

## Osteo-taxonomic distinction of fishes of the family Leiognathidae

P. S. B. R. JAMES

Central Marine Fisheries Research Institute, Cochin - 682 018, India

Present address : No. 832/27, 3<sup>rd</sup> B Main, 2<sup>nd</sup> Cross, Prem Nivas Road,  
Kammanahalli, P. O., St. Thomas Town, Bangalore - 560 084.

e-mail: prabakar.ramichetty@in.daksh.com

### ABSTRACT

The subtle external taxonomic differences between closely resembling species of Leiognathidae have been osteologically substantiated by highlighting the differences in the skull bones. Amongst them, the vomer, epiotic, basisphenoid and palatine were found to be characteristic of most of the species.

### Introduction

The fishes of the family Leiognathidae, popularly called silver-bellies have been continuously sustaining a commercial marine fishery in India for about 50 years, with the annual yield varying between 48544 to 69915 t during the ten-year period 1994 to 2007 (CMFRI Ann. Repts.). The fishery is more important in the southern States of Tamil Nadu, Kerala and Andhra Pradesh. Silver-bellies are bottom-dwelling fishes, captured in coastal areas upto a depth of about 50 m, in a wide variety of gears, predominantly in trawl nets. Being scanty of flesh, the catches are mostly sun-dried, partly salt-cured and partly consumed in fresh condition.

At present, 21 species are known to occur in the seas around India. Most of the species are small (upto 15 cm) but a couple of species, like *Leiognathus equulus* and *L. fasciatus* attain larger sizes of about 25 cm length. They are identified mostly based on body shape, colour and fin elongations. However, morphometric characters of the species are quite variable and overlapping, the colours fading soon after death and the fragile fin spines and rays often found broken, making these differences subtle and identification difficult.

In order to confirm and substantiate the taxonomic studies made earlier by the author (James, 1967; 1969; 1975; 1984; 1990) on this family, a detailed osteological study covering 17 of the species was made (James, 1985 a; b), drawing the convergence and divergence between the three genera and species. The present study attempts to delineate the osteo-taxonomic distinction between the species further by critically re-examining all

the skull features and identifying the most important features for each species.

### Materials and methods

The present study is based on the same material and methods of the earlier study (James, 1985 a; b). In addition to material of *L. elongatus*, material of the three new species since described, *L. indicus* (Rani Singh and Talwar, 1978), *Gazza shettyi* (Jayabalan, 1985) and *L. striatus* (James and Badrudeen, 1990) were also not available for the present study. *L. bindus* was found to be quite distinct from all other members of the family and hence excluded from this study. Thus, 16 species out of a total of 21 were dealt in this study.

For the purpose of this study, the 16 species, based on their external features and close resemblance to one or more other species, were divided into seven groups and the osteo-taxonomic characters examined.

### Results

The distinctive osteo-taxonomic characters of the seven groups are listed in Tables 1 to 7. The most significant characters for species in each group are shown in Figs. 1 to 7. It is interesting to note that, of all skull bones examined, the vomer, epiotic, basisphenoid and palatine exhibit remarkable differences between species.

The single most distinctive osteological character of each species is mentioned below:

1. *L. fasciatus* : Epiotic process club-shaped
2. *L. equulus* : Epiotic process long, curved, gradually tapers to a sharp point

- 3. *L. smithursti* : Hyomandibular with two prominent inner processes
- 4. *L. splendens* : Anterior part of palatine almost vertical
- 5. *L. jonesi* : Posterior part of basisphenoid very long, the sides of anterior part smooth and straight
- 6. *L. dussumieri* : Posterior part of palatine long, thread-like
- 7. *L. daura* : Bulbous projection on the ventral side of parasphenoid
- 8. *L. blochi* : Vomer deeply forked anteriorly
- 9. *L. brevirostris* : Basisphenoid cup-like, shallow with posterior part short and stumpy
- 10. *L. leuciscus* : Vomer long, narrow, anterior part more than thrice in posterior part
- 11. *L. berbis* : Anterior part of palatine upturned and abruptly narrows to a sharp point
- 12. *L. lineolatus* : Epiotic process broad at base, curved and narrows down to tip
- 13. *S. ruconius* : Conspicuous, mid-lateral blunt process on parietal
- 14. *S. insidiator* : Inner process on vertical limb of premaxillary very narrow
- 15. *G. minuta* : Anterior part of palatine strongly and evenly curved upwards, posterior stiff part pointing downwards
- 16. *G. achlamys* : Frontal ridge prominent, extends posteriorly as a strong spine

Fig. 1 - i

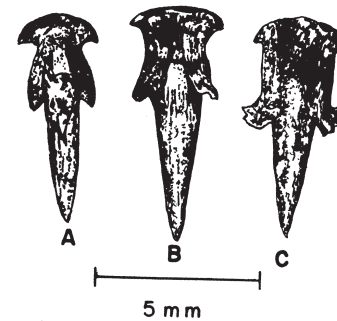


Fig. 1 - ii

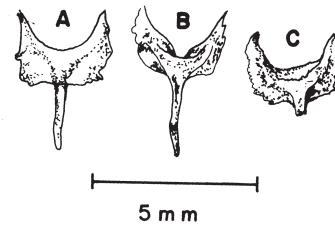


Fig. 1 - iii

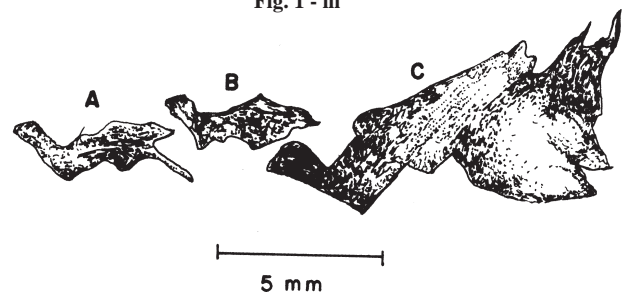


Fig. 1. i. Vomer, ii. Basisphenoid, iii. Palatine, A. *L. fasciatus*, B. *L. equulus*, C. *L. smithursti*

Table 1. Osteological differences between *L. splendens* and *L. jonesi*

Sl. No.	Character	<i>L. splendens</i>	<i>L. jonesi</i>
1.	Vomer	Small, narrow, shallow depression at anterior end, tips of posterior pair of lateral processes point inwards	Large, broad, anterior end deeply forked, tips of posterior pair of lateral processes point outwards
2.	Epiotic	Small, roundish	Big, squarish
3.	Basisphenoid	Small, anterior depression deep, posterior process conspicuously small	Large, anterior depression shallow, posterior process conspicuously long
4.	Palatine	Anterior portion almost vertical. Posterior margin indented	Anterior portion strongly curved. Posterior portion drawn into a long process

Table 2. Osteological differences between *L. leuciscus*, *L. berbis* and *L. lineolatus*

Sl. No.	Character	<i>L. leuciscus</i>	<i>L. berbis</i>	<i>L. lineolatus</i>
1.	Vomer	Long and prominent. Sides of anterior end blunt	Short and stumpy. Sides of anterior end small, spine-like	Short and stumpy. Sides of anterior end small, rounded
2.	Epiotic process	Conspicuous, curved, long, tip blunt	Conspicuous, straight, tip sharp	Conspicuous, base bulged, tip pointed
3.	Basisphenoid	Y-shaped, shallow anteriorly	Hourglass-shaped, deeply concave anteriorly	Hourglass-shaped, concave anteriorly, posterior margin highly denticulate.
4.	Palatine	Anterior part blunt, posterior elongation absent	Anterior part sharp, filamentous posterior elongation present	Anterior part blunt, filamentous posterior elongation present.

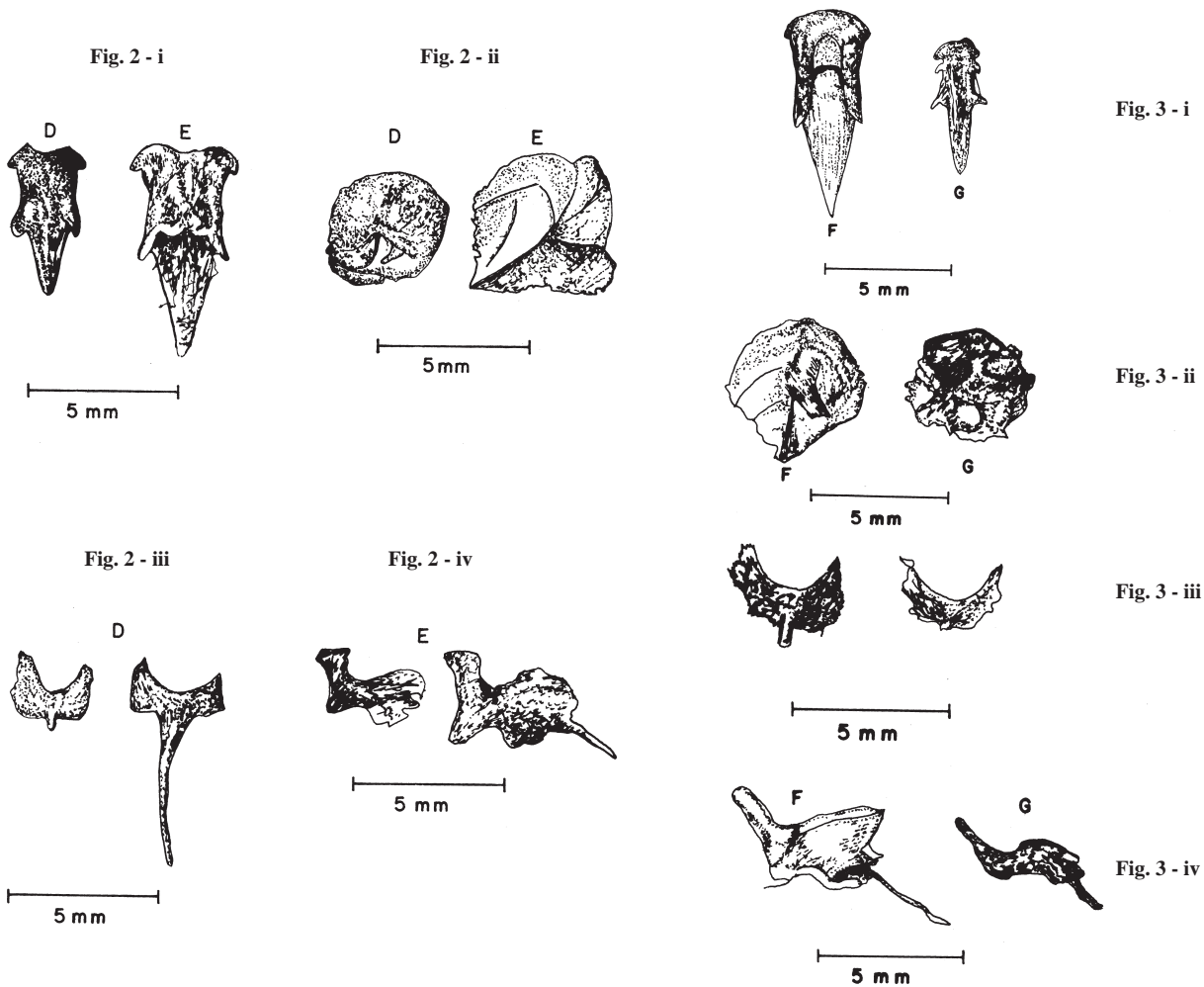


Fig. 2. i. Vomer, ii. Epiotic, iii. Basisphenoid, iv. Palatinem, D. *L. splendens*, E. *L. jonesi*

Fig. 3. i. Vomer, ii. Epiotic, iii. Basisphenoid, iv. Palatine, F. *L. dussumieri*, G. *L. daura*

Table 3. Osteological differences between *L. dussumieri* and *L. daura*

Sl. No.	Character	<i>L. dussumieri</i>	<i>L. daura</i>
1.	Vomer	Very large, lateral processes indistinct	Small, lateral processes distinct
2.	Epiotic process	Broad, blunt at tip	Narrow, sharp at tip
3.	Basisphenoid	Stem long, ventral margin of body	Stem very short, ventral margin of body wavy
4.	Palatine	Massive, posterior portion filamentous	Small, postero-process short

Table 4. Osteological differences between *L. blochi* and *L. brevirostris*

Sl. No.	Character	<i>L. blochi</i>	<i>L. brevirostris</i>
1.	Vomer	Short, narrow and deeply forked anteriorly	Long, broad anteriorly with shallow fork
2.	Epiotic process	Tip broad and blunt	Tip narrow and blunt
3.	Basisphenoid	Conspicuously long, bent, tip pointed	Conspicuously short, tip blunt
4.	Palatine	Posterior portion blunt	Posterior portion drawn into a long process

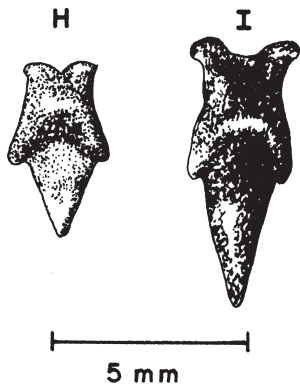


Fig. 4 - i

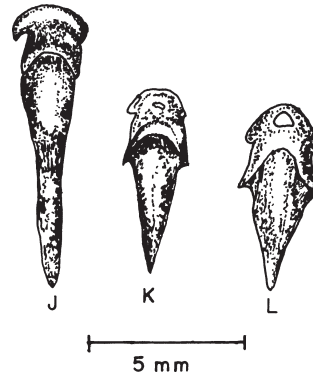


Fig. 5 - i

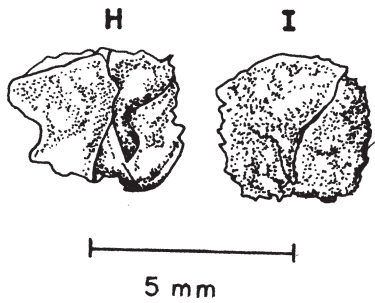


Fig. 4 - ii

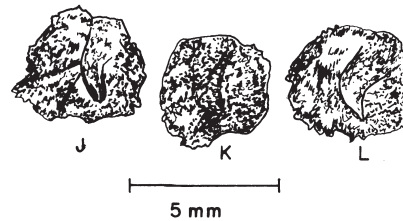


Fig. 5 - ii

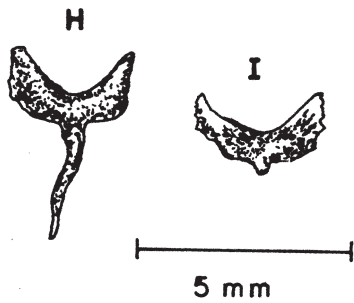


Fig. 4 - iii

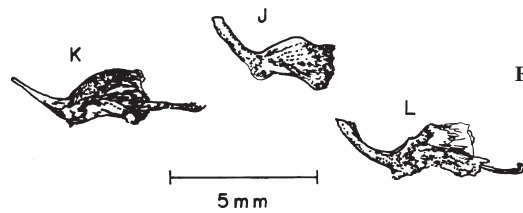


Fig. 5 - iii

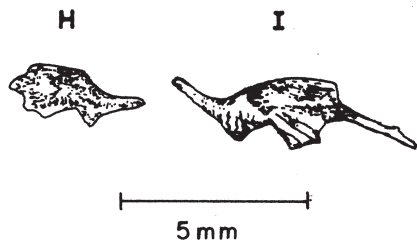


Fig. 4 - iv

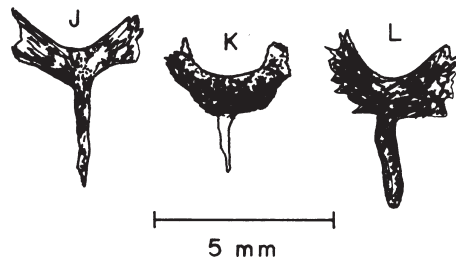


Fig. 5 - iv

Fig. 4. i. Vomer, ii. Epiotic, iii. Basisphenoid, iv. Palatine, H. *L. blochi*, I. *L. brevirostris*

Fig. 5. i. Vomer, ii. Epiotic, iii. Palatine, iv. Basisphenoid, J. *L. leuciscus*, K. *L. berbis*, L. *L. lineolatus*

Table 5. Osteological differences between *L. fasciatus*, *L. equius* and *L. smithursti*

Sl. No.	Character	<i>L. leuciscus</i>	<i>L. berbis</i>	<i>L. lineolatus</i>
1.	Vomer	Sharp processes on side, tip distinctly convex	Sharp processes on side, tip flat	Side processes frayed, tip convex and indented
2.	Epiotic process	Club-shaped	Long, curved, tip pointed	Blunt and stumpy
3.	Basisphenoid	Anterior depression shallow, margins of body wavy, stem long	Anterior depression deep, margins of body wavy, stem long	Anterior depression shallow, margins of body denticulate, stem stumpy
4.	Palatine	Small, posterior portion drawn into a long process	Small, posterior portion blunt	Massive, posterior portion blunt and indented

Table 6. Osteological differences between *S. ruconius* and *S. insidiator*

Sl. No.	Character	<i>S. ruconius</i>	<i>S. insidiator</i>
1.	Vomer	Small, posterior portion short, lateral processes at the anterior end distinct	Large, posterior portion elongated, lateral processes at the anterior end irregular
2.	Epiotic process	Long, broad and blunt at the end	Short, narrow and blunt at the end
3.	Basisphenoid	Margin of body plain	Margin of body denticulate
4.	Palatine -		
	Anterior portion	Strongly curved	Gently curved
	Posterior portion	Abruptly ends	Drawn into a long process

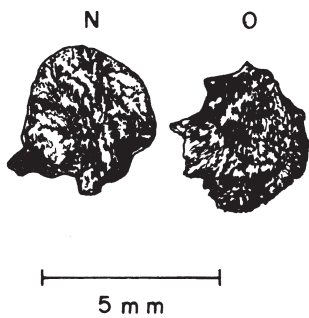


Fig. 6 - i

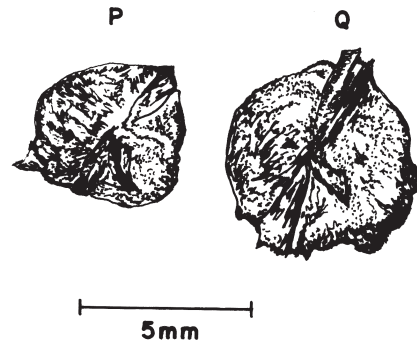


Fig. 7 - i



Fig. 6 - ii

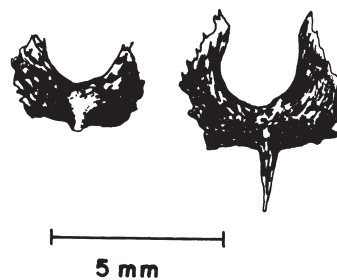


Fig. 7 - ii

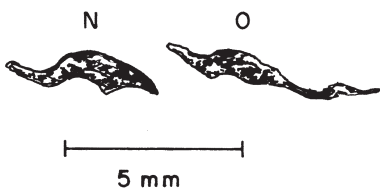


Fig. 6 - iii

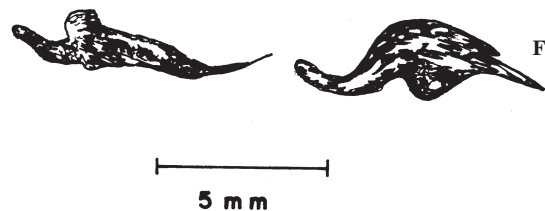


Fig. 7 - iii

Fig. 6. i. Epiotic, ii. Basisphenoid, iii. Palatine, N. *S. ruconius*, O. *S. insidiator*

Fig. 7. i. Epiotic, ii. Basisphenoid, iii. Palatine, P. *G. minuta*, Q. *G. achlamys*

Table 7. Osteological differences between *G. minuta* and *G. achlamys*

Sl. No.	Character	<i>G. minuta</i>	<i>G. achlamys</i>
1.	Vomer	Small, narrow, margin of tip convex	Large, broad, margin of tip wavy
2.	Epiotic process	Base broad, curved, tip sharp	Base narrow, diamond-shaped
3.	Basisphenoid	Shallow depression anteriorly, stem short, tip blunt	Deep depression anteriorly, stem long, tip sharp
4.	Palatine -		
	Anterior portion	Long, gently curved upwards	Short, sharply curved upwards
	Posterior portion	Short, bent down	Long, curved upwards

## References

- James, P. S. B. R. 1967. *Leiognathus leuciscus* (Gunther) and *Leiognathus smithursti* (Ramsay and Ogilby) (Family Leiognathidae : Pisces) - two new records from the Indian seas. *J. Mar. Biol. Ass. India*, 9(2): 300-302.
- James, P. S. B. R. 1969. A new species of silver-belly, *Leiognathus jonesi* (Family Leiognathidae : Pisces) from the Indian seas. *J. Mar. Biol. Ass. India*, 11(1&2): 316-319.
- James, P. S. B. R. 1975. A systematic review of the fishes of the family Leiognathidae. *J. Mar. Biol. Ass. India*, 17(1): 138-172.
- James, P. S. B. R. 1984. Leiognathidae. In: Fischer, W. and Bianchi, G. (Eds.), *FAO species identification sheets for fishery purposes. Western Indian Ocean (Fishing Area 51)*, Vol. II.
- James, P. S. B. R. 1985a. Comparative osteology of the fishes of the family Leiognathidae, Part I. Osteology. *Indian J. Fish.*, 32(3): 309-358.
- James, P. S. B. R. 1985b. Comparative osteology of the fishes of the family Leiognathidae, Part II. Relationships among the genera and the species. *Indian J. Fish.*, 32(4): 395-416.
- James, P. S. B. R. and Badrudeen, M. 1990. A new species of silver-belly, *Leiognathus striatus* (Family Leiognathidae : Pisces) from the Gulf of Mannar, India and redescription of *Leiognathus fasciatus* (Lacepede). *J. Mar. Biol. Ass. India*, 32(1 & 2): 217-226.
- Jayabalan, N. 1985. A new species of silver-belly, *Gazza shettyi* (Pisces: Leiognathidae) from the Bay of Bengal. *Matsya*, 11: 42-45.
- Rani Singh and Talwar, P. K. 1978. On a new species of silver-belly, *Leiognathus indicus*, Pisces : Leiognathidae (from the Bay of Bengal). *Bull. Zool. Surv. India*, 1(3) : 275-277.

Date of Receipt : 04-07-05

Date of Acceptance : 21-10-08