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First report on the anal fin deformity and other morpho-meristic deformities in Gangetic anchovy genus *Thrissina* from Indian waters

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ABSTRACT

Morphological and meristic irregularities were observed in nine Specimens of genus *Thrissina* collected from various fisheries landing centers in India. Their morphometric and meristic characters were compared with normal specimens. They were found that nine samples were abnormal in which three with the absence of a pelvic fin, two having anomalous anal fin with a reduced number of scutes, and other two with branched gill rakers and one without a pectoral fin, and one having a defect in the head region. An increased number of deformities in a particular species or population is a warning signal which indicates severe problems in their environment. Analysis of deformities appearing in many of these fish species is paving a way to find the actual limiting factor responsible for these body changes. Findings of different deformities in *Thrissina* species have been discussed here.

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1. Introduction

Genus *Thrissina*, commonly called Gangetic anchovy, belongs to the family Engraulidae are small marine pelagic schooling fishes inhabiting depths less than 60 meters. There are 35 species of *Thrissina*, of which 17 are reported in India. Gill net and mini pure seins are the major gear employed in their fishery. *Thrissina* contributed 41820 tonnes to the total marine landings in India in 2021(CMFRI, 2022). The genus *Thrissina* (Jordan and Seale 1925) was previously considered a misspelling of *Thryssa* (Cuvier 1829), but this has been corrected (Kottelat, 2013). The deformity is a situation in which parts of the body have not developed in the normal way or with the normal shape. This is a condition of having body part with an unsual shape owing to injury, disease, or by congenital distortion. Direct damage occurring in live tissue is known as injury and any deformity in the body effect the lack of functional performance. These abnormalities occurred outside (external) or inside (internal). These abnormalities lead to changes in body shape, feeding and swimming behaviors, increased pathogen invasion and mutation, and predator attack (RAMP). The absence of fins or limbs in actinopterygian and tetrapod groups leads to an increase their body elongation, often with increased vertebral counts. Some cases of deformities in the genus *Thrissina* have been reported in India. Sri Haru Murrugesan *et al.* (2019) found the absence of anal fin in White Sardines from Indian waters. Gangan *et al*. (2018) also reported anomalies in pelvic fin and pectoral filaments of the genus *Setipinna* from the east Coast of India. The anal fin and pectoral fin deformity are not adequately reported in the genus *Thrissina*. Recently, Jose *et al*. (2020) documented the first report on the absence of pelvic fin in the three species of the genus *Thrissina* from various landing centers in India. The current study provides the first report on the absence of anal fin and pectoral fin and some other morphological abnormalities in four species of the genus *Thrissina* from various landing centers in India.

2. Materials and Methods

During regular sampling, abnormal specimens were obtained from different landing centers in India. Standard literature was referred for species identification (Fischer and Bianchi 1984; Whitehead *et al*. 1988). Abnormal specimens of *T. polybranchialis,* and *T. mystax* were collected from landing centers of Kochi in 2020 and Kollam in 2020.*T. dussumieri* from Ratnagiri Maharashtra in 2021 lacked a pectoral fin. Another specimen of *T. dussumieri* was collected from Odisha in 2020. The fish specimens with anal fin deformities were observed *T. mystax* from Ratnagiri in 2021 and *T. dayi* from Kerala in 2021(Table. 1). The morphometric and meristic characters were recorded by using Hubbs and Lagler 1947. Both morphometric and meristic characters of each specimen were compared with normal specimen (Table. 2). The morphological comparison of abnormal and normal specimens was documented using an X-ray radiograph (Fig. 3 & Fig. 4).

3. Results and Discussion

Morphometric and meristic characteristics of abnormal specimens are compared with the normal specimens. These specimens of *T. mystax* and *T. dayi* have anal fin deformities. In *T. mystax*, the deformed area starts down to the dorsal fin, and the anterior part of the anal fin is completely absent (Fig.1b). The posterior part contains only 28 anal fin rays. The analysis of the X-ray reveals that abnormal specimen with a reduction in the number of belly scutes. Normal specimen of *T. mystax* (Fig.1a) contains 17 to 19 pre-pelvic and 8 to 13 post-pelvic scutes, but the abnormal specimen has 15 scutes from the isthmus to the anus. The anus was notched upward with 13 mm depth, and there was a bulging of tissues in the deformed portion. In *T. dayi* the anal fin region shows a wavy arc-like structure in the anterior part of the anal fin with a depth of 8mm (Fig.1e). The deformed area shows mild inflammation. Normal specimens of this species (Fig.1d) mostly contain 42 to 43 anal fin rays. Whereas in a deformed specimen, it

Table 1. Geographical locations of sampling sites

Species name	Year	Sampling sites	Geographical location	Reference
T. polybranchialis (without pelvic fin and head deformity)	2020	Kalamukku, Kerala	lat:09°59' 924" N, long:76 °4' 564" E	Current study
T. mystax (pelvic fin& branched gill raker)	2020	Neendakara, Kollam, Kerala	lat:8° 56' 11.49 "N, long:76 °32' 15.11" E	Current study
T. dussumieri (without pectoral fin)	2021	Ratnagiri, Maharashtra	lat:16° 59 39.9984" N, long:73 180.00108"E	Current study
T. dussumieri (without pelvic fin)	2020	Puri, Odisha	lat:19°48' 48.1752" N, long:85°49'53.274"E	Current study
T. mystax (anal fin deformity)	2021	Ratnagiri, Maharashtra	lat:16°59'39.9984"N, long:85°49'53.274"E	Current study
T. dayi (anal fin deformity)	2021	Kalamukku, Kerala	lat:09°59' 924" N, long:76 °4' 564" E	Current study

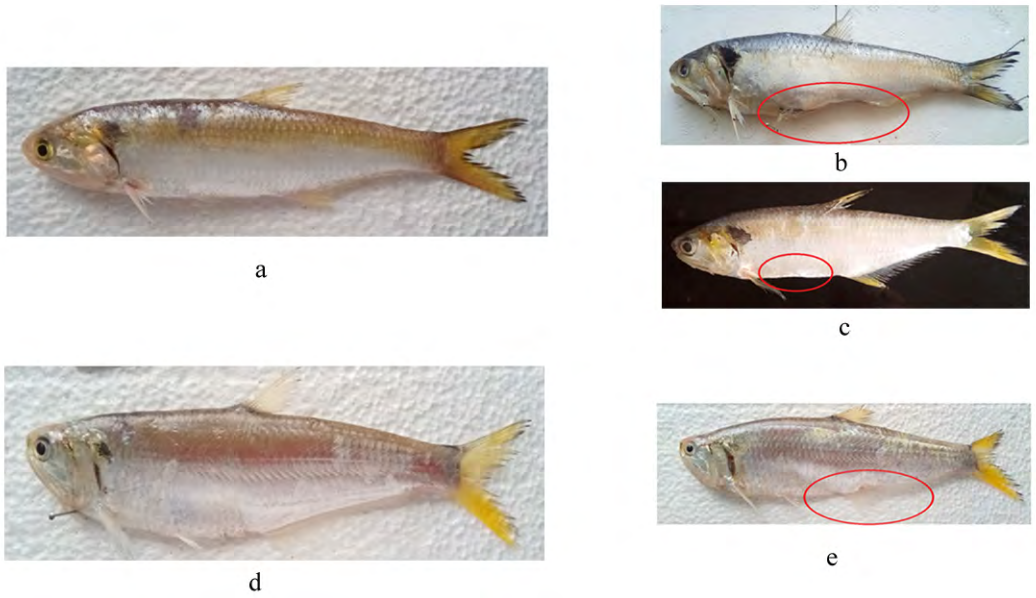

Fig. 1. Representative image of normal and abnormal specimens of two species of *Thrissina* (2a. Normal specimen of *T. mystax*, and 2b-*T. mystax* with anal fin deformity and 2c.- *T. mystax* (without pelvic fin). 2d. Normal specimen of *T. dayi* and, 2e.- *T. dayi* with anal fin deformity).

Table 2. Comparison of Morpho-meristic characters of normal and abnormal specimens of various species of genus *Thrissina*

Species name	*T. mystax*	*T. mystax*	*T. dayi*	*T. dayi*
Parameters(mm)	**Normal**	**Abnormal**	**Normal**	**Abnormal**
Total length	167	183	177	208
Fork length	146	165	161	182
Standard length	134	147	141	164
Eye diameter	8.2	8.4	7	7.4
Snout length	6.2	7.1	5.8	5.8
Body depth at anal	29.9	28	36.1	39.8
Anal fin length	16.4	14.8	25.4	23.8
Anal fin base length	40.4	36.4	52.5	62
Head height	28.2	32.1	30.1	37.3
Pre anus	82.9	96	79.6	89.3
Scutes	16+10	15	15+10	14+10
Anal fin rays	34	28	44	47

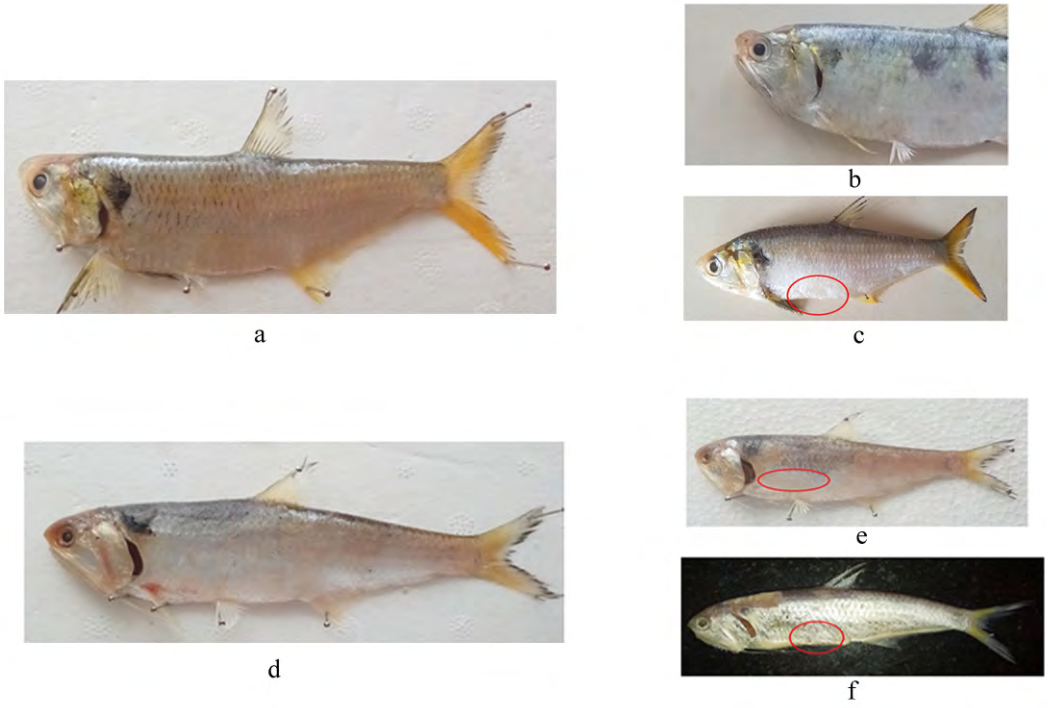

Fig. 2. Image of normal and abnormal specimens of two species of genus *Thrissina* (3a. Normal specimen of *T. polybranchialis* 3b&c.- Abnormal specimens, 3d.-Nomral specimen of *T. dussumieri*, 3e.-Abnormal (without pectoral fin) and 3f.- without pelvic fin

is 47. No other anomalies were observed from these two specimens.

On examination, it was found that *T. polybranchialis* (Fig.2c), *T. dussumieri* (Fig.2e), and *T. mystax* (Fig.1c) are devoid of pelvic fin. The finless region was scaly and there was no tissue thickening. In *T. polybranchialis* head region shows a wavey structure near the upper part of the eye (Fig.2b) There was no trace of injury or inflammation along the abnormal portion. These deformities did not affect the growth and shape of the fish.

Gill raker of genus *Thrissina* mainly consists of 11 to 32 numbers. Serrae in the gill raker may be even or clumped. During the present study, it was found that two specimens of *Thrissina* have some abnormal gill raker. Normal specimens of *T. mystax*, lower gill raker were found to be 16 (rarely 17), but in the abnormal one, a number of gill rakers were found to be more than the normal count ie, 29 in number. Branched gill rakers were also observed in another specimen (Fig. 5).

Several authors have reported various abnormalities in Fishes. Jawad and Ibrahim (2018) reported some anal fin deformities in fishes collected from Jubail City, Arabian Gulf. Jawad and AL-Mamry (2012) explained dorsal fin abnormality in Silver pomfret, *Pampus argenteus* from the Arabian Gulf coast of Oman. Brown *et al*. (2011) reported pectoral fin loss in the *Mastracembelidae*. Parimala (2011) reported the absence of pelvic fin in estuarine gizzard shad, *Nematalosa nausus*. Different workers have contributed various reasons to explain such abnormalities. A specimen of *T. malabarica* without a pelvic fin and with a reduced number of scutes was reported by Baburao (1975). Jose *et al*. (2020) documented a report on the absence of pelvic fins in three species of the genus *Thrissina* from India. They suggested that this absence could be attributed to environmental stress or mutation events occurring during the early life stages. Yamanoue *et al*. (2010) explained when the level of deformities is high and exists in different age classes, it would be a sign of ecosystem changes or genetic changes in the population. Marichamy (1968) observed certain abnormalities in the short-jaw anchovy, *Thrissina baelama*, from Port Blair, Andaman Islands. They highlighted two significant abnormalities in *T. baelama* specimens: the absence of ventral fins and ovarian abnormality. One female specimen exhibited a complete absence of ventral fins without any signs of injury or scarring. Marichamy (1968) revealed this abnormality to be an unprecedented finding for the species. Gangan (2016) observed an abnormal specimen of *Encrasicholina punctifer* from Mumbai, on the west coast of India. The major distinguishing characteristics included a thread-like extension of the last ray of the dorsal fin and the number of lower gill rakers. They noted that the elongation of the last ray of the dorsal fin in *E. punctifer* might be due to unusual muscle bud development during early embryonic stages or defects in early development caused by anthropogenic activity. Murakami *et al*. (2004) reported that deformity in body leads to decrease the biological survival. The anal fin serves to stabilize the fish while swimming. In this note, two specimens were studied with two types of anal fin deformities, from one with a reduction in belly scutes and an external bulging present in the posterior pelvic region with a small lesion near the anal part. Normally their body is soft with numerous scutes in the abdominal area. These scutes act as a protective and supporting layer.

Absence in the number of scutes may severely affect the fish by spoiling the pertaining skin layer. These deformities

Fig. 3. X-ray radiograph of *T. mystax* and *T. polybranchialis*

Fig. 4. X-ray radiograph of *T. dayi*

Fig. 5. Representative image of branched gill rakers of species *T. mystax*

in the anal fin may affect their movement. Compared with other fin, pelvic fin did not play crucial role but by the help of pelvic and pectoral fin a fish can slowdown their speed. According to Murty (1972) loss of pelvic fin did not affect the growth and body proportion of the fish. In some species, the pectoral fin helps to generate a thrust so the fish can speed up to ten body lengths per second. The pectoral fins of fish may be loss by different lineages. Depending on the fish's shape pectoral fin serve much important than that of the pelvic fin and there are no sufficient notes are available in of pectoral fin reduction. The burrowing habit of some vertebrates leads to their limb loss. The absence of pectoral and pelvic fin may be congenital ie, it could be considered as an abnormality occurring at or before birth. This abnormality leads to an increased predatory attack. Environmental changes such as physical or chemical changes in their embryonic development, also affect their normal growth. Gill rakers are comb-like structures that help filter the food from the water. The gill rakers number is correlated with the feeding habits of fish (Nilson, 1958). The observed abnormalities may alter the feeding habits of fish.

4. Conclusion

In this report, it is hypothesized that these deformities must have occurred due to the result of genetic aberration. The incomplete or irregular development of these fins appears in *Thrissina* species is due to the disturbance occurred in the early development stages of their limbs. These developmental deformities may be due to genetic abbreviations, which may hinder the normal development of the fish. Since there was no predatory attack or injury observed in origin of find in area so it should be assumed that these deformities occurred purely by birth. Even though these groups possess different limb abnormalities, they do not affect the overall growth, development and biological activities of fish.

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5. References

CMFRI (2022). CMFRI Annual Report 2022, Technical report. (ICAR- Central Marine Fisheries Research Institute, Kochi), pp. 20-21.

Cuvier G.1829: Le Règne Animal, distribué d'après son organisation, pour servir de base à l'histoire naturelle des animaux etd'introduction à l'anatomie comparée. Edition 2, vol 2. Chez Déterville, Paris.

Baburao M. 1975: An abnormal specimen of *Thryssa malabarica* (Bloch) (Pisces: Engraulidae) without pelvic fins, *Curr Sci.*, 44 (9): pp. 313. 13.

Brown KJ, Britz R, Bills R, Rüber L, and Day JJ. 2011: Pectoral fin loss in the *Mastacembelidae*: a new species from Lake Tanganyika. *Journal of Zoology.*, *284*(4): 286-293.

Fischer W. and Bianchi G. 1984: FAO species identification sheets for fishery purposes: Western Indian Ocean (Fishing Area 51). v. 1: Introductory material. Bony fishes, families: *Acanthuridae to Clupeidae.-v. 2: Bony fishes*, families: *Congiopodidae to Lophotidae.-v. 3:... families: Lutjanidae to Scaridae.-v. 4:...* families*: Scatophagidae to Trichiuridae.-v. 5: Bony fishes, families: Triglidae to Zeidae. Chimaeras. Sharks. Lobsters. Shrimps and prawns. Sea turtles. v. 6:* Alphabetical index of scientific names and vernacular names.

Gangan SS, Jahageerdar S, Kumar PA, Nayak BB & Jaiswar AK. 2016: Dorsal fin abnormality in Bucanner anchovy, *Encrasicholina puncitfer* (Fowler, 1938) from Mumbai Coast, India, *J Indian Fish Assoc*., 43 (2): 71-80.

Gangan SS, Jaiswar AK, Kumar AP, Jahageerdar S, Lakra WS, and Krishna G. 2018. A report on anomalies in pelvic fin and pectoral filament of two species of genus *Setipinna* (Swainson, 1839) from the east coast of India, *Indian Journal of Geo-Marine Science*., Vol (47): pp.1893-1898.

Jawad LA and AL-Mamry JM. 2012: Saddleback syndrome in wild silver pomfret, *Pampus argenteus* (Euphrasen, 1788) (Family: *Stromatidae)* from the Arabian Gulf coasts of Oman. *Croatian Journal of Fisheries: Ribarstvo*., 70(3): 135-142.

Jawad LA and Ibrahim M. 2018: First Records of Anal Fin Deformity in Fishes Collected from Jubail City, Saudi Arabia, Arabian Gulf. *Thalassas: An International Journal of Marine Sciences.*, 34(2): 341-348.

Jordan DS and Seale A. 1925: Analysis of the genera of anchovies or Engraulidae. Copeia. (141): 27-32.

Jose N, Gangan SS, Sri Hari M. 2020: Report of absence of pelvic fin in three species of genus *Thryssa* (Engarulidae, Clupeiformes) from India. *Indian Journal of Geo-Marine Sciences*., Vol. 49 (04): 703-705

Kottelat M. 2013: The fishes of the inland waters of Southeast Asia. *Raffles Bull Zool Suppl*., 27(1): 663.

Marichamy R. 1968: On certain abnormalities in the short-jaw anchovy *Thrissina baelama* (Forskal) (family: Engraulidae), *J Mar Biol Ass India*., 10 (2): 395-397.

Murakami T, Aida S, Yoshioka K, Umino T, and Nakagawa H. 2004: Deformity of agglutinated pelvic fin membrane in hatchery-reared black rockfish *Sebastes inermis* and its application for stock separation study. *Fisheries science*., *70*(5): 839-844.

Murty VS. 1972: On a specimen of *Caranx carangus* Bloch (*Carangidae*: Pisces) without a pelvic fin. *Journal of the Marine Biological Association of India*., 14(2):884-885.

Nilsson NA. 1958: On the food competition between two species of Coregonus in a north Swedish lake. *Rep. Inst. Freshw. Res. Drottningholm*., 39:146-161.

Parimala S.2011: Estuarine Gizzard shad *Nematalosa nasus* (Block) without pelvic fins. *Centre of Advanced Study in Marine Biology.*, Vol (30): 167-169.

RAMP http://www.ramp-alberta.org/ramp/community//abnormalities/detecting.aspx.

Sri Hari Murugesan S, Jose N, Viswambharan D, and Jaiswar AK. 2019: First record on the absence of anal fin in the white sardine, *Escualosa thoracata* (Valenciennes, 1847), from Indian waters. *Indian Journal of Geo-Marine Sciences.*, 48(10): 1521-1523.

Whitehead PJ, Nelson GJ, Wongratana T. 1988: FAO species catalogue. v. 7: Clupeoid fishes of the world (Suborder *Clupeoidei*). An annotated and illustrated catalogue of the herrings, sardines, pilchards, sprats, shads, anchovies and wolf herrings. pt. 2: Engraulididae, 125(7/2): 305-579.

Yamanoue Y, Setiamarga DHE, and Matsuura K. 2010: Pelvic fins in Teleosts: structure, function and evolution. *Journal of Fish Biology.*, 77(6): 1173-1208.