Table 1 *Latex-induced mortality in the test organisms*

	Time (hr, min) taken for 100% mortality		
	10^{-4}	10^{-6}	10^{-8}
Fishes:			
Therapon jarbua	0, 09	3, 36	3, 45
Ambassis commersoni	0, 10	0, 15	0, 20
Ambassis gymnocephalus	0, 11	2, 36	2, 58
Siganus javus	0, 15	0, 40	2, 30
Therapon theraps	0, 20	0, 25	0, 30
Arothron immacutus	0, 27	1, 40	2, 20
Macrones gulio	1, 00	3, 00	3, 30
Prawns:			
Penaeus semisulcatus	0, 10	0, 30	1, 57
Penaeus indicus	0, 30	0, 50	2, 00
Crabs:			
Portunus pelagicus	1, 00	7, 00	9, 00
Uca annulipes	14, 00	19, 00	20, 00
Clibanarius clibanarius	18, 20	23, 20	24, 00
Gastropods:			
Cerithidea fluviatilis	12, 00	20, 00	25, 00
Telescopium telescopium	23, 40	30, 00	36, 00
Bivalves:			
Meretrix meretrix	36, 00	*	*
Meretrix casta	40, 00	*	*

*Survived throughout the experiment.

(S 28‰). Ten specimens of each organism were kept in each aquarium tank with 3 litre of test solution. Controls were kept in estuarine water. The morphological changes and the mortality of organisms were noted. The test solutions were changed every 12 hr of treatment. Each experiment was run thrice.

The effect of aqueous solutions of latex on mortality of the test organisms is shown in table 1. Fishes and prawns were most sensitive to latex toxicity and death occurred within few minutes of treatment at 10^{-4}. But crabs and molluscs were rather tolerant to the latex. *Meretrix casta* and *M. meretrix* survived at 10^{-4} concentration for 40 and 36 hr respectively and no mortality of the 2 species of *Meretrix* was observed in the concentrations of 10^{-6} and 10^{-8}. Latex also caused many abnormal changes in the organisms. The puffer fish (*Arothron immacutus*) showed abnormal swells in the abdominal region; Hermit crab (*Clibanarius clibanarius*) released a peculiar mass of air bubbles to the surface of the test solution; and *Telescopium telescopium* secreted out a white mucilaginous fluid.

E. agallocha occurs commonly in the periphery of many islets of the Pitchavaram mangroves[3] It is, therefore, reasonable to assume that the high wind velocity of coastal region, leading to the breakage of plant parts and eventual mixing of latex in the stagnant water in the central bowl of islets, will pose a potential threat to the faunal resources of the mangroves. Though a massive death of fishes especially puffer fish is being observed in mangrove waters, there is a lack of scientific information on the toxic effect of the latex of *E. agallocha* on the depletion of such fishery resources. Further detailed studies on this and related aspects will yield fruitful results to counteract marine biotoxicity.

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1. Bulletin Botanical Survey of India, Medicinal uses of Plants, 1960, 2, 180.
2. Matthew, K. M., *Fl. Tamil Nadu Carnatic*, Dioecesan Press, Madras, 1982, p. 638.
3. Muniyandi, K., *Studies on mangrove of Pitchavaram (South East Coast of India)*, Ph.D. thesis, Annamalai University, 1985, p. 46.

PANGASIUS PANGASIUS (HAM)—AN ADDITION TO THE LIST OF AIR-BREATHING TELEOSTS

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Pangasius pangasius (Ham), the only species of the genus in India, is an important component of the catfish fauna of our major river systems and enjoys a fishery of considerable commercial value[1-4]. Its white creamy flesh with fewer intermuscular bones has a special appeal. In recent years, efforts have been directed towards evolving methods of its culture and propagation. Owing to its marked preference for a molluscan diet, *P. pangasius* comes in handy as a useful biological agent for controlling excessive multiplication of molluscs in ponds, thereby checking mollusc-borne diseases[5].

Earlier studies have shown that *P. pangasius* is the most tolerant among the fishes of the highly polluted Kulti estuary in West Bengal[6]. It is also reported to withstand pollutional hazards (low dissolved oxygen)[7]. However, it was not clearly understood as to how it adapted itself to such ecological adversities. It had been assumed that the fish had developed certain peculiar breathing traits to compensate oxygen deficiency in its environs, that it had some mechanism to store air in its buccal cavity for gaseous exchange and that a certain amount of compensation for the lack of sufficient oxygen was also met by cutaneous respiration through its fin membranes and lips. The present communication, however, establishes that the fish can survive such ecological hazards through aerial respiration and that its swim-bladder is adapted to function as an accessory respiratory organ.

The material for this study was collected from the catches of the river Devi near Govindpur Village of Cuttack District. The specimens were caught by employing large pocketed dragnets. Some 65 specimens in the weight range of 250 g to over 2.5 kg were collected and transported alive in plastic fish carriers filled with river water. The mortality during transport was 1.5%. The specimens were stocked in ponds of the instructional fish farm of Kausalyaganga for raising brood stocks.

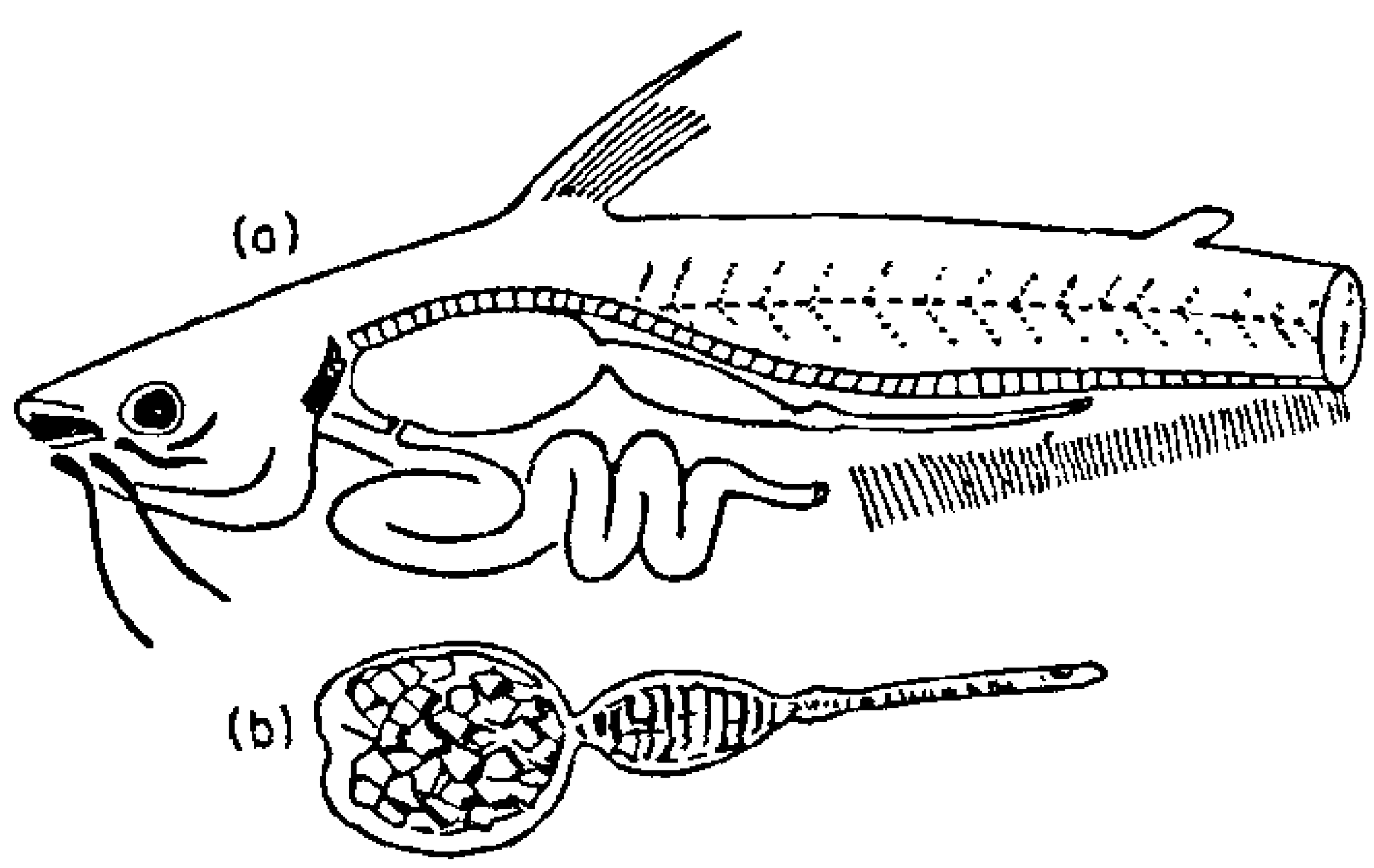
From this collection, five specimens (247 to 349 mm length range) were sorted out and kept in a plastic pool in the laboratory for making observations on feeding response and behaviour. It was here that the air-breathing behaviour of the fish was noticed. Details regarding the air-breathing behaviour of the fish were noted and the associated accessory respiratory organ was discovered.

It was observed that the fishes displayed a tendency of surfacing from time to time, commonly seen in other air-breathing fishes, namely, *Clarias, Heteropneustes, Anabas, Channa, Notopterus*. This tendency was markedly accentuated when (due to shortage of regular water supply) fresh tubewell water was used for replenishing the plastic pool. Almost every 30 sec, the fishes rose to the surface, gulped in air and swam away. It was also observed that before each surfacing, the fishes invariably released air-bubbles from their opercular opening. The dissolved oxygen content of the ambient water was measured by an oxygen analyzer and found to be 0.71 ppm.

The frequency of surfacing was recorded at different levels of dissolved oxygen content of the water. The lowest recorded level was 0.67 ppm when the frequency of surfacing was maximum, about three times per minute. Whenever the dissolved oxygen level was 3 ppm and above, the fishes showed no tendency to surface for long periods. This implies that under normal conditions, air-breathing is not a necessity and the fish breathes air only when the situation demands it i.e. when the dissolved oxygen goes down to a very low level. It was also observed that under such conditions, if the fish is denied access to atmospheric air, it gets asphyxiated.

A study of the anatomy revealed that *P. pangasius* possesses a spacious three-chambered swim-bladder (figure 1). The ventral wall of the anterior chamber has a small aperture leading by a slender pneumatic duct, into the oesophagus on its dorsal aspect. The anterior chamber, the largest of the three, occupies almost half the anterodorsal aspect of the abdominal cavity while the middle chamber extends up to the anal region and the rear one, which is a slender tube, extends beyond the abdomen into the trunk, penetrating the muscles along the base of the anal fin almost to three quarters of its length. The inside of all the three chambers is thrown into anastomosing ridges enclosing small spaces. The ridges are most pronounced in the anterior chamber. They are richly supplied with fine blood capillaries. The three chambers of the swim-bladder are inter-connected. It is construed that the air gulped in by the fish finds access to the swim-bladder through the pneumatic duct which brings about the exchange of gases between the cavities of the bladder and the exterior.

In the teleosts, instances of secondary adaptation



Figures 1 a–b. a. Dissected specimen of *P. pangasius* in lateral view showing its swim-bladder and alimentary canal. **b.** The inside of the three chambers of the swim-bladder of the fish showing the pattern of anastomosing ridges.

of swim-bladder for a respiratory function have been reported in *Arapima, Gymnarchus, Erythrinus, Umbra, Notopterus* and *Phractolaemus*[8]. *P. pangasius* is an addition to this list.

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1. Hora, S. L., *J. Bombay Nat. Hist. Soc.*, 1939, **40**, 353.
2. David, A., *Indian J. Fish.*, 1954, **1**, 231.
3. Job, T. J., David, A. and Das, K. N., *Indian J. Fish.*, 1955, **2**, 1.
4. Jhingran, V. G., *Indian J. Fish.*, 1956, **1**, 197.
5. Hora, S. L., *Curr. Sci.*, 1952, **21**, 164.
6. David, A., *J. Asiat. Soc.*, 1959, **1**, 339.
7. David, A., *Indian J. Fish.*, 1963, **10**, 521.
8. Dehadrai, P. V. and Tripathi, S. D., In: *Respiration of amphibious vertebrates*, (ed.) G. M. Hughes, Academic Press, London, 1976, p. 39.

COPTARCA PUNCTARIA (WALKER), AN UNIQUE INDIAN ACRIDID WITH CHROMOSOMAL POLYMORPHISM (ORDER: ORTHOPTERA, CLASS: INSECTA)

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THE family Acrididae forms a group well exploited for karyological studies. Though chromosomal investigations on this group were started by Asana[1] in India as early as 1928, many of the karyological details of several species are not yet known. Hence a systematic chromosomal analysis was carried out on some Acridid species. The present study deals with the structural variations in chromosomes of *Coptarca punctaria*.

Six individuals of *C. punctaria* (2 males and 4 females) were collected from Ranganathittu near Mysore. The chromosomal analysis was made using testes and hepatic caecae after 3 hr treatment with 0.1 ml of 0.025% colchicine and processed for chromosomal preparations by air-dry-Giemsa method.

All individuals showed a somatic count of 23 (22A + XO) in males and 24 (22A + XX) chromosomes in females. No individual sample had all the acrocentric chromosomes as some chromosome pairs exhibit different morphology. The structural changes were the same in all the tissues of an individual. Based on the chromosomal composition, the karyotype is categorized into 3 types.

(i) Karyotype consisting of almost all acrocentric chromosomes, the 9th pair being metacentric (figure 1); ii) Karyotype with most of the acrocentric chromosomes, the 9th pair being submetacentric. The 6th pair is heteromorphic with meta-/acrocentric (figure 2); iii) The karyotype with almost all acrocentric chromosomes. The 9th pair is heteromorphic with meta-/submetacentric chromosomes and the heteromorphic 10th pair having meta-/acrocentric chromosomes (figure 3).

Acrididae is a huge family in which approximately 90% of the species belonging to Cryptosacci show the typical 23 chromosomes in males with all acrocentrics[2]. Though almost all Indian species of Acridids are reported to have only acrocentric chromosomes, there are instances of the occurrence of subacrocentric chromosomes in most of the populations as in *Poikilocerus pictus*[3] ($2n = 19$, XX:XO) and metacentric chromosomes in *Gastrimargus africanus orientalis*[4] ($2n = 23$; XX : XO). In the present study, a definite change in the morphology of the 9th pair was noticed *in all* the individuals and this change is represented by meta-/meta-, submeta-/submeta- and meta-/submetacentric chromosomes. Changes are also seen in the 6th and 10th pairs (figures 1, 2 and 3). The structural variations observed in the present study are due to pericentric inversions as confirmed by the morphometric data. The pericentric inversion polymorphism is not uncommon in Acridids of other geographical regions. It is reported in the Trimerotropine grasshoppers of North America and Morabine grasshoppers of Australia and also in an Australian species *Chryptobothrus chrysophorus*[2].

The presence of distinct metacentric chromosomes in *G. a. orientalis*[4] and the present observation annul the earlier reports that the chromosomes of Indian Acridids are all acrocentric. The present findings of structural polymorphism in a few particular pairs of autosomes (eg. 6th, 9th and 10th) appear to be amenable for further changes, more so of the 9th pair, which in course of time, could fix a karyotype of particular architecture. Hence this feature is of utmost importance and significance in karyotypic evolution.