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***Cryptocaryon irritans* (Protozoa: Ciliata) infection among aquarium-held marine ornamental fish and its control**

A. P. Lipton

Regional Centre of Central Marine Fisheries Research Institute,
Mandapam 623 520, India

Ornamental fishes belonging to seven genera maintained in the marine aquarium in Mandapam were infected by the ciliate *Cryptocaryon irritans*, reported for the first time from India. In the affected fishes numerous whitish pustules were noticed on the body. The percentage mortality ranged from 4 to 100%. Bath treatment using 2 ppm chloramphenicol, followed by 5 ppm of copper sulphate after 6 h, controlled and eradicated the ciliates effectively. Hydrological and other possible environmental factors for the onset and spread of ciliate infection are discussed.

SEVERAL species of Protozoan ciliate parasites have been documented as causing considerable damage to marine fin fishes, particularly to those cultured or reared under controlled conditions^{1,2}. Among the ciliates, *Cryptocaryon*

irritans, which causes the disease cryptocaryoniosis (white spot disease), has been reported by a few workers³⁻⁹ and is considered as the marine counterpart of the 'ich' disease caused by *Ichthyophthirius multifiliis* among the freshwater fishes⁹. Epizootics caused by Cryptocaryoniosis have been described in marine aquarium fishes in Japan, Singapore and London^{3,10}. For example, in Japan, *C. irritans* affected 44 species of the 53 species stocked in marine aquaria². Nigrelli and Ruggieri¹¹ have listed 27 species of marine fishes affected by Cryptocaryoniosis in New York.

In the present investigation, eleven species of ornamental and other fishes belonging to seven genera were infected by *C. irritans*. The causative factors, the species affected and the possible control measures are discussed here.

During December 1988, heavy mortality was noticed among marine ornamental fishes. The fishes affected had numerous macroscopic glistening whitish pustules spread all over the body surface. Some were restless, exhibiting unusual swimming movements and respiratory distress. A few were lethargic and on the verge of collapse with excessive production of mucus, ultimately succumbing to death. Although the infected fish responded to external stimuli, their feeding intensity was poor. In some fishes, fins were infected, eroded and necrotic. The different species of fish affected by cryptocaryoniosis and their mortality percentages are given in Table 1.

Except for the box fishes and cow fishes, all other species of fishes registered mortalities (Table 1). In these fishes and *Lethrinus* sp., the infection was in the initial stages. The temperature of the water in aquarium ranged from 28 to 29 °C; the dissolved oxygen ranged from 3.54 to 4.73 ml l⁻¹ (average 3.84 ml l⁻¹) and the salinity was 27.25‰.

Observations of parasites from the moribund fishes under microscope indicated that their body was densely ciliated. The presence of characteristic ribbon-shaped nuclei together with buccal apparatus including three membranelles and one paroral membrane suggest that this organism is a ciliate belonging to Hymenostomatidae, which could be assigned as *Cryptocaryon irritans* species. Among the four stages, viz. trophonts, matured ones, tomites and tomites, the trophonts stage is parasitic, which attach and live in the skin of fish. Although *C. irritans* has been recorded from marine aquarium fishes from other countries, there appears no report from India so far.

The infected live fishes were given external treatment by reducing the water level in each aquarium to 5 cm. As bacteria and fungi were also found on the eroded fins, chloramphenicol (CDH make) at 2 ppm was given for 3 min, followed by flushing with fresh seawater. After 6 h, copper sulphate at 5 ppm was given following the above procedure, the contents flushed by increasing the seawater level in each aquarium and the fresh seawater allowed to flow through each tank. After this pattern of

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Table 1. Species of fish and percentage mortality caused by *Cryptocaryon irritans* in marine aquaria

Total Species	Number number	Number affected	Mortality dead	(%)
<i>Chaetodon collaris</i>	40	40	20	50
<i>octofasciatus</i>	8	8	8	100
<i>Chaetodon sp.</i>	5	5	5	100
<i>Acanthurus sp.</i>	35	35	20	57
<i>Lutianus rivularis</i>	27	27	25	93
<i>Pomocanthoides annularis</i>	1	1	1	100
<i>Lethrinus sp.</i>	50	50	2	4
Carangid	1	1	1	100
<i>Plectorhincus sp.</i>	20	20	12	60
Box fishes	10	8	—	—
Cow fishes	8	5	—	—

treatment was continued for five days, no further mortality of fish was observed. Flush treatment with copper sulphate was also continued for five days. All the box fishes, cow fishes and *Lethrinus sp.* which were infected could thus be completely saved from aggravation and became normal. Although a few of the treatment patterns by chemical, physical and other means were suggested earlier^{1,2,8}, this new method of antibiotic and copper sulphate is useful as it controlled both the bacterial and ciliate infections.

Analyses of the enzootic in this study indicate that the following environmental and other parameters could help in the onset and spread of Cryptocaryoniasis in marine aquarium: (i) introduction of infected fish in any one of the aquarium during recent collections; (ii) crowding of fish, which reduces the host resistance and favours the spread of disease; (iii) lowering of salinity owing to the monsoon. This coupled with the drawing of water from the vicinity of the aquarium drainage whenever possible, initial excystment and release of tomites could also have aggravated the spread of the disease.

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Mineral composition of different regions of the scale of an endangered fish *Tor putitora* (Hamilton) using energy-dispersive X-ray microanalysis technique

K. K. Tandon and M. S. Johal

Department of Zoology, Panjab University, Chandigarh 160 014, India

Presence of Ca, P, Al and Fe has been recorded in the fish scale. It has been observed that the fall in the level of Fe and increase in Ca result in the formation of an annulus in *Tor putitora* (Hamilton) from Gobindsagar. The rolling of the margin of the scale appears to be related to the excess deposition of Al.

SCALES of fishes have been employed in the identification¹⁻³, life history⁴ and growth studies^{5,6}. It is generally considered to be a calcified structure. The number of scales on a fish's body remains constant. Therefore, with the increase in body size, the scales grow. Hence, a straight line relationship exists between the total fish length and the scale radius with high degree of correlation coefficient in majority of Indian freshwater fishes^{5,6}.

Scales of golden mahseer *Tor putitora* (Hamilton), an endangered species, have been reported to be as big as the

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