TABLE 1

Percentage of ursolic acid in the leaves of various Eucalyptus species

Name of Eucalyptus species	% oil	% Ursolic acid	% Eucalyptin
E. alba	0.30	1.50	—
E. crebra	0.16	0.85	—
E. grandis	0.30	0.60	0.010
E. melanophloia	0.10	0.92	0.014
E. microtheca	0.60	2.50	0.015
E. rudis	1.10	1.00	0.018
E. staigeriana	1.20	1.00	—
E. tesselaris	0.25	1.30	0.037
E. torelliana	0.20	0.64	0.032

This is the first report on the occurrence of ursolic acid and eucalyptin (excepting in *E. torelliana*) in the respective eucalyptus species. These results also indicate that the *E. microtheca* leaves can be used for the isolation of large amounts of ursolic acid.

The petroleum ether and alcohol extracts did not give any compound.

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THE LUMINOUS BACTERIUM, *BENECKEA HARVEYI* IN THE GUT OF LEIOGNATHID FISHES

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LUMINOUS bacteria are versatile heterotrophs with high adaptability. They have been reported not only from the surface waters of tropical, temperate and polar marine regions but also from a depth of several metres[1,2]. Having been known as symbionts in the light organs of fishes[3-8], saprophytes on the surface of fishes and crustaceans[1,9], enteric bacteria in several marine organisms[1,10,11] and parasites in crustaceans[9], they also occur as general planktonic microbial populations[2,12]. Studies conducted in India are limited, but they are known to occur in marine, estuarine, backwater and mangrove biotopes[8,11]. The present report is of interest as *Beneckea harveyi*, a species of luminous bacteria, occurs as enteric form in the gut of 6 species of leiognathid fishes (Family: Leiognathidae) *viz.*, *Gazza minuta*, *G. achlamys*, *Secutor ruconius*, *Leiognathus splendens*, *L. bindus* and *L. dussumieri*, in Porto Novo waters.

Fish samples were collected from Porto Novo fish landing centre and the adjoining Vellar estuary (lat. 11° 30' N, Long. 79° 46' E) between March and May 1978. They were transferred to sterile polythene bags and brought to the laboratory in insulated containers. Totally 41 fishes (table 1) were used within 2 hr after collection. The specimens were externaly sterilised with 60% ethanol to avoid contamination. Swabs of gut contents were taken using sterile cotton-tipped applicator sticks and inoculated with the sea water nutrient agar medium (SWC) consisting of 750 ml of sea water, and 250 ml of distilled water, 5 g of bacto-peptone, 3 g of yeast extract and 3 ml of glycerol, and the pH adjusted to 7.2.

TABLE 1

Isolation of luminous bacteria from leiognathids

Species	Number of specimens utilised	Number of luminous strains isolated
Gazza minuta	7	12
G. achlamys	4	7
Secutor ruconius	8	10
Leiognathus splendens	10	18
L. bindus	7	14
L. dussumieri	5	15
Total	41	76

Cultures were grown at 25° ± 2° C. Within 24 hr of inoculation bright luminous colonies appeared on the medium. After 36 hr well separated single luminous colonies were picked up randomly in the dark room using sterile tooth picks and were transferred to SWC agar slants for later taxonomic characterisation.

A total of 76 luminous isolates were tested for extracellular enzymes. Especially, lipase, amylase and gelatinase are useful to differentiate *Beneckea* from the closely allied *Photobacterium*[6]. Of these, 62 iso-

lates produced all the above three extracellular enzymes, showing their identity as *Beneckea harveyi*.

B. harveyi has both luminous and non-luminous strains with phenotypic and genotypic similarities that justify their inclusion in one species[13]. Nealson and Hastings[14] are of the view that the bacteria are luminous under certain conditions and non-luminous under others *i.e.* the luminescent system is autoinducible and repressible. However, in the present study, only luminescing bacterial colonies were selected and identified. Occurrence of *B. harveyi* in the gut of leiognathids shows that the species exists not only as free-living forms but also occurs in an enteric habitat.

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SEX STIMULI RECEPTORS OF *PARHYALE HAWAIENSIS* DANA (CRUSTACEA: AMPHIPODA)

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FEMALE crustaceans produce a 'pheromone' during the breeding period and this is promptly received by adult males. It is generally believed that the chemoreceptor organs are the aesthetes usually found on the antennules or antennae of the male. In some cases both sexes possess aesthetes.

In order to study the location of sex stimuli receptors the following experiments were conducted.

The antennules and antennae of nature males were amputated in the following ways. 1. Both the antennae were amputated at the base of the third peduncular segment. 2. Both the antennules were amputated at the base of the first peduncular segment. 3. Both the antennules and the left antenna were amputated at the base of the peduncle. 4. Both the antennae and the left antennule were amputated at the base of the peduncle. 5. Both the antennules and the antennae were removed at the base of the peduncle.

Fifty individuals were used in each set of experiments. In two days after amputation, the animals resumed normal activity. Every day, females that had performed precopulatory ride were made available to these males to make sure that the sex stimuli were actually present; the pheromone is believed to be produced only by females having developed eggs in the ovary and the males perform precopulatory riding only with such females.

Between the 4th and 10th day after amputation all the males except those in the 5th group mentioned above (without both antennules and antennae) took up precopulatory riding. None of the males in the 5th group did this till the next moult. During this moult both the appendages were regenerated.

The following deduction is possible from the above experiments. According to the present observation, it is not clear whether the aesthetes have any role in sex stimuli reception. But it is established that even in the absence of aesthetes, male *P. hawaiensis* can receive sex stimuli, and the sex stimuli receptors are located both in the antennules and antennae. This is contrary to the belief of the previous workers that aesthetes are the sex stimuli receptors in Crustacea. Further, it is evident that *P. hawaiensis* can receive sex stimuli either with the antennule or with the antenna.

By the study of tritium labelled isotope Dahl *et al*[1] found that in *Gammarus duebeni* aesthetes are the pheromone receptor organs. It may be true in cases where males alone possess aesthetes. As in *P. hawaien-*