



Abdominal Swelling and Skeletal Deformity in Gilthead Sea Bream (*Sparus aurata*) and European Sea Bass, (*Dicentrarchus labrax*) Developed under Rearing Conditions

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ABSTRACT

The development of morphological deformity in cultured fish is a main problem as it affects the quality of the product. *Dicentrarchus labrax* and *Sparus aurata* are among the most cultured species especially in the European and Mediterranean Aquaculture Company. The assessment of the quality of the two species reared in open sea cage has allowed the identification of three types of malformation, body atrophy, skeletal deformity and abdominal swelling. Body atrophy and skeletal deformity were mostly observed in *S. aurata* 5.9% and *D. labrax* 2.72%, respectively. Specimens exhibiting an abdominal swelling were observed at relatively similar rates in both species. Factors probably implicated in the development of such type of malformations have been discussed.

Keywords: Skeletal malformation; Body atrophy; Abdominal swelling; Open sea cage

INTRODUCTION

Malformations observed in fish were usually linked to the existence of pollutants into the aquatic system [1-3]. According to the literature, malformations in fish were also proved to happen as a consequence of several other factors as parasitic infestation, nutriment and/or oxygen deficiency, strong currents, genetic and change in water temperature [4-6]. Malformations affecting fish were detected in species collected from the natural environment, and particularly on fish species reared in hatcheries [7-10]. The commonly observed types of malformation were touching the fish skeleton [7].

In Tunisia, skeletal deformities have been reported in *Atherina lagunae* [7], *Syngnathus abaster* [11], *Zosterisessor ophiocephalus* [12], *Gobius niger*, *Gobius paganellus*, [13] and *Aphanius fasciatus* [14]. All the observed malformations were associated with the accumulation of pollutant as heavy metal; also other environmental stressors have been discussed [12,14].

In the European sea bass (*Dicentrarchus labrax*) and the gilthead sea bream (*Sparus aurata*) malformations were primarily reported to ensue in farmed fish, during larval and juvenile stages [8,15]. Indeed, it has been shown that malformation occur during the early life stages of the *D. labrax* as a consequence to the effect of

water current [16], and temperature variation [17,18]. Also, [19] revealed the development of malformation in *Sparus aurata* larvae because of temperature dissimilarity.

Morphological malformations in farmed fish were considered as a serious problem for the farmers as it affects directly the quality of the product and increased indirectly the rate of mortality [4,8,20].

Dicentrarchus labrax and *Sparus aurata* are among the most consumed species in Europe and Mediterranean countries. Several techniques of aquaculture have been developed in order to satisfy the increasing demand on both species, which has result in a global rise in farming production [21]. Indeed, according to data from the Food and Agriculture Organization (2021) during the last two decades the global production of the two species was multiplied by four.

In the current study, we reported the occurrence of morphological malformations on the European sea bass (*Dicentrarchus labrax*) and the gilthead sea bream (*Sparus aurata*) reared in open sea cage.

MATERIALS AND METHODS

Adult *Dicentrarchus labrax* and *Sparus aurata* reaching a commercial size of around 400 to 500 g and 400 to 600 g, respectively, were randomly sampled from cage belonging to a Tunisian farming company. Both species were grown in open

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Received: 14-Jan-2022, Manuscript No. JARD-22-15482; **Editor assigned:** 17-Jan-2022, PreQC No. JARD-22-15482 (PQ); **Reviewed:** 31-Jan-2022, QC No. JARD-22-15482; **Revised:** 03-Feb-2022, Manuscript No. JARD-22-15482 (R); **Published:** 10-Feb-2022, DOI:10.35248/2684-1606.22.13.668.

Citation: EL Ayari T, Mhadhbi L, El Menif NT (2022) Abdominal Swelling and Skeletal Deformity in Gilthead Sea Bream (*Sparus aurata*) and European Sea Bass, (*Dicentrarchus labrax*) Developed under Rearing Conditions. J Aquac Res Dev. 13:668.

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seawater during 20 months. Fish were slaughtered by immersion in ice water (hypothermia). Specimens exhibiting malformations were transported to the laboratory, where they were counted; weighed using a precision scale, body length was measured using a vernier calliper to the nearest 0.1 mm. Subsequently, they were photographed and then desiccated; the occurrence and the type of malformation was noted. Comparisons were made with normal specimens reared in the same condition.

RESULTS

The examination of specimens of *Sparus aurata* and *Dicentrarchus labrax* has allowed the discovery of malformation affecting both species. Overall, three types of malformation have been distinguished as following: body atrophy, skeletal deformity and abdominal swelling (Figures 1-3). Concerning the first type of malformation which corresponds to a general atrophy of the fish body, it was mainly detected in *S. aurata* 5.9% against 2.2% in *D. labrax* (Figure 1). However, skeletal deformity was mostly observed in *D. labrax* 2.72% against 1.5% in *S. aurata* (Figure 1). The common type of skeletal deformity found in sea bream and sea bass was lordosis (Figure 2C and Figures 3B-3E), cases of scoliosis were mostly noted in sea bream (Figures 3F-3H). Regarding the third type of malformation which corresponds to the development of abdominal swelling (Figure 2B and 2C) (Figures 3H-3I), it was recorded at similar rates for the two studied species, 0.85% and 0.8% in *S. aurata* and *D. labrax*, respectively (Figure 1). The dissection of individual presenting this anomaly has revealed the existence of seawater without any parasite. Other type of malformation has been as well detected at few specimens of *S. aurata* as, cranial and jaw opercular deformity (Figure 3F).

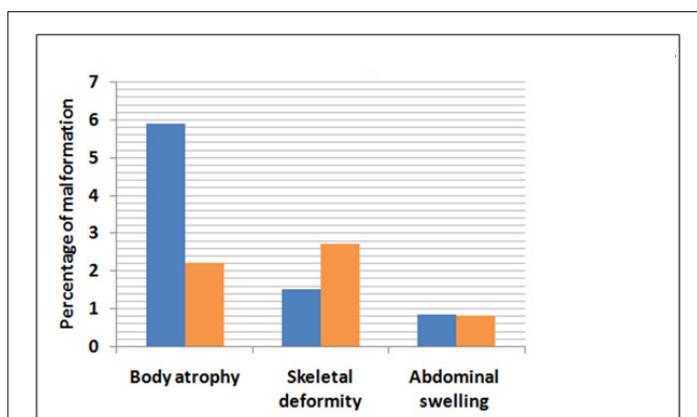


Figure 1: Percentage of malformation observed in *Sparus aurata* and *Dicentrarchus labrax* reared in open sea cage. Note: (■) *Sparus aurata*, (■) *Dicentrarchus labrax*.

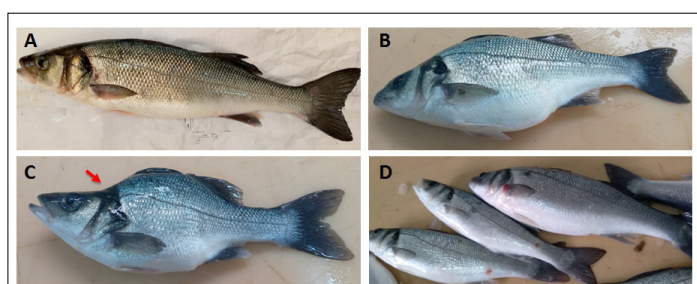


Figure 2: Malformation observed in adult and *Dicentrarchus labrax* reared in open sea cage.

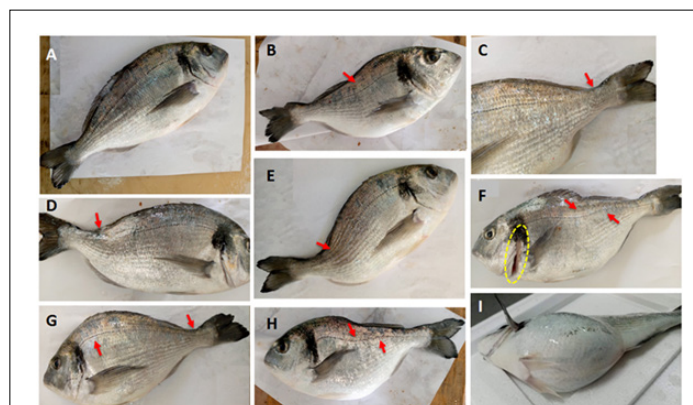


Figure 3: Malformation observed in framed *Sparus aurata* reared in open sea cage.

DISCUSSION

The present work report the incidence of morphological malformations in two commercial fish *Dicentrarchus labrax* and *Sparus aurata* reared in open sea cage. Malformations observed at fish collected from the natural environment were usually used as an indicator of pollution [12]. However, malformation in fish may as well appeared under other conditions, indeed, the effect of temperature was widely reported as a determinant factor in the development of malformation in fish [10,17,18]. In this context, [10] found an increase in the incidence of malformed *D. labrax* developed at 20°C with comparison with that developed at 15°C. In addition, [19] detected a significant correlation between the occurrence of malformation in larvae *Sparus aurata* and the variation of seawater temperature.

As previously stated temperature variation is one among other factor proposed to explain the occurrence of malformation in fish. Skeletal deformity has been reported to develop as a consequence to either an excess or a deficiency in a nutritional component [22,23]. In *Sparus aurata*, scoliosis increased as a response to changes in calcium-phosphor hydroxyapatite salts and collagen fibers [24]. Similarly, [25] noted a rise of skeletal deformity occurrence in farmed *S. aurata* due to an excess of vitamin A dietary. The effect of vitamin A on the development of skeleton deformity was also reported in *Dicentrarchus labrax* [26]. Besides [27] proved the effect of ascorbic acid dietary on the development of such type of deformity in sea bass.

Among the factor proposed to elucidate the induced malformation in farmed fish, [28-30] discussed the role of the increased swimming activity in the emergence of lordosis deformity in farmed *D. labrax*

Besides to skeletal deformity, another type of malformation was observed in the studied species corresponding to the development of abdominal swelling. Usually, abdominal swelling in fish constitutes a clinical signs of parasitic infection. In this study, the dissection of specimens having an abdominal swelling did not reveal the existence of any parasite. Further analyses should be conducted in the aim to determine the reason leading to the generation of such malformation in marine fish reared in open sea cage.

CONCLUSION

The results of the current study reported the occurrence of three types of malformation in farmed *Sparus aurata* and *Dicentrarchus labrax*. Body atrophy was mainly observed in *S. aurata*. While, skeletal deformity was frequently observed in *D. labrax*. The

third type of malformation (abdominal swelling) was detected at similar rates at both species. Additional investigations should be conducted in order to elucidate the factor inducing such types of malformations in economically important fish species.

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