

## **Preliminary Taxonomic Studies on *Sillago* Fish Species of Kollam District of Kerala, India**

**Dr. Mathews Plamoottil\***, <sup>1</sup>**Sahatrat Muangkhwang**

\*Asst. Professor in Zoology, Government College, Chavara, Kollam, Kerala, India

<sup>1</sup>Researcher, Kasetsart University, Thailand

---

**Abstract:** *Systematic studies conducted on the Sillago fish species of Kollam district of Kerala. Meristic, metric and other morphometric characters of these fishes were studied and taxonomically analyzed*

**Keywords:** *Taxonomy, Percoid fishes, Meristic counts, Metric characters*

---

### **1. INTRODUCTION**

*Sillago* species are edible percoid fishes of the family Sillaginidae distributed in saline and brackish waters of India, Southeast Asian countries and Australia. A few are also distributed in water bodies of Africa and Japan They are commonly known as whittings, smelt-whittings, sillaginids, sand borers and sand-smelts.

The genus name was first coined by famous taxonomist Georges Cuvier as a genus for his new species, *Sillago acuta*. John Richardson placed the genus, along with *Sillaginodes* and *Sillaginopsis* in a family. Due to close similarity in appearance and color and also due to overlapping distribution, identification and taxonomic studies of them are hard. So morphology of swim bladder is used for its identification [1, 2]. Many different *Sillago* species were described and named by various workers were found to be synonyms later. It created confusion in taxonomic studies of *Sillago* species. Roland McKay [3] of the Queensland Museum published a revision of the family Sillaginidae. It helped to solve the ambiguity which had existed in *Sillago* systematics. Taxonomic studies conducted on *Sillago* fishes of India are very rare. It is an endeavor to trace out the systematic details of species of this genus in Kollam district of Kerala.

### **2. MATERIALS AND METHODS**

Fishes were collected from Ashtamudi Lake at Neendakara, Kollam; they were caught using gill nets and preserved in 10 % formalin. Measurements were made point to point with dial caliper and data recorded to tenth of a millimeter. Methods used are of Jayaram [4, 2]; counts and measurements were made on the left side of specimens. Subunits of head are presented as percentage of head length and head length and proportions of body parts are given as percentage of standard length.

### **3. RESULTS AND DISCUSSION**

During the present study two types of *Sillago* species were collected from Neendakara of Kollam district. After careful observation it was proved that they are of two different species; *Sillago sihama* Forsskal and *Sillago vincenti* McKay. Detailed taxonomic studies were conducted on both of these.

#### **SILLAGO SIHAMA FORSSKAL**

Type species name: *Atherina sihama*

Taxon Authority: Forsskal [5]

Type Locality: Lohaja, Red Sea

Synonyms: *Platycephalus shihamas*, Bloch & Scheiner [6]; *Sciaena malabarica* Bloch & Scheiner [6], (Tranquebar); *Sillago acuta* Cuvier [7] (Sea of Indies); *Sillago erythraea* Cuvier & Valenciennes [8] (Suez, Red Sea); *Sillago malabarica* (Cantor) [9].

Common Names: Northern Whiting; sand smell, silver whiting etc.

Regional Name (Malayalam): Kalimeen, Kaaliyodan

### 3.1. Dianosis

First dorsal fin with XI spines and second dorsal fin with 22 soft rays; anal fin with 21- 22 soft rays; lateral line scales 74-79; Vertebrae- 34. Two posterior extensions to swim bladder; two anterior extensions extend forward and diverge to terminate on each side of the basioccipital above the auditory capsule, two lateral extensions commence anteriorly; two posterior tapering extensions of swim bladder project into the caudal region, one usually longer than the other; the lateral extensions are normally convoluted and have blind tubules arising along their length. Tip of longest ray of first dorsal fin fairly reach the front base of second dorsal fin.

### 3.2. Description

Body elongate; anterior pre narial profile smooth; dorsal and ventral profiles nearly straight; snout long; eye diameter 40.3- 42.3 % of HL; 2 pairs of nostrils, posterior pair larger, located 1/3 orbit diameter away from orbits. Mouth small, terminal and forwardly placed; upper jaw longer, slightly prominent; lower jaw fit into upper jaw when mouth is closed; numerous minute villiform teeth on upper and lower jaws on its midterminal part. Gill aperture large, lateral, extending to ventral side of head. Two completely separated dorsal fins; first dorsal fin located an internarial distance away from pectoral fin base; second dorsal fin inserted 1/2 of inter orbital width away from first dorsal fin; tip of longest ray of first dorsal fin fairly reach the front base of second dorsal fin; first fin provided with 11 soft spines; it is higher than the second fin, composed of soft spines; two spines longest, others short. Fin membranes of both first and second dorsal fins without distinct color spots in fresh condition; base of second dorsal fin long; it is composed of 22 soft rays, starting at the middle of the body and not extending to caudal fin origin when placed flat; pectoral and ventral fin base provided with small scales; pectoral fin with 14 slender soft rays; ventral fin located a little behind pectoral fin origin,



**Fig 1.** *Sillago sihama* collected from Neendakara, Kollam



**Fig 2.** *Sillago vincenti* collected from Neendakara, Kollam

pointed at its tip; ventral and pectoral fin triangular; one of the ventral fin ray a little longer- half eye diameter longer than rest of ventral fin rays- and never reach vent or anal fin base; origin of anal fin slightly posterior to 2<sup>nd</sup> dorsal fin; it is with 21- 22 rays, not extending to caudal fin origin when placed flat; caudal peduncle short, depth of caudal peduncle 65.8 - 72.6 % of its length. Body with ctenoid scales. Lateral line begins above gill aperture and anterior portion of pectoral fin; it is convex on upper lateral region at the anterior part but straight on mid lateral region at its posterior part; it go through upper half of the lateral side for most of its length.

**3.3. Distribution**

Throughout the Indo- Pacific region from Knysna, South Africa to Japan

**3.4. Habitat**

A near shore species that frequently visits estuaries for considerable distances. It has rarely been recorded from freshwater.

**Table 1.** Meristic counts of *Sillago sihama*

Sl.No.	Meristic features	Counts
1	Dorsal fin rays	XI, 22
2	Ventral fin rays	i, 5
3	Pectoral fin rays	14
4	Anal fin rays	21- 22
5	Caudal fin rays	18- 20
6	Predorsal scales	27- 28
7	Lateral line scales	74- 79
8	Scales between lateral line and dorsal fin	5
9	Scales between lateral line and ventral fin	8.5
10	Scales between lateral line and anal fin	12½
11	Circum peduncular scales	20

**Table 2.** Morphometric measurements of *Sillago sihama*

Sl. No	Characters	Measurements
1	Total length (mm)	238.5- 252.5
2	Standard length (mm)	205.0- 219.0
3	Head length (mm)	59.0- 65.0
<b>% SL</b>		
3	Head length	28.8- 29.7
4	Head depth	11.5- 12.3
5	Head width	12.6- 12.8
6	Body depth	15.5- 16.3
7	Predorsal length	33.3- 34.6
8	Post dorsal length	64.4 - 65.7
9	Prepectoral distance	27.4 -29.8
10	Prepelvic distance	28.3 - 29.8
11	Preanal distance	53.4- 54.6
12	Length of pectoral fin	14.1- 15.1
13	Length of pelvic fin	14.2 - 14.6
14	Length of dorsal fin	19.0- 20.3
15	Length of anal fin	7.3 - 7.8
16	Length of caudal fin	15.3 - 16.3
17	Distance from pelvic to anal fin	26.4 - 28.0
18	Distance from anal to caudal fin	7.4 - 9.0
19	Length of base of first dorsal fin	17.6- 18.8
20	Length of base of anal fin	34.2 - 36.3
21	Length of caudal peduncle	8.7 - 9.3
22	Depth of caudal peduncle	6.1 - 6.3
23	Width of caudal peduncle	2.5 - 2.9
<b>% HL</b>		
24	Head depth	38.8- 42.7
25	Head width	42.3 - 44.6
26	Eye diameter	24.6- 27.1
27	Snout length	40.3 - 42.3
28	Interorbital width	16.1- 18.8
29	Inter narial width	17.2- 20.0
30	Width of gape of mouth	13.7 - 15.2

**SILLAGO VINCENTI McKAY**

*Sillago vincenti* Mc Kay [10], 378-381, Fig 1 A-C (Kavanad Near Neendakara, Kollam District Kerala, India)

Synonyms: none

Common Names: Vincent's *Sillago*.

Regional Names (Malayalam): Kalimeen, Kaaliyodan

### 3.5. Diagnosis

First dorsal fin with XI spines and second dorsal fin with 20-23 soft rays; anal fin with 23 soft rays. lateral-line scales 77; vertebrae- 34. Swim bladder with a single posterior extension, a short bulbous projection anteriorly with one to three anterolateral lobate or recurved projections; no tubular extensions anteriorly. Body depth 18.6- 20.0 and head depth 15.0- 15.4 in percentage of standard length. Tip of longest ray of first dorsal fin never reach the base of second dorsal fin.

### 3.6. Description

Body elongate; anterior prenarial profile smooth; 2 pairs of nostrils, posterior one larger, a little in front of eye, 1/3 diameter of eye away from orbit to posterior nares; two pairs of nostrils at the anterior part of eye; mouth small, terminal, forward in position; upper jaw slightly prominent and longer; lower jaw fit into upper jaw when closed. Numerous terminal villiform teeth on midterminal part of upper and lower jaws; pectoral fin base and ventral fin base with small scales; gill aperture large, lateral and extending to ventral side of head.

Two completely separated dorsal fins; first dorsal fin higher than second one; it is located an ½ eye diameter away from pectoral base; second dorsal fin inserted a little away (½ of inter orbital width) from first dorsal fin; tip of longest ray of first dorsal fin never reach the base of second dorsal fin; but smallest fin ray of first dorsal roughly reach second dorsal fin origin; lateral line convex at its origin and straight at caudal peduncle; ventral fin located little behind pectoral fin, pointed at its tip; one of the ventral fin rays is half eye diameter longer than rest of ventral fin rays, never reach vent or anal fin front; first dorsal fin with soft spines; 2 spines longest; others short; base of second dorsal fin long, starting at the middle of the body and not extending to caudal fin origin when placed flat. Origin of anal fin slightly posterior to second dorsal fin, not extending to caudal fin origin when placed flat. Dorsal fins with distinct black spots. Body with ctenoid scales. Colour: Body uniform pale tan coloured, with the second dorsal fin spotted.

**Table 3.** Meristic counts of *Sillago vincenti*

Sl.No.	Meristic features	Counts
1	Dorsal fin rays	XI, 20- 23
2	Ventral fin rays	i, 5
3	Pectoral fin rays	16-17
4	Anal fin rays	23
5	Caudal fin rays	17
6	Predorsal scales	31
7	Lateral line scales	77
8	Scales between lateral line and dorsal fin	6
9	Scales between lateral line and ventral fin	12
10	Scales between lateral line and anal fin	13
11	Circum peduncular scales	20

**Table 4.** Morphometric characters of *Sillago vincenti*

I. No	Characters	Range
1	Total length (mm)	200.0
2	Standard length (mm)	175.0
Percentage of standard Length		
3	Head length	31.4
4	Head depth	15.4- 15.0
5	Head width	14.8-15.4
6	Body depth	18.6- 20.0
7	Predorsal length	35.4- 36.6
8	Post dorsal length	61.1- 64.6
9	Prepectoral distance	31.4- 32.6
10	Prepelvic distance	32.8- 33.4
11	Preanal distance	55.4
12	Length of pectoral fin	15.4- 16.8
13	Length of pelvic fin	14.8- 15.4

**Preliminary Taxonomic Studies on *Sillago* Fish Species of Kollam District of Kerala, India**

14	Length of dorsal fin	17.7- 19.1
15	Length of anal fin	7.7
16	Length of caudal fin	13.1- 14.3
17	Distance from pelvic to anal fin	23.7- 26.8
18	Distance from anal to caudal fin	36.6- 42.8
19	Length of base of first dorsal fin	17.7- 18.8
20	Length of base of anal fin	29.1- 32.0
21	Length of caudal peduncle	8.9-11.4
22	Depth of caudal peduncle	6.6- 7.4
23	Width of caudal peduncle	3.1- 3.7
Percentage of head length		
24	Head depth	47.3- 48.2
25	Head width	44.5- 45.4
26	Eye diameter	23.6- 27.3
27	Snout length	40.0
28	Interorbital width	16.3- 21.8
29	Inter narial width	15.4
30	Width of gape of mouth	14.5- 16.4

**Table 5.** Morphometric differences between *Sillago sihama* and *S. vincenti*

Sl. No	Characters	<i>S. sihama</i>	<i>S. vincenti</i>
% SL			
1	Head length	28.8- 29.7	31.4
2	Head depth	11.5- 12.3	15.0- 15.4
3	Head width	12.6- 12.8	14.8- 15.4
4	Body depth	15.5- 16.3	18.6- 20.0
5	Predorsal length	33.3- 34.6	35.4- 36.6
6	Post dorsal length	64.4 - 65.7	61.1- 64.6
7	Prepectoral distance	27.4 -29.8	31.4- 32.6
8	Prepelvic distance	28.3 - 29.8	32.8- 33.4
9	Preanal distance	53.4- 54.6	55.4
10	Length of pectoral fin	14.1- 15.1	15.4- 16.8
11	Length of pelvic fin	14.2 - 14.6	14.8- 15.4
12	Length of dorsal fin	19.0- 20.3	17.7- 19.1
13	Length of anal fin	7.3 - 7.8	7.7
14	Length of caudal fin	15.3 - 16.3	13.1- 14.3
15	Distance from pelvic to anal fin	26.4 - 28.0	23.7- 26.8
16	Length of base of anal fin	34.2 - 36.3	29.1- 32.0
17	Length of caudal peduncle	8.7 - 9.3	8.9- 11.4
18	Depth of caudal peduncle	6.1 - 6.3	6.6- 7.4
19	Width of caudal peduncle	2.5 - 2.9	3.1- 3.7
% HL			
20	Head depth	38.8- 42.7	47.3- 48.2
21	Head width	42.3 - 44.6	44.5- 45.4
22	Snout length	40.3 - 42.3	40.0
23	Inter narial width	17.2- 20.0	15.4
24	Width of gape of mouth	13.7 - 15.2	14.5 -16.4

Geographical Distribution: East and west coast of India

**Remarks:** This species is very similar in external morphology to *Sillago sihama*. A dissection of the posterior part of the swim bladder is required for field identification.

#### 4. CONCLUSION

Order Perciformes is the most diversified of all fish orders; its classification is controversial since many families are similar and are not easily definable in terms of common shared derived characters [2, 11]. *Sillago* species are edible percoid fishes. 31 *Sillago* species were reported from various parts of world. *Sillago sihama* and *S. vincenti* are commonly found in south Indian waters. They are indistinguishable by direct observation. But both these show distinct differences in morphometric characters and in the structure of swim bladder. Color differences can also be noticed in both. Fins of *S. sihama* is hyaline but that of *S. vincenti* is colored. Fins of *Sillago vincenti* is with dark spots but

plain in *S. sihama*. The latter one is an elongated species compared to *S. vincenti*. Many of the morphometric measurements show considerable differences between these two *Sillago* species. Tip of longest dorsal fin ray of first dorsal fin fairly reach front base of second dorsal fin in *Sillago sihama* but it never reach in *S. vincenti*. As shown in Table 5, *S. sihama* and *S. vincenti* shows morphological differences in 24 characters. Relevant taxonomic studies conducted on the *Sillago* fishes of Kerala are rare. The present study also revealed that *Sillago* population has also been declined greatly in last few years. It is due to pollution and indiscriminate and over fishing [12, 13].

Inventorying and monitoring of biodiversity of a biogeographically significant territory is a pre requisite for biodiversity conservation. Conservation efforts require scientific documentation of bio-resources along with details on their distribution and status [14, 15, 16]. This requires inventory and systematic studies of the fishes. A detailed study on the different aspects of taxonomy of fishes is helpful in the correct identification and to search for the presence of new species. It emphasizes the need of taxonomical studies on *Sillago* and all other species. It is expected that more relevant taxonomic studies may be conducted on the *Sillago* fishes in near future.

#### **ACKNOWLEDGEMENTS**

Both authors acknowledge the anonymous reviewers comments of which helped to improve the manuscript. The first author acknowledges Principal, Baby John Memorial Govt. College Chavara for providing necessary facilities.

#### **REFERENCES**

- [1] Talwar PK. & Jhingran A. Inland fishes of India and adjacent countries. Oxford and IBH publishing Co., New Delhi, 1991, 250- 286.
- [2] Jayaram KC. Fresh water fishes of the Indian region. Narendra publishing House, Delhi, 2010, 292pp
- [3] McKay RJ. A revision of the fishes of the family Sillaginidae, memoirs of Queensland Museum, 1985, 23 (1): 1-73.
- [4] Jayaram KC. Fundamentals of fish taxonomy. Narendra publishing House, Delhi, 2002, 53-65.
- [5] Forsskål P. Descriptiones animalium; avium, amphibiorum, piscium, insectorum, vermium; quae in itinere orientali observavit Petrus Forskal-Hauniae. Post mortem auctoris edidit Carsten Niebuhr, Copenhagen, 1775, 164 pp.
- [6] Bloch ME. & Schneider JG. M.E. Blochii Systema Ichthyologiae iconibus ex illustratum. Post obitum auctoris opus inchoatum absolvit, correxit, interpolavit J.G. Schneider, Saxo, Berolini, 1801, 584 pp
- [7] Cuvier G. Le règne animal distribué d'après son organisation, pour servir de base à l'histoire naturelle des animaux et d'introduction à l'anatomie compare. Poissons 2. Deterville, Paris. 1817, 532 pp.
- [8] Cuvier G & Valenciennes A. Histoire naturelle des poissons. Tome troisième. Suite du Livre troisième. Des percoïdes à dorsale unique à sept rayons branchiaux et à dents en velours ou en cardes. 3. Paris, Levrault, Strasbourg. 1829. 500 pp.
- [9] Cantor TE. Catalogue of the Malayan Fishes, Journal of Asiatic Society of Bengal, 1849,18 (2): 983- 1443
- [10] Mc Kay RJ. The fishes of the family Sillaginidae from India with a description of a new species; Journal of Marine Biology Association of India, 1980, 18: 375- 385.
- [11] Plamoottil M. Systematic accounts on percoid fishes of Travancore. International Journal of Research in Environmental Science, 2016, 2 ( 5): 12-23
- [12] Plamoottil M & Abraham N P. Indegenous fishing methods of manimala River. Journal of Advanced Zoology, 2013, 34 (2): 92- 102.
- [13] Plamoottil M & Win T. On some destructive fishing methods of Central Travancore of Kerala, India. Journal of Zoological and Bioscience Research, 2017, 4 (1): 6-12
- [14] Easa PS. & Shaji CP. Fresh water fish diversity in Kerala part of Nilgiri Biosphere Reserve. *Current science*, 1997, 73(2): 180-182.
- [15] Easa PS. & Shaji CP. Biodiversity documentation for Kerala. Part 8, KFRI, Peechi, 2003, 127pp.
- [16] Easa, PS. & Basha SC A survey on the habitat and distribution of stream fishes in the Kerala part of Nilgiri Biosphere Reserve, KFRI research report No. 104. Kerala Forest research Institute, Peechi, 1995.