESULTS

A total of 1026 specimens of *Etrolplus suratenscis* were sampled from location 1 and 486 from location 2. The mean prevalence of *E. parvitergum* on *E. suratenscis* was greater than the other species of parasite found at location 1 (30.8±22.1) and location 2 (28.9±29.2) (Table1). The infra communities of parasites on *E. suratensis*, *Tachysurus* sp., *G. giuris, O. striatus, O. mossambicus* and *A. commersoni* were different at both locations (Table 1). There were significant differences in the mean prevalence of infection between the parasites at location 1 ($p = 0.0001$) and location 2 ($p = 0.0001$).

However, it was different for the parasites in *Tachysurus sp.* The mean prevalence of Acanthocephala was greater than the other parasites on *Tachysurus* at location 1 (14.238 mean prevalence), whereas *P. lonis* at location 2 (20.43 mean prevalence) (Table 1). There were significant differences in the mean prevalence of infection between the parasites in *Tachysurus* sp. at location 1 ($p=0.043$) and location 2 ($p =0.037$) (Table 2) but not in *G. giuris* at location 1 and at location 2, *O. striatus* at location 1 and at location 2, *O. mossambicus* at location 1 and location 2 and *A. commersoni* at location 1 and location 2

Table 1: Some economically important fin fish fauna of the Batticaloa lagoon showing the mean prevalence of their respective parasites.

	Etroplus suratenscis		*Tachysurus* spp.		*Glssogobius giuris*		*Ophiocephalus striatus*		*Oreochromis mossambicus*		*Ambassis commersoni*	
Number of fish caught	*1026*	*486*	*474*	*678*	*179*	*255*	*131*	*184*	*480*	*770*	*400*	*194*
Parasites	Loc 1	Loc 2	Loc 1	Loc 2	Loc1	Loc2	Loc1	Loc2	Loc1	Loc2	Loc1	Loc2
Malabarotrema india			6.9±19.4	1.6±4.6					3.0±8.0	2.1±9.6		
Ceylonotrema colembencis	1.9±5.8	1.8±9.5							1.2±4.5	1.9±5.9		
Posthodiplostomum	2.6±5.4	1.4±5.2										
Neascus	-		2.8±8.4	1.3±6.8								
Rhabdochonidae	-						3.6±18.9	2.0±8.1				
Digenean	-		1.3±5.2	2.7±8.2								
Capillaria	-							3.6±18.9				
Procamellanous lonis	0.7±3.8		1.5±5.9	20.4±31.7	25.7±38.4	31.2±33	3.6±18.9	6.1±20				
Acanthocephala sp.			14.2±16.2	9.7±16.9								
Ergasilus parvitergum	30.8±22.1	28.9±29.2							1.2±4.5	0.5±2.1		
Ergasilus seiboldi					20.4±35.9	16.5±28.5						
Dermoegarsilus amplectens	14.6±17	16.7±20.8										7.1±26.2
Ergasilus sp.	2.2±7.8	2.5±10.1										
Caligus curtus	2.5±6.1	7.6±18.3	3.4±10.2	2.7±8.7		16.7±25.8			0.7±3.0	2.9±8.1	13.4±29.3	0.4±2.1
Caligus epidermicus											2.6±10.3	1.8±9.5
Lernaenicus sprattae							14.3±32.9	15.7±30.8				

Table 2: The mean prevalence of some important parasites of the fin fish fauna at location 1 and location 2 of the Batticaloa lagoon with P value (5%).

Host	P value	
	Loc 1	Loc2
Etroplus suratenscis	0.0001	0.0001
Tachysurus spp.	0.043	0.037
Glossogobius giuris	0.652	0.131
Ophiocephalus striatus	0.580	0.50
Oreochromis mossambicus	0.953	0.957
Ambassis commersoni	0.330	0.960

DISCUSSION

The results of the present study represent a comparative analysis of the ecto- and endo parasites in a range of economically important fish hosts at two locations in Batticaloa lagoon. Proper comparative analyses are useful tool for hypothesis testing in evolutionary ecology [20]. Used in isolation from other kinds of evidence, comparative studies provide limited insights into evolutionary mechanisms and the casual links between biological traits [21]. On the other hand, the comparative approach is the most useful tool to identify general patterns that can guide further research.

The mean prevalence and composition of the infra communities were different in different species of fish at both locations. These differences may be attributed to the composition of infra communities, in terms of the number and identity of species and the relative numbers of individuals of each species, will depend on many factors. In theory, infra communities can range from highly structured and predictable sets of species to purely stochastic assemblages of species coming together entirely at random. Interactions among parasite species are one of the main forces that can shape an infra community and give it a structure departing from randomness [20].

The mean prevalence of the Acanthocephala were greater than the other parasites in *Tachysurus* sp. at location 1 (14.2± 16.2av. worms / infected fish) (Table 1), this may be due to the following reasons. The first is that the intermediate hosts with infective larvae constitute an appropriate portion of the diet of the definitive hosts [22]. Although low host

specificity permits other hoststo be utilized [23], *C. epidermicus* was found only on *A. commersoni* at location 1 (2.6±10.3 worms/fish) (Table 1) and location 2 (1.8 ±9.5 worms/ fish) (Table 1).

The proportion of parasitized fish found in this study, however, differed between location 1 and location 2. This may be a true difference or may be explained by the variation in the number of fish that were collected from each location resulting in different chances of detection.

The parasitic copepods *C.curtus D.amplectens, C.epidermicus, E.sieboldi, E. parvitergum* and *L. sparattae* were identified in the present study and the mean prevalence of each were different on the sampled hosts. Again the observed differences may be due to several reasons. Above mentioned parasites aggregated in the respective surfaces of fish and mean parasites per fish or prevalence distributions may function as a regulatory mechanism and one of the regulatory mechanisms is that the population is determined for quick transmission of parasite [23]. Another possible reason is that regulation occurs when certain individuals of a host population mount a successful immune response resulting in destruction of their parasites. Bradly's type III regulations, designate regulation of parasite numbers by host individuals [23].

The lowest fish infection rates were found for nematodes in farm fishes in Sri Lanka.[24]. This was expected, as nematodes are generally less of a problem in fish compared to terrestrial vertebrates [25]. However, the mean prevalence of *P. lonis* was highest in *G. giuris* at location 1 and location 2 (25.7± 38.4 and31.2±33 worm per fish) respectively (Table 1), lower in *Tachysurus* spp. at location 1 (1.5± 5.9) (Table 1) and not found at all at location 2 (Table 1). This may be due to different host specificity, competition among the parasite community within a host and the availability of the other hosts.

CONCLUSION

In conclusion, *E. parvitergum, D. amplectens, C. curtus, L. sprattae, P. lonis,* and *Acanthocephala* sp., were the most commonly encountered parasites among the fin fishes of Batticaloa lagoon. The parasite genera *E. parvitergum* were prevalent in *E. suratensis* whereas *P. lonis* and *C. curtus* were more common in *G. giuris, L. sprattae* were more common in *O. mossambicus* and *C. curtus* and *D. amplectens* in *A. commersoni* and *Acanthocephala* sp. and *P. lonis* were more common in *Tachysurus,* suggesting that they were specific for such fish species. Some of the parasites were absent in some species

may be due to competition of the parasites perhaps some parasites are generalistics however some are specific to a particular host.

ACKNOWLEDGEMENTS

The financial assistance provided by the National Science Foundation (Research Grant No: NSF/ RSP/2001/EUOS/S/01) is gratefully acknowledged.

REFERENCES

[1] Holmes, J.C. & Price, P.W. (1986) *Communities of Parasites in Community Ecology: Pattern and Process.* Blackwell Scientific Publications, Oxford, pp.187-213.

[2] George- Nascimento, M. & Marin. S. (1992) Effecto de dos especies hospedadoras, el lobo fino austral *Arctocephalus australis* (Zimmenman) ayel lobo marino commin taria byronia (Blainville) (Carrivora; Otariidae), sobre la Morfologi ay la fecundidad de Corynosoma sp. (Acanthocephala; Polymophidae) en Uruguay. *Rev. Chil. Hist. Nat.*, **65**, 83-193.

[3] Riffo, R. (1994) Fauna de parasitos metazoos del robalo Elginops maclovinus Valencinnes 1830 (Pisces: Nototheniidae): Importancia de los para'sitos como indicadores de las relaciones ecolo'gicas del hos[edador. *Est. Ocean*,**13**, 65-69.

[4] Gonza'lez,M., Acun a, E. & Oliva, M. (2001) Metazoan parasite fauna of the big eye flounder, Hippoglossina macrops, from northern Chile. Influence of host age and sex. *Mem. Inst. Oswaldo Cruz,* **96**, 1049-1054.

[5] Munoz, G., Baldebenito, V. & George–Nascimento, M. (2002) La dieta y fauna de para' sitos metazoos del torito *Bovichtys chilensis* Regan 1914 (Pisces: Bovichthydae ela costa de Chile centro –sur: variaciones geogra ficas y ontogene' ticas. *Rev. Chil. Hist. Nat.*,**75**, 661-671.

[6] Vickery, W. & Poulin, R. (1998) Parasite extinction and colonization and the evolution of parasite communities. *International Journal of Parasitology*, **28**, 727-737.

[7] Poulin. R. & Morand, S. (2000) The diversity of parasites. *Qualitative Review in Biology*., **75,** 277-293.

[8] Williams, H.H. & Jones, A. (1994) *Parasitic Worms of Fish*. Taylor and Francis, London, 593pp.

[9] Aldana, M., Oyarzu´n, J. & George-Nascimento, M. (1995) Iso´podos para´sitos como indicadores poblacionales del jurel *Trachurus symmetricus murphyi* (Nichols, 1920) (Pisces: Carangidae) frente a las costas de Chile. *Biol. Pesq*., **24**, 23– 32.

[10] George- Nascimento, M., 1997. Populations and assemblages of parasites in hake, Merluccius gayi, from the Southeastern Pacific Ocean: stock implecations. *Journal of Fish Biology*, **48**, 557-568.

[11] Riffo, R., Nu' n ez, M., 2000. La fauna de para sitos metazoos del rollizo Mugiloides chilensis (Pisces: Mugiloidae): la importancia de las relaciones ecolo' giccas del hospedader. Med. Amb. 13, **89-96.**

[12] Gonza'lez, M., Acun a, E. & Oliva, M. (2001) Metazoan parasite fauna of the big eye flounder, *Hippoglossina macrops*, from northern Chile. Influence of host age and sex. *Mem. Inst. Oswaldo Cruz*, **96**, 1049-1054.

[13] Shaw, D.J. & Dobson, A.P. (1995). Patterns of macro parasite abundance and aggregation in wildlife populations: a quantitative review. *Parasitology,* **111** (Suppl.), S111–S133.

[14] Anderson, R.M., Whitfield, P.J. & Dobson, A.P. (1978) Experimental studies of infection dynamics: infection ofthe definitive host by the cercariae of *Transversotrema patialense*. *Parasitology*, **77**, 189–200.

[15] Poulin, R. & Fitzgerald, G.J. (1989) A possible explanation for the aggregated distribution of *Argulus canadensis* Wilson, 1916 (Crustacea: Branchiura) on juvenile sticklebacks (Gasterosteidae). *Journal of Parasitology*, **75**, 58–60.

[16] Grenfell, B.T., Wilson, K., Isham, V.S., Boyd, H.E.G. & Dietz, K. (1995) Modelling patterns of parasite aggregation in natural populations: trichostrongylid nematode ruminant interactions as a case study. *Parasitology*, **111** (Suppl.), S135–S151.

[17] Wilson, K., Bjornstad, O. N., Dobson, A. P., Merler, S.,Poglayen, G., Randolph, S. E., Read, A.F. & Skorping, A. (2002) Heterogeneities in macroparasite infections: patterns and processes. In: *The Ecology of Wildlife Diseases* (ed. Hudson, P.J., Rizzoli, A., Grenfell, B.T., Heesterbeek, H. & Dobson, A.P.), Oxford University Press, Oxford. pp. 6–44.

[18] Karvonen, A., Hudson, P.J., Seppso Lao, O. & Valtonen, E.T. (2004) Transmission dynamics of a trematode parasite: exposure, acquired resistance and parasite aggregation. *Parasitology Research*, **92**, 183–188.

[19] Poulin, R. (1998) The evolutionary ecology approach. Evolutionary ecology of parasites from individuals to communities, ***1-12***

[20] Doughty, P. (1996) Statistical analysis of natural experiments in evolutionary biology: comments on recent criticism of the use of comparative methods to study adaptation. *American Naturalist*, **148**, 943-955.

[21] Kennedy C.R., (1972) The effect of Temperature and other factors upon the establishment and survival of *Pomphorhynchus laevis* (Acanthocephala) in gold fish, *Carassius auratus*, *Parasitology*, **65**, 283-294.

[22] Roubal, F.R. (1990) Seasonal changes in ecto parasites infection of juvenile yellow fin, *Acanthopagrus australis* (Gunther) (Pisces: Sparidae), from a small estuary in northern new South Wales. *Australian Journal of Marine and Fresh Water Research*, **41, 411-427.**

[23] Crofton, H.D. (1971) A quantitative approach to parasitism. Parasitology, **62**, 179-193.

[24] Thilakaratne, I.D.S.I.P., Rajapaksha, G., Hewakopara, A., Rajapakse, R.P.V.J. & Faizal, A.C M. (2003) Parasitic infections in freshwater ornamental fish in Sri Lanka. *Diseases of Aquatic Organisms*, **54**, 157-162.

[25] Anderson, R.C. (1996) Why do fish have so few roundworms (nematode parasites)? *Environmental Biology, Fisheries*, **46**, 1–5.