2. —, *Ibid.*, 1973, 18, 87.
1. Dutt, M. K., *Ann. Histochim.*, 1972, 17, 65.
3. —, *Curr. Sci.*, 1973, 42, 354.
4. —, *Folia Histochem. Cytochem.*, 1978, 16, 47.
5. —, *The Nucleus*, 1967, 10, 168.
6. —, *Folia Histochem. Cytochem.*, 1977, 15, 249.
7. Brode, W. R., *Chemical Spectroscopy*, 2nd Ed., John Wiley and Sons, Inc., New York, 1946.

OCCURRENCE OF SYMBIOTIC BIOLUMINESCENT BACTERIA IN INDIAN LEIOGNATHIDS

Introduction

LUMINOUS bacteria occur freely in sea-water or in association with other organisms either as symbionts or as parasites or saprophytes[1–10]. The light organs of silver-bellies are 'donut' shaped encircling the distal end of the oesophagus and harbouring symbiotic bioluminescent bacteria[11–14]. Knowledge concerning bacterial luminescence is totally lacking from Indian Seas. The present study is first of its kind dealing with the occurrence of symbiotic bioluminescent bacteria in the light organs of 4 species of silverbellies belonging to 3 genera of the family Leiognathidae.

Material and Methods

Four species of silver-bellies, *viz.*, *Leiognathus splendens*, *Gazza* sp., *Secutor ruconius* and *S. insidiator* were obtained from shore-seine catches from Porto Novo waters (Lat. 11° 30′ N, Long. 79° 46′ E) in living condition and were sacrificed fori solation of bacteria. The 'sterile-technique' adopted by Reichelt *et al.*[14] was followed in the present study to remove the symbionts from the light organs for culturing them in nutrient-agar medium with 3 ml of glycerol per litre. Electrical micro-balance (Oertling) was made use of for taking the weight of light organ corrected upto 0·0001 g. The bacterial population was enumerated on wet weight basis of the luminescent organ.

Results and Discussion

Table I shows the numbers of viabl esymbiotic bioluminescent bacteria in different species of leiognathids. The bacterial population ranged from log 9·6284 to log 10·1367 per gram (wet weight) of the organ. The present observation on *Leiognathus splendens* and *Secutor ruconius* is almost similar to the report of Hastings and Mitchell[12] in the waters of New Guinea. Viable colonies per gram wet weight of the organ in *Gazza* sp. (log 9·6284) seemed to be lower than in *S. insidiator* (log 10·1206). Maximum bacterial population was found in two species of the genus *Secutor* where weight of the light organ is more in relation to body weight. Hastings and Mitchell[12] have also shown that major fraction of the weight of the light organ is mainly due to viable symbiotic luminescent bacteria.

TABLE I

Numbers of symbiotic bioluminescent bacteria in leiognathid light organs

Species	Total length of fish (mm)	Weight of the fish (g)	Weight of the organ (mg)	Log of total bacterial counts/organ	Log of bacterial counts/g of organ (wet weight)
Leiognathus splendens	104	22·5	42·1	8·2989	9·6749
Gazza sp.	133	40·6	194·4	8·9175	9·6284
Secutor ruconius	72	7·6	62·0	8·9294	10·1367
S. insidiator	92	13·4	77·6	9·0103	10·1206

All the bacterial colonies observed presently were luminescent (Figs. 1 and 2) which confirms the earlier findings of Hastings and Mitchell[12]. Figure 3 shows the luminescent colonies isolated from *Gazza* sp. Simple

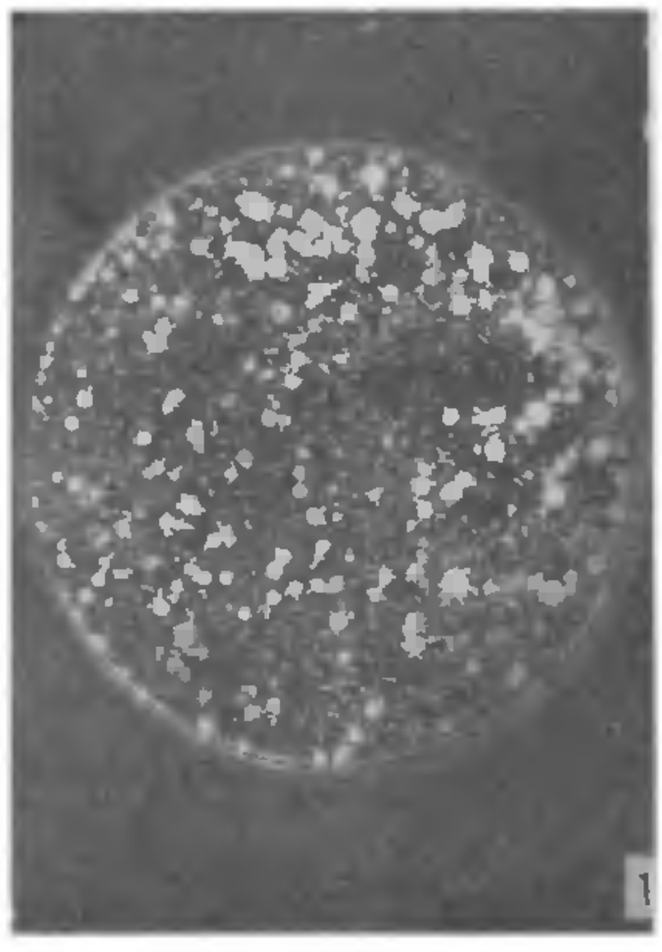

FIG. 1

tests on the contents of the luminous gland in 3% NaCl solution showed the presence of luminescence. The solution was luminescent at room temperature ($28 \pm 2°$ C) but not so at 4° C. In distilled water it failed to emit luminescence. When centrifuged only the residue maintained it. This confirms the earlier observations of Haneda[11] and Haneda andTs uji[13].

Beijerinck[15] proposed that all luminescent bacteria should be placed under a single genus *Photobacterium*. But Reichelt *et al.*[14] and Nealson and Hastings[16] grouped the luminescent bacteria under 2 genera

(*Photobacterium* and *Beneckea*). Identification of luminescent symbionts isolated presently from leiognathid fishes and their antagonistic properties against known pathogens and other saprophytes are under way.

FIG. 2

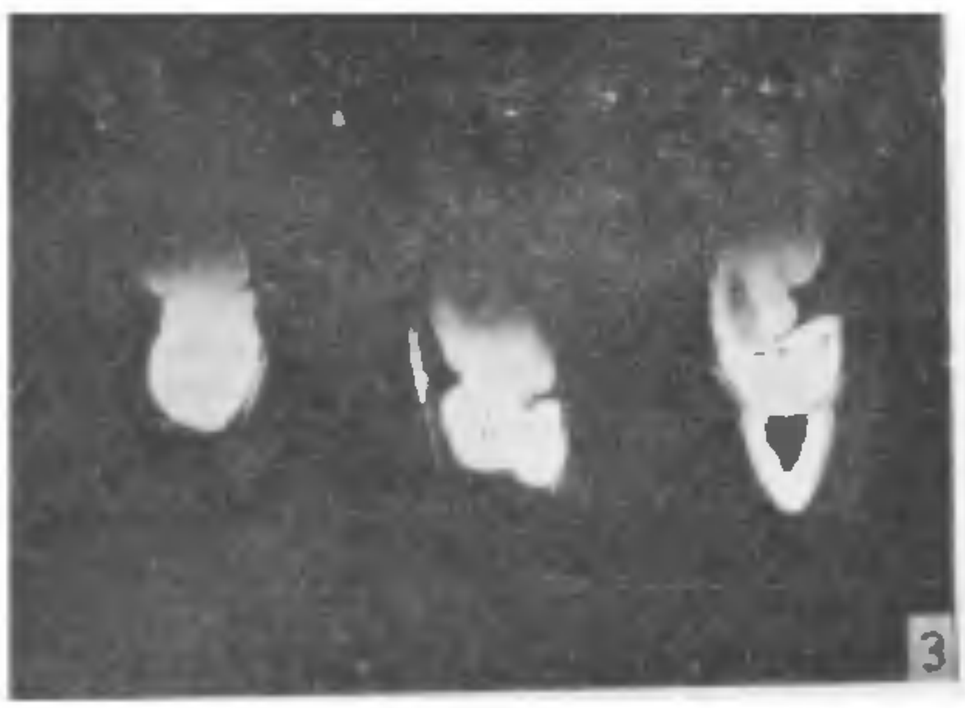

FIG. 3

Our thanks are due to Professor R. Natarajan Director, Centre of Advanced Study in Marine Biology, Porto Novo for his keen interest and encouragement, to Professor J. W. Hastings, The Biological Laboratories, Harvard University, for suggestions and to Dr. A.L. Paul Pandian for his help in photography. We are grateful to the University Grants Commission, New Delhi for financial support.

Centre of Advanced Study in
Marine Biology,
Porto Novo 608 502,
Tamil Nadu, *April* 3, 1978.

N. JAYABALAN,
K. DHEVENDARAN,
K. RAMAMOORTHI.

1. Harvey, E. N., *Bioluminescence*, Academic Press, New York, 1952, p. 649.
2. Dubois, R., *C.R. Acad. Sci. Paris*, 1890, **111**, 363.
3. Kuhnt, P., *Ent. Wschr.*, 1907, **24**, 3.
4. Osorio, B., *C.R. Soc. Biol. Paris*, 1912, **72**, 432.
5. Pierantoni, *U.*, *Boll. Soc. Nat. Napoli*, 1914, **27**, 83.
6. Buchner, P., *Zool. Anz.*, 1914, **45**, 17.
7. —, *Endosymbiosis of Animals with Plant Microorganisms*, John Wiley and Sons, New York, 1965, p. 909.
8. Yasaki, Y., *Zool. Mag. Tokyo*, 1929, **41**, 490.
9. Kishitani, T., *Sci. Rept. Tohoku Univ.*, 1930, **5**, 801.
10. Yasaki, Y. and Haneda Y., *Proc. Imp. Acad. Japan*, 1935, **12**, 55.
11. Haneda, Y., *Palao Trop. Biol. Sta. Stud.*, 1940, **2**, 29.
12. Hastings, J. W. and Mitchell, G., *Biol. Bull.*, 1971, **141**, 261
13. Haneda, Y. and Tsuji, F. I., *J. Morph.*, 1976, **150**, 539.
14. Reichelt, J., Nealson, K. and Hastings, J. W., *Arch. Microbiol.*, 1977, **112**, 157.
15. Beijerinck, M. W., *Arch. Neerl. Sci.*, 1889, **23**, 416.
16. Nealson, K. and Hastings, J. W., *Arch. Microbiol.*, 1977, **112**, 9.

EFFECTS OF SCORPION (*HETEROMETRUS FULVIPES*) VENOM ON PHOSPHATASE ACTIVITIES IN GUINEA PIG

THE effects of scorpion venoms on physiological activities of animals have earlier been demonstrated[1-4]. Scorpion venom has been found to induce the release of esterases[5, 6], decrease succinate dehydrogenase activity[7], rise proteolytic activity and produce hyperglycemic conditions[8] apart from several other pat' ological effects[4]. However, relatively little is known about the effects of these venoms on the activities of phosphatases, although it has been reported that scorpion venom contains phosphatases[9]. The acid and alkaline phosphatases have been found to occur in a variety of tissues and play an important role in metabolism[10]. Hence in the present investigation an attempt has been made to study the effects of intramuscular injection of *Heterometrus fulvipes* venom on the levels of acid and alkaline phosphatase activites in the tissues of guinea pigs.

A regular colony of guinea pigs is maintained in the laboratory and fed on a standard diet consisting of Bengal gram, carrots, green leaves and water *ad libitum*. Guinea pigs of the same age group (60 days) weighing 400-450 gms have been used for the experiments.

Venom collection from *Heterometrus fulvipes* was done as reported ealier[1]. Fifty per cent lethal dose