Journal of Animal and Veterinary Advances 4 (9): 789-793, 2005

Prevalence of *Epistylis* SP. Ehrenberg, 1832 (Peritrichia, Sessilida) on the Narrow-clawed Crayfish, *Astacus leptodactylus* (Eschscholtz, 1823) from Manyas Lake in Turkey

[1]Sası Hüseyin and [2]Berber Selcuk
[1]Department of Marine-Inland Water Sciences, Fisheries Faculty, Mugla University, Mugla, Turkey
[2]Department of Marine-Inland Water Sciences, Fisheries Faculty,
Çanakkale Onsekiz Mart University Çanakkale, Turkey

Abstract: The narrow-clawed crayfish, *Astacus leptodactylus* for its natural characteristics has a strong ecological impact in Manyas Lake. The record of ectocommensalism between *Epistylis* sp. and *A. leptodactylus* has been observed in Turkey. The narrow-clawed crayfish in the gill-chamber and on the gill filaments, carapace, abdomen, walking legs, uropod, telson, antennae, antennulae and eggs are present a ciliate protozoa peritrich as *Epistylis* sp. The total of 1018 specimens was examined, 512 were involved in ectocommensalism as being 50,29%. The presence of the ectocommersal *Epistylis* sp. has been determined in a new locality from Manyas Lake in Turkey. The correlation between the ciliata and the crayfish, and the water quality are shown monthly.

Key Words: Protozoa, *Epistylis*, *Astacus leptodactylus*, ectocommensal, epibiont, Manyas lake

INTRODUCTION

The genus *Epistylis* belongs to the order Peritrichida, a group of ciliated vase-shaped protozoans. Many species in this genus are sessile and form branching colonies[1]. The genus is the *Epistylis* most important group of fish parasites. Colonies of *Epistylis* can cause "Red sore disease" in freshwater fish. This parasit cause irritation, producing large amounts of mucous on the gils which is obstacle to oxygen uptake. The organism secrete an enzyme that breaks down tissue at the attachment and leaves a wound that is vulnerable and weak to bacterial and fungal invasion[2-6].

Epistylis species are described by some authors as being ectosymbiotes or Epibiosis or obligate ectocommensals on the surface of the aquatic invertebrates. Epibiosis is a facultative association of two organism. The form epibiont includes organism that, during the sessile phrase of their life cyle, are attached to the surface at the living substratum[7]. Several crustacean groups as cladocerans, copepods, isopods, cirripedes, amphipods, and decapods, include forms that are host for macroepibiont invertebrates[8].

Epistylis nigarae was reported first on narrow-clawed crayfish, *A. leptodactylus* by Matthes and Guhl[9]. Later the occurence of *Epistylis* sp. on the body surface of *A. leptodactylus* has been introduced in Spain[8]. Then *Epistylis* were recorded in a crayfish rearing unit from Turkey[10] and in artificially cultivated crayfish from Bulgaria[11].

In the crayfish, the ectocommensal form of *Epistylis* to attach to the exoskeleton and the branchia was observed in a new locality in Manyas Lake. The present study reports for the incidence of the detection of ectocommensal relationship between *Epistylis* sp. and narrow-clawed crayfish.

Manyas lake is located in province of Balıkesir in the Northwestern part of Turkey. The lake is about 4 m depth and the average is 1 to 2 m. The level of the lake, which is generally shallow, rises in spring, falling again in summer because of irrigation. The lake is fed by the Kocacay (Madra Stream), which forms a long delta from where it empties into the lake on the South. Another stream feeding the lake from the North is Sıgırcı Stream. The lake waters flow into Karadere from the southeast corner and empty into the Sea of Marmara. Manyas lake, known as bird paradise, is a natural reservation and a recreation area. This region is one of the most important world wide natural reserves for migratory birds and wildfowl species. The lake is surrounded by farmland. Dutlu stream has transported mostly solid and liquid wastes of poultry activities and household wastes.

The purpose of this study was to obtain an up-to-date look over of the peritrich ciliat as epibiont on *A. leptodactylus* from a new habitat in Manyas Lake. Therefore, faunal species and abundance of *Epistylis* sp. can be indicators of the water quality. The correlation between the ciliate and the crayfish, and the water quality are given.

Corresponding Author: Sası, Hüseyin, Department of Marine-Inland Water Sciences,
Fisheries Faculty, Mugla University, Mugla, Turkey

MATERIALS AND METHODS

This study was obtained between on April 2002 and on March 2003. A total of 1018 crayfish, *A. leptodactylus* were collected in Manyas lake of north-western Anatolia. The crayfish specimens were caught monthly with a trap. The samples of crayfish were transported alive to the laboratory in the jar with water. The crayfish examined alive for protozoa and then fixed in 4% formalin solution. After the crayfish samples were brought to the laboratory, the length (L±0.1 mm), weight (W±0.1 g) were recorded. The sex of specimen was determine from first and second pleopods and in the one occurring egg, either by eye or with the aid of a microscope. The samples enrolled according to the length. *Epistylis* was examined and identified by light microscope with micrometer[1]. Photographs of the ciliat and the infected crayfish were taken (Fig. 1).

RESULTS

Epistylis sp. belonging to the class Ciliphora of Protozoa were found with ectocommersal on the narrow-clawed crayfish, *A. leptodactylus* in a new locality from Manyas Lake in Turkey. *Epistylis* sp. was determined in the gill-chamber and on the gill filaments, carapace, abdominal, walking legs, uropod, telson, antennae and antennulae of the crayfish. In additional to, *Episylis* sp. is observed on submerged vegetation resources on the bottom at the top of the stack, which raised an alarm for the Manyas lake.

The carapace length and weight of the narrow-clawed crayfish were calculated respectively as 21.7-77.5 mm and 2.1-126.0 g in Manyas Lake during a year. The crayfish population was 34.62% female and 65.38% male.

During this study water temperatures varied from 9.2 to 31.2°C; pH was between 7.46 and 8.87, dissolved oxygen levels were 6.2-11.3; $CaCO_3$ levels were 200.0-360.0 mg L^{-1} and conductivity levels were 295.2-595.2 µm hos cm^{-1} (Fig. 2).

The Morphology of *Epistylis* sp.: *Epistylis* sp. was forms on the body of the crayfish and submerged plants. This protozoan is small and constitutes colonies. The ciliate protozoan *Epistylis*, a genus of Pentrichous infusoria with a short oral disc and collar and a rigid stalk, is often branching to form colony. The peristome is with a definite lip encircling. *Epistylis* has an elongated bell-form, contracting individualy with characteristics at posterior end. Pellicle is slightly annulated. *Epistylis* colonies is branched. The length of the body is ranged individuals 80-160 µm, colony long up to 3,5 mm. *Epistylis* colonies on crayfish resemble white tufts of fungus (Fig. 3).

Fig. 1: Infected crayfish catched from Manyas lake

Fig. 2: The crayfish covered with Epistylis

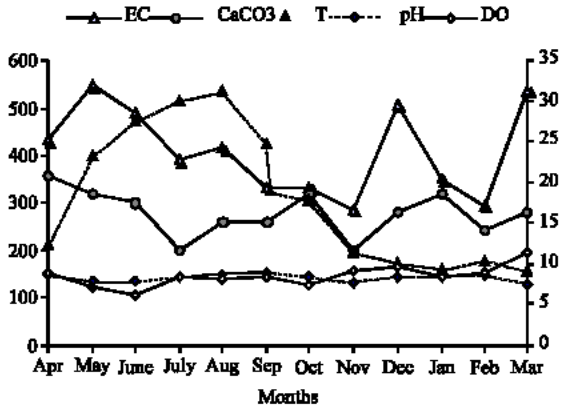

Fig. 3: Some physico-chemical characteristics in Manyas lake

Epistylis was introduced on 612 (%54,74) crayfish into a total number of 1118 in Manyas lake during the one year (Fig. 4).

The highest prevalence recorded was 82.5% for *Epistylis* sp. with ectocommensalism in June. The overall infestation prevalence of crayfish was in 54.74% (N=1118). The percent of infected crayfish was determined monthly between on April, 2002 and on March, 2003 21.88, 25.0,

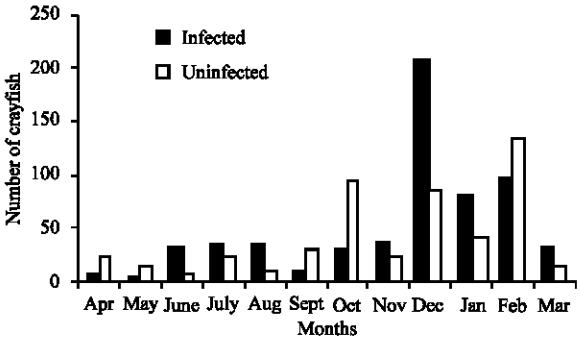

Fig. 4: The number of Infected and uninfected of crayfish in Manyas lake

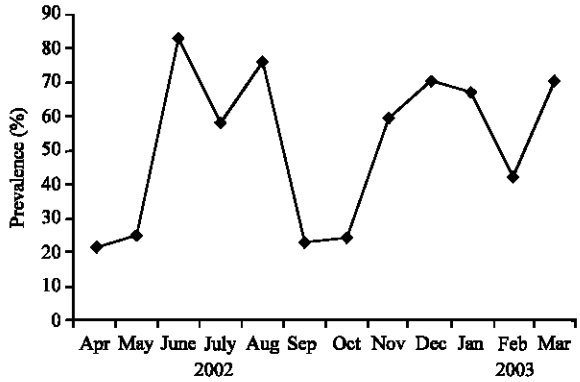

Fig. 5: Seasonal variations in infestation of crayfish in Manyas lake, 2002-2003 by *Epistylis* sp.

82.5, 58.33, 76.09, 23.08, 24.6, 59.68, 70.89, 66.67, 42.17 and 70.83% respectively (Fig. 5).

In view of these data, Epibiont appeared the lowest in the early season, but increased in mid rainy season, and had the highest prevalence in the early dry. It is shown that the highest degree of prevalence reached up in June (82.5%). But epibiont prevalence was not related with water temperature.

Epistylis expansion was the widest on carapace and abdomen, particularly all body parts were effected, as a result of this, erosion occurred on uropods, telsons, antennae and antennulae 18,30% of 112 specimens, but no loses.

It was determined that *Epistylis* burden increased with host weight. In heavy infections, the stalks of the protozoan were long and branched extensively. *Epistylis* burden was higher for females (57,11%) than males (53 and 49%).

DISCUSSION

In Manyas lake, The distribution of *Epistylis* was recorded for all the body parts and gills. Harlioglu[10] was determined with *E. nigarae* on 176 (80.73%) crayfish in crayfish rearing tanks in August and September when water temperature was 19-23°C. Zaikov *et. al.*[11] reported that in artificially cultivated crayfish, the number of *Epistylis* colonies rised and 510 individuals observed (61.4%) were invaded by the ectocommensal, and the losses were reported being 22.0% specimens.

The exoskeleton and gills of the 50.29% of crayfish to examine were infested. When the infestation levels were high, and *Epistylis* was considered to have health problem (18.30%) in telson and uropod. *A. leptodactylus* individuals suffered higher burdens of the protozoan *Epistylis* sp.

The ciliate *Epistylis* sp. the most prevalent symbiont, was recorded in native wild shrimp (2-29%) which were collected from five sites on the coast of the Yucatan Peninsula of Mexico[12].

Fernandez-Leborans and Tato-Porto[8] observed a protist-bryozoan-crustacean hyperebiosis on specimens of the brachyuran decapods collected from the NW Mediterranean coast. The bryozoans were located on the body of the crab, and ciliate protists were attached to any of the surface of the bryozoans and on the body of the crab.

Hanamura's study[13] based on seasonal variation and the infestation pattern of epibiosis in the beach mysid in Ishikan bay, northern Japan. The mysid-peritrich ciliate association was a year-round phenomenon and the prevalence of infestation varied between 49-100% (Average: 92%). It was no significant seasonal trend.

A peritrich protozoan of the genus *Epistylis* was found on the exoskeleton as 48% a gammarid, which probability of infection was significantly higher for male than females, in the River Lagon tributary in Ireland[14].

The occurrence of microbial (algal, protozoan, bacterial and fungal) epibionts on crustaceans and other invertebrates has been documented repeatedly[15-17]. The ecological context and significance of these relationships actually are not well understood. Several studies have examined the population and community ecology of protozoan epibiont on freshwater crustaceans[8,14,18].

The abundance of the protozoan can be indicators of the water quality of effluent issuing from activated-sludge plant, and can be used to evaluate and assess the performance of the plant. In experiment, the number of *Epistylis* peaked repeatedly, mainly in autumn, winter and spring[19].

Esch *et al.*[20] observed thermal effect and the epizootiology of ciliate *Epistylis* and the bacterium *Aeromonas* in association with Centrarchid fish. In combination with the gram-negative bacteria *Aeromonas*, outbreaks of *Epistylis* have implicated in the death of many thousands of game fish, primarily striped bass and

several species of Centrarchidae (sunfish) in several reservoirs in North Caroline of US.

The genus *Epistylis* has been reported to attach on the body of fish, causing erosion of fish body. *Epistylis* were the parasites found in diseased fish together with the other parasites as *Trichodina*, *Glossatella* and *Scgpihidaa*. These parasites can weaken and kill fish. *Epistylis* infections may make fish more vulnerable to bacterial infections, and cause ulser. Fish fries were to be seriously ill and to cover in fin and gill rot of fish[6].

Stressful conditions, such as poor water quality or high stocking densities in the lake, may contribute to disease outbreaks. Some authors have considered that under eutrophic conditions, as sometimes occurring in aquaculture ponds, infestation levels increased[21].

The narrow-clawed crayfish, *A. leptodactylus*, was heavily infected by peritrich *Epistylis* sp., individuals of which were attached to their body segments and locomotory organs. It is suggested that heavily infected invertebrates have decreased locomotive capabilities.

Epistylis attached on eggs could be a weight burden, increase drag, and possibly inhibit egg development. Those on the body of *A. leptodactylus* also could interfere with *Epistylis*, inhibiting the feeding and further slowing locomotion. Also, this epibiont has the potential to influence the structure of the crayfish.

There is a relation between the temperature and the occurance of *Epistylis*. During the study, The *Epistylis* population showed different patterns within the different temperature periods with respect to the infestation prevalence and mean intensity level.

If the *Epistylis* settled with dense populations in the gill cavity, this may interfere with respiratory processes. Crayfish mortalities associated with heavy infestations of peritrichs have been reported[22].

There have been few studies on *Epistylis* in freshwater crayfish. The study of microbial epibionts in aquatic environments is still in its infancy.

The marketability of crayfish will be reduced if the surface of the body is stained or covered by *Epistylis*. Dead *Epistylis* will cause a rapid deterioration in water quality.

Epistylis growth is a result of very poor water quality and its presence indicates that water management practiced should be reviewed[23].

Epibiont cause by *Epistylis* is to be important stress affecting fish and cructacean population in this unique water body. They can exert a strong regulatory effect of population, especially in water body with poor environmental conditions. Environmental stresses can depress host immunity. Fish become more susceptible to infections and these can become more severe and even fatal.

REFERENCES

1. Patterson, D.J. 1996. Free-Living Freshwater Protozoa. Manson Publishing, London, pp: 14-114.
2. Bykhovskaya-Povlovskaya, I. E., A.V. Gusev, M.N. Dubinina, N.A. Izyumova, T.S. Smirnova, I.L. Sokolovskaya, G.A. Shtein, S.S. Shul'man and V.M. Epshetein, 1964. Key to Parasites of Freshwater Fishes of the USSR I. Trans. II. Birrow, A., Isr. Prog. Sci. Trans., Jeruselam, pp: 615-887.
3. Hoffman, G.L., 1967. Parasites of North American Freshwater Fishes. University of California Press, Los Angeles, pp: 486.
4. Chapman, W.R., F.A. Harris and W.R. Miller, 1976. Incidence and seasonal variations of *Epistylis* among fishes in North Carolina Reservoirs. In: Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies, 30: 269275.
5. Klinger, R.E. and R.F. Floyd, 2002. Introduction to freshwater fish parasites, Universty of Florida, fisheries and aquatic sciences department, Florida cooperative extension service CIR 716, http://edis.ifas.ufl.edu/FAO41 (July, 2002).
6. Durborow, R.M., 2003. Protozoan Parasites. Aquaculture program. Kentucky State University, Southern Reginal Aquaculture Center, SRAC Publication, 4701: 8.
7. Wahl, M., 1986. Marine epibiosis. I: Fouling and antifouling some basics aspects. Mar. Ecol. Progr. Ser., 58: 175-189.
8. Fernandez-Leborans, G. and M.L. Tato-Porto, 2000. A review of the species of protozoan epibionts on crustaceans. I. Peritrich Ciliates. Crustaceana, 73: 643-683.
9. Matthes D. and W. Guhl, 1973. Sessile ciliaten der flusskrebse. Protistologica, 4: 459-470.
10. Harlioglu, M.M., 1999. The first record of *Epistylis niagarae* on *Astacus leptodactylus* in a crayfish rearing unit, Cip. Tr. J. Zool., 23: 13-15.
11. Zaikov, A., Y. Karanikolov and T. Hubenova-Siderova, 2000. Record of ectocommensalism between *Epistylis* sp. (Peritrichia, sessilida, epistylidae) and artificially cultivated narrow-clawed crayfish (*Astacus leptodactylus* Esch.), Bulgaria. J. Agriculture Sci., 6: 575-578.
12. Vidal-Martinez, V.M., A.M. Jimenez-Cueto and R. Sima-Alvarez, 2001. Parasites and symbionts of native and cultured shrimps from yucatan, Mexico. J. Aquat. Anim. Health, 14: 57-64.

13. Hanamura, Y., 2000. Seasonality and infestation pattern of epibiosis in the beach mysid *Archaeomysis articulata*. Hydrobiologia, 427: 121-127.
14. Dunn A.M. and J.T.A. Dick, 1998. Parasitism, and epibiosis in native and non-native gammarids in freshwater in Ireland. Ecography, 21: 593-598.
15. K.R. Carman and F.C. Dobbs, 1997. Epibiotic microorganisms on copepods and other marine crustaceans. Microsc. Res. Technol., 37: 116-135.
16. Cook, J.A., J.C. Chubb and C.J. Veltkamp, 1998. Epibionts of *Asellus aquaticus* (L.) (Crustacea, Isopoda): An SEM study. Freshwater Biol., 39: 423-438.
17. Lopez, C., E. Ochoa, R. Paez and S. Theis, 1998. Epizoans on a tropical freshwater crustacean assemblage. Marine Freshwater Res., 49: 271-276.
18. Fernandez-Leborans, G., 2003. Protist-Bryozoan-Crustacean hyperepibiosis on *Genoplax rhomboides* (Linnaeus, 1758) (Decapoda) from the NW Mediterranean coast. Crustaceana, 76: 479-497.
19. Chen, S., M. Xu, H. Cao, J. Zhu, K. Zhou, J. Xu, X. Yang, Y. Gan, W. Liu, J. Zhai an Y. Sahao, 2004. The Activated-sludge fauna and performance of five sewage treatmnet plants in Beijing, China. Eur. J. Protistol., 40: 147-152.
20. Esch, G.W., T.C. Hazen, Jr.R.V. Dimock and J.W. Gibbons, 1976. Thermal effluent and the epizootiology of the ciliate *Epistylis* and the bacterium *Aeromonas* in association with centrarchid fish. Transactions of the American microscopical society, 95: 687-693.
21. Scott, J.R. and R.L. Thune, 1986. Ectocommensa protozoan infestations of gills of red swamp crayfish, Procambarus clarkii (Girard), from commercial ponds. Aquaculture, 55: 161-164.
22. Edgerton, F.E., H.L. Evans, F.J. Stephens and R.M. Overstreet, 2002. Synopsis of freshwater crayfish diseases and commensal organism. Aquaculture, 206: 57-135.
23. Langdon, J.S., 2004. Health and handling of harvested yabbies. WA fisheries department, Fish information, Vaccine, 5: 91.