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İSMAIL REIS[1], CELAL ATEŞ[1], LAITH JAWAD[2]

[1] Department of Fishing Technology, Fisheries Faculty, Muğla Sitki Koçman University,
Kotekli-Mentese 48000 Muğla, Türkiye
[2] School of Environmental and Animal Sciences,
Unitec Institute of Technology, 139 Carrington Road,
Mt Albert, Auckland 1025, New Zealand
email: laith_jawad@hotmail.com

CAUDAL FIN MALFORMATION IN *SAURIDA LESSEPSIANUS* RUSSELL, GOLANI & TIKOCHINSKI, 2015 COLLECTED FROM GÖKOVA BAY, AEGEAN SEA, TÜRKIYE

SUMMARY

One specimen of *S. lessepsianus* Russell, Golani and Tikochinski, 2015, with 296 mm TL showing caudal fin anomaly, was collected using a gill net from the Gökova Bay, Aegean Sea, at 52 meters of depth. The lower three fin rays were deformed in the caudal fin's lower lobe. The length of the lower lobe of the tail of the abnormal fish is 75.6% of the length of the upper lobe of the abnormal fish, while it is 76.5% in the normal specimen. Possible reasons that could cause this abnormality, such as viral or bacterial infection or environmental pollution, are discussed. Since the anomaly was observed in a single specimen and not a frequent state in other fish within the studied area, spontaneous genetic mutation was also considered. The present finding represents the first record of caudal fin-deformed wild fish, *S. lessepsianus*, from the southeastern Aegean Sea ever reported and highlighted the need for closer monitoring of the marine environment for the identification of the specific factor that caused this abnormality.

Key words: Aegean Sea, Synodontidae, anomaly, fins, fin-rays, environmental factors

INTRODUCTION

The synodontid *Saurida lessepsianus* Russell, Golani and Tikochinski, 2015 is a benthopelagic piscivorous species inhabiting sandy or muddy substrates from 20 m to 100 m of depth, more common inshore close to islands or coasts in depths of 20-30 m (Russell *et al*., 2015). Widely dispersed in the Red Sea, including the Gulf of Suez, *S. lessepsianus* is a Lessepsian migrant introduced into the eastern Mediterranean Sea through the Suez Canal (Golani and Fricke, 2018).

Individuals of this species reach maturity at 282 mm standard length (Russell *et al*., 2015). The spawning season of this lizardfish is prolonged and occurs nearly all year round in the Gulf of Suez, with two peaks in December and May (El-Halfawy *et al*., 2007). In Iskenderun Bay, Turkey, spawning occurs mainly in two seasons (May-July and September-November) (İşsmen, 2003). It is a commercially important species in the trawl fishery of the Gulf of Suez and the Mediterranean coast of Egypt as well as in the northeastern Levant, where it comprises almost one-third of the commercial trawl catch (Russell *et al*., 2015).

The fin anomalies are notably recognized in both wild and reared fish (Divanach *et al*., 1996), but a restricted number of studies concerning the caudal fin deformities have been published (Almatar and Chen, 2010; Jawad & Al-Mamry, 2012; Jawad, 2014; Kowlaser *et al*., 2022). Publications reporting caudal fin abnormalities in fishes from Turkey are scarce. Yildrim *et al*. (2014) described a case of caudal fin deformity in the larva of the sparid species *Diplodus puntazzo* (Walbaum, 1792); Jawad *et al*. (2018) reported on the deformation of the tail in *Conger conger* (Linnaeus, 1758); Çolak and Çanak (2020) described a case of abnormality in the sparid species *Sparus aurata* Linnaeus, 1758 and Aydin *et al*. (2022) reported an incidence of tail deformity in the flatfish *Scophthalmus maximus* (Linnaeus, 1758).

Fish can encounter abnormalities in their early developmental phases if the living environment presents unfavorable conditions, such as pollution (Bengtsson *et al*., 1988; Lemly, 1993). Therefore, abnormal fishes can be used as signs of water pollution because of their high incidence in polluted areas (Bengtsson *et al*., 1988).

The present study aims to report for the first time the presence of caudal deformity in the synodontid species *S. lessepsianus* collected from Gökova Bay, Aegean Sea, Turkey.

MATERIAL AND METHODS

One specimen was collected on 15th June 2022 from the Gökova Bay, Aegean Sea (Latitude 37° 01′ 10″ N and Longitude 28° 17′ 22″ E) (Fig. 1). The depth of the sampling area is 52 meters. One specimens of *S. lessepsianus* having a total length of 296 mm, 216 mm standard length, 241 mm fork length and weight 139.38 g showed deformity in the caudal fin ray of the lower lobe of the caudal fin (Fig. 2A). Specimen was collected using gill net (46 mm stretched mesh sized). The specimen was kept frozen for further examination and deposited in the fish collection of the Department of Fishing Technology, Fisheries Faculty, Mugla Sitki Kocman University. A normal specimen (was collected from the same locality for morphological comparison (Figs. 2B, 3). The Body and fins were examined carefully for external parasites, malformations, amputations, and any other morphological anomalies. Measurements were recorded to the nearest millimeter using a digital caliper.

Fig. 1 - Map showing the sampling area.

Fig. 2 - Specimen of *Saurida lessepsianus*. A, abnormal, 296 mm TL; B, normal, 263.5 mm TL.

RESULTS

Caudal fin deformity was visible on the fish body immediately after capture. The body measurements of the normal and abnormal specimens (Figs. 2, 3) were shown in Table 1. The abnormal specimen was compared to normal fish and the results showed that the length of the lower lobe of the tail of the abnormal fish was 75.6 % of the length of the upper lobe of the abnormal fish, while the ratio was 76.5% in the normal specimen.

Externally, the lower lobe of the caudal fin was shorter than the upper lobe, and the lower three caudal fin rays of the lower lobe of the tail appeared to be deformed at their posterior half. The remaining caudal fin rays were normal.

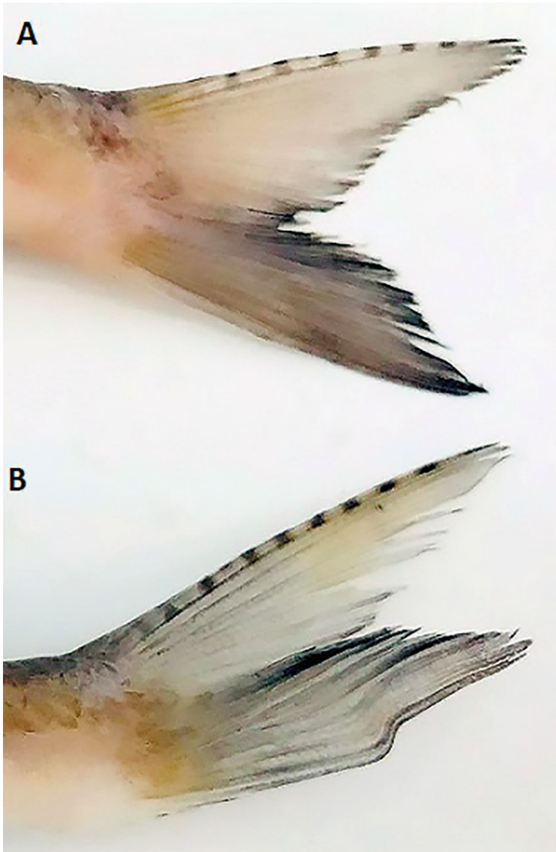

Fig. 3 - The tail of *Saurida lessepsianus,* A, normal specimen, 263.5 mm TL; B, abnormal, 296 mm TL.

Tab. 1 - Morphometric characters (mm) of normal and abnormal specimens of *Saurida lessepsianus* collected from Gökova bay, Aegean Sea, Türkiye.

	Normal specimen	Abnormal specimen
Total length (TL)	263.5	296
Fork length (FL) (% in TL)	238 (86.5)	241 (81.4)
Standard length (% in TL) (SL)	227.5 (86.5)	216 (73.0)
Head length (% in SL) (HL)	33.2 (14.6)	51 (23.6)
Snout length (% in HL)	6.8 (20.5)	13.6 (26.7)
Eye diameter (% in HL)	9.4 (16.6)	10.2 (20.6)
Predorsal fin length (% in SL)	88.4 (38.9)	95.2 (44.1)
Postdorsal length (% in SL)	117.3 (51.6)	125 (87.9)
Prepectoral fin length (% in SL)	45.9 (20.2)	54.4 (25.2)
Prepelvic fin length (% in SL)	79.8 (35.1)	88.4 (40.9)
Preanal fin length (% in SL)	183.6 (80.7)	161.5 (74.8)
Postanal fin length (% in SL)	190.4 (83.7)	190.4 (88.1)
Body depth (%in SL)	28.9 (12.7)	35.7 (16.5)
Caudal peduncle length (% in SL)	30.6 (13.5)	30.6 (14.2)
Caudal peduncle depth (% in SL)	15.3 (6.7)	11.9 (14.2)

DISCUSSION

The first occurrence of caudal fin anomaly observed in *S. lessepsianus* taken from the wild in the Turkish waters is described.

The present case of caudal fin deformity was incidental, and no intentional experiment on the impact of malnutrition and environmental parameters was performed. Therefore, it was not conceivable to define the exact reason for the anomaly in the adult of the studied species.

Even with many studies on fin anomalies have been carried out worldwide, the percentage of the deformity for each fin is unavailable, the distribution of the fin deformities could reflect the second next to the vertebral column abnormalities in fish, which comprise13% of the described malformed vertebral columns (Galvan-Magana *et al.*, 1994). The caudal fin anomalies can arise due to irregular bending of the posterior end of the notochord during the yolk-sac stage before the development of the caudal skeleton (Koumoundouros *et al.*, 1997). Consequently, the fish specimen inspected in the present study might have lived for several years with this anomaly, and this kind of deformation would not have impeded its biological activities, such as feeding (Ribeiro-Prado *et al.*, 2008).

In the wild several possible factors cause caudal fin anomalies; these are the outcome of disclosure to light and heat during reproduction (Koo and Johnston, 1978) and pollution with heavy metals (Sloof, 1982). In the Aegean Sea, the disparity in water temperature during the year is known (Souvermezoglou *et al.*, 1999; Sunlu, 2006). Such variation will cause a reduction in oxygen level, a case known as "hypoxia" which can prompt the possibility of malformations (Eva *et al*., 2004).

Possibly, the present anomaly in the synodontid *S. lessepsianus* resulted from pollution with trace metals. High trace metals were reported recently from the Aegean Sea in general (Bilgin *et al*., 2017; Uluturhan *et al*., 2019; Karavoltsos *et al*., 2021) and the Gökova Bay in particular (Genc *et al*., 2021; Döndü *et al*., 2022). The trace metals can reduce collagen synthesis, cause a protoplasmic poison and change the bones (Luh *et al*., 1973; Iguchi and Sano, 1982). On the other hand, the genetic factors causing deformity should be also considered.

The ecological effect of the abnormal caudal fin or the reduction in its size can be discernible in the fish biological activities and swimming behaviour. In fish performing, the outstanding swimming ability could adapt to the environment the fish living in (Laale, 1977). Generally, the predatory fish are significantly larger than their prey; to avoid predation, the prey must swim or play tactics much faster and better than the predator. With individuals having a lower aspect ratio of the deformed caudal fin, a reduction in the lift to thrust will be clear in such individuals (Weihs, 1989; Videler, 1993). Also, the abnormal caudal fin will have less wavelength of bending than the normal fin (Simons, 1970).

Moreover, the smaller the caudal fin, the less momentum transmission from the muscles to the water, decreasing swimming ability. Plaut (2000) in his study on zebrafish suggested that approximately 65% of the power transmitted to the water in individuals with the normal caudal fin is derived from the tail. For fish performing and fast and continuing swimming, a non-deformed caudal fin is required. Rapid and continual movement is needed in a rapidly moving water environment to escape predators and catch passing prey (Plaut and Gordon, 1994).

From what has been said, it is possible to visualize that the caudal fin is a crucial task in swimming and the activity of the fish. A fish with an abnormal fin will have a decrease in swimming competencies, resulting in a reduction in activity rates and the ability to gather food, making it more susceptible to predation. Such costs corresponding with increased chances of sexual selection may exemplify the handicap principle (Zahavi, 1977; Maynard Smith, 1985).

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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