

MORPHOMETRY AND ELECTROPHORETIC STUDIES OF *CYNOGLOSSUS BILINEATUS* (LAC.) FROM BOMBAY WATERS

The Malabar sole, *Cynoglossus semifaciatatus* (Day) is a commercially important flat fish, considering the total landings in India. It is widely distributed in the Indo-Pacific region and is abundant along Kerala-Karnatak coast and is also common along the Southern coast of Maharashtra.

Its biology, age and growth have been studied earlier by Seshappa and Bhimachar (1954, 1955), eggs and larvae by Bensam (1965). Life history of other species of the same genus, *C. lingua* was studied by Kuthalingam (1957). These and other flat fishes are known to constitute local populations which can be identified by using morphometric and electrophoretic methods (Dwivedi, 1963, 1964).

In the present investigation, *Cynoglossus bilineatus* (Lac) has been studied for its morphometry and protein components of eye-lens and muscle proteins to delineate the characters of the species in waters around Bombay.

The morphometry was studied using standard procedures (Dwivedi and Menezes, 1974). The method of electrophoresis in polyacrylamide gel described by Davis and Lindsay (1967) was followed using the standard acrylamide gel of 7.5%. Trisglycine mixture of pH between 8.2 — 8.4 was used as buffer. Muscle and eyelens proteins were studied from 25 fishes and for each sample 0.15 g of tissue were homogenized in 1.0 ml. distilled water and centrifuged at 1200 rpm for five minutes. During electrophoresis five milliamperes current was passed through each tube. In order to obtain clear demarcation of the position of the front, bromophenol blue dye was added. When the front band had moved 33 mm into the gel, the current was turned off; the gels were removed from the glass tubes and were stained in Amido-Schwartz. After 2 hours of staining, the gels were destained in 8% acetic acid. All samples were analysed in the same manner to ensure that electrophoresis was conducted under identical conditions and the results could be used for a comparative study. RF values, the ratio of the distance from the origin to a given fraction and the distance from the origin to the front band were calculated from direct measurement of the gels.

A total of 100 specimens of the length range 15 to 27 cm were studied for meristic characters. Males were comparatively small, they ranged between 15 to 25 cm and the females were slightly larger from 17 to 27 cm (Fig. 1). The sex ratio between males and females was 1:1.

Amongst the meristic characters the dorsal and anal fin rays, vertebrae and lateral line scales were observed (Fig. 2-5). Their range, mode, mean, standard error and coefficient of variation (C. V. Mayr *et al.*, 1953) are given in Table 1.

Table 1. Variation of meristic characters in *Cynoglossus bilineatus*

Characters	Range	Mode	Mean Std. Error	Coefficient of variation (CV)
Vertebrae	50-58	53	52.83 ± 0.06	1.05
Dorsal fin rays	105-120	114	113.37 ± 0.174	1.52
Anal fin rays	82-102	97	96.87 ± 0.23	2.60
Lateral line scales	79-90	86	85.06 ± 0.08	1.05

The C. V. of anal and dorsal fin rays was 2.56 and 1.52 respectively which indicates that these characters are more variable. Fin formula as described by earlier authors and as established based on the present study is given in Table II.

Table II. Fin formula in *C. bilineatus*.

Authors	Dorsal	Fin rays Anal	Lateral line scales	Vertebrae
Day 1889	107	82-88	—	—
Munro 1955	104-114	84-95	84-96	—
Misra 1959	104-114	84-95	84-96	—
Present study	105-120	82-105	79-90	50-58

The number of vertebrae and lateral line scales are comparatively more stable and CV of both the characters was 1.05. Amongst the metric characters depth of the body, headlength (Fig. 8 and 6) have allometric growth where as the diameter of eyes shows (Fig. 7) negative allometry and decreases with increase in body length. In the electrophoretic studies of muscle and eye lens proteins both the eye-lens and muscle were found to have nine bands. Table III.

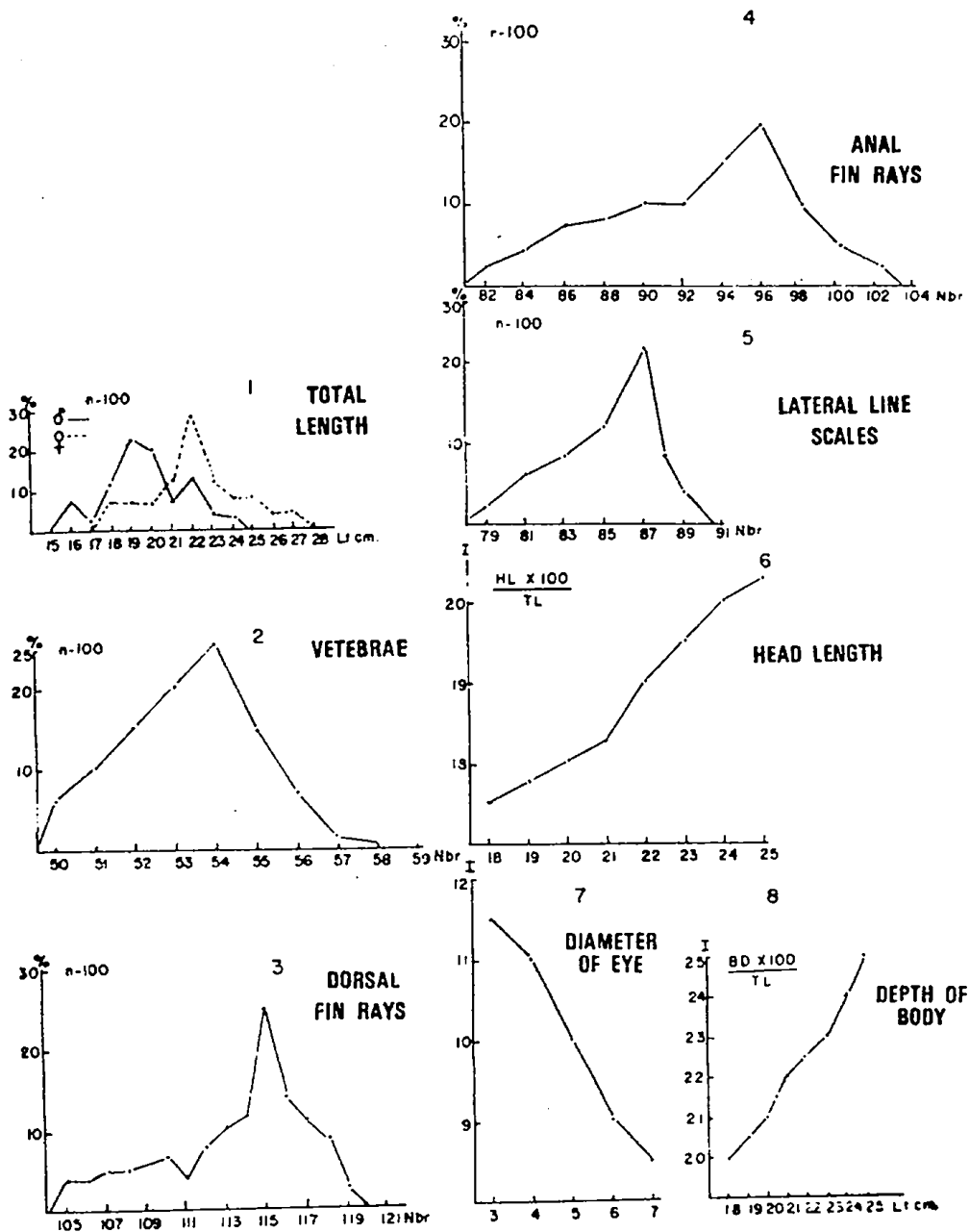


Fig.:1: The figure shows index values of the depth of body (8) head length (6). diameter of the eye (7), the frequency polygon of total length (1), vertebrae (2), rays of the dorsal fin (3), anal fin (4), and the number of lateral line scales (5)

PLATE

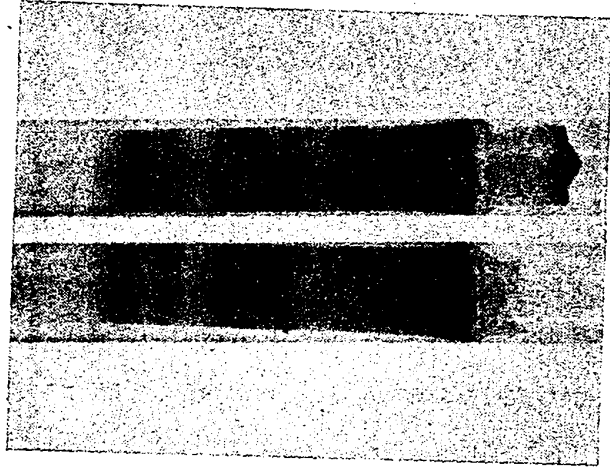


Fig. 1. Muscle protein pattern of the fish *C. bilineatus* (Lac)

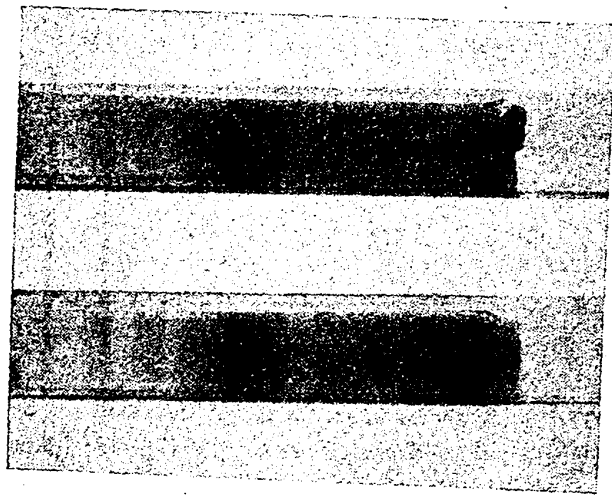


Fig. 2. Eye-lens protein pattern of the fish *C. bilineatus* (Lac)

Table III. Average Rf values for the separated protein components of muscle and eye lens of *Cynoglossus bilineatus*.

Band No.	Rf values		Band position measurement in mm.	
	Muscle	Eye lens	Muscle	Eye lens
1	—	0.212	—	7
2	0.330	0.330	10	10
3	0.394	0.394	13	13
4	0.543	—	18	—
5	0.666	0.666	22	22
6	—	0.757	—	25
7	0.848	0.848	28	28
8	0.969	—	32	—
9	1.000	1.000	33	33

Though the number of bands was the same but they showed quantitative differences in the total protein content of different bands. Three bands were thick, of which band number 5 was extremely thick and denser in muscle as compared to the eye lens. This band may be the characteristic of the genus. The characteristic fraction for *C. bilineatus* (Lac) was found between Rf. 0.394-0.666 (bands 3-5) while the first band and the gel region beyond Rf. value of band number 2, 3, 5, 7 and 9 coincides both in eye lens and muscle protein, the thicker bands are not clear in the eye lens protein (Plate 1, Fig. 1, 2).

These studies indicate that the number of vertebrae and lateral line scales along with analysis of proteins are characteristic of the local population. A more precise fin formula based on the study of a large number of specimen has also been given.

The authors thank Dr. S. Z. Qasim, Director, National Institute of Oceanography, for his support and keen interest in the work and they are grateful to Dr. C. V. Kulkarni, for his valuable comments and going through the manuscripts.

National Institute of Oceanography,
Bombay-61.

R. Kasinathan,
B. N. Desai,
and

Central Institute of Fisheries
Education, Bombay-61.

S. N. Dwivedi,

REFERENCES

- Bensam, P. 1965. On the eggs and larval stages of the malabar sole *Cynoglossus semifasciatus* Day. *Indian J. Fish.* 12, 90-98.
- Davis G. M. and Lindsay, G. K. 1967. The systematic study of *Oncomelania hupensis* Chiu (Gastropoda: Hydrobiidae) *Malacologia*, 7 (1): 17-70.
- Day, F. 1889. The fishes of India. Gilliam Dawson and Sons.
- Dwivedi, S. N. 1963. Comparaison entre *Lepidorhombus boscii* de mediterranee (Folfe du lion) et de L'atlantique (Cotes due Portugal Extrait des Rapports et Proces-verbaux des reunions de la C.I.E. S.M.M. (2), 379-381.
- Dwivedi, S. N. 1964. Ecologie, morphologie et biologie comparees des deux especes due genre *Lepidorhombus*: *L. megastoma* (Donovan) et *L. boscii* (Risso). Etude de leurs races et populations. *Revue Trav. Off (scient. tech.) Pech. marit*, 28, 321-400.
- Dwivedi, S. N. and Menezes, M. R. 1974. A note on the morphometry and ecology of *Brachyurus orientalis* (Bloch and Schneider) in the Estuaries of Goa. *Geobios* 1 (4) 80-83.
- Kuthalingam, M. D. K. 1957. Life history and feeding habits of *Cynoglossus lingua* (Ham-Much), *J. Zool. Soc. India.* 9 (2): 208-215.
- Mayr (E), 1963. Animal species and evolution— Cambridge, Mass., The Belknap press of Harvard University press, chap. 11, 13, 16.
- Misra, K. S. 1959. An aid to the identification of the common commercial fishes of India and Pakistan. *Rec. Indian Mus.* 57, 311-313.
- Munro, S. R. 1955. The marine and freshwater fishes of Ceylon. Department of external affairs, Canberra.
- Seshappa, G. and Bhimachar, B. S. 1954. Studies on the age and growth of the malabar sole, *Cynoglossus semifasciatus* Day. *Indian J. Fish.* 1 (1) 145-162.
- Seshappa, G. and Bhimachar, B. S. 1955. Studies on the age and growth of the malabar sole. *Cynoglossus semifasciatus* Day. *Indian J. Fish.* 2 (1) 180-230.