CORRELATION OF SADDLEBACK SYNDROME WITH DEFORMITIES OF THE PELVIC FINS AND LATERAL LINE IN EUROPEAN SEA BASS, *DICENTRARCHUS LABRAX*

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Introduction

The lack of the dorsal fin is a rare deformity (<1%), with however significant negative effects on fish morphology. Anatomically, saddleback syndrome is characterized by the partial to complete lack of rays, accompanied by severe abnormalities of the respective pterygiophores (Koumoundouros 2010, Boglione et al. 2013).

In the present study we describe **a new type of saddleback syndrome**, which is highly correlated with abnormalities of the pelvic fins and of the lateral line.

Materials and methods

Samples were taken from a population of sea bass juveniles (70-90mm SL[1], 145-150 dph[2]) during routine quality control in a commercial hatchery.

Juveniles were macroscopically examined for the presence of saddleback syndrome. Subsequently, a random sample of 50 normal and 50 deformed individuals was taken and examined in respect to **a**) the morphology of lateral line, and **b**) the presence of skeletal deformities (x-rays).

To study the ontogeny of the new type of saddleback syndrome, stained samples from the records of the laboratory were examined.

[1]SL=standard length, [2]dph=days post hatch

Results & Discussion

In the examined population, the 12% of the fish presented a new type of saddleback syndrome (SBS). The deformity is characterised by the loss of fin rays on the pterygiophores Prx3-Prx7 (92% of the cases, Fig. 1B), which rarely expands at the first two pterygiophores (Fig. 1C). Unlikely to the saddleback types which have been recorded so far (Koumoundouros, 2010), this new type neither correlates with deformities of the pterygiophores, nor with deformities of the caudal fin.

However, it is highly correlated with a partial or total lack of pelvic-fin rays (Fig. 1B, Fig. 2).

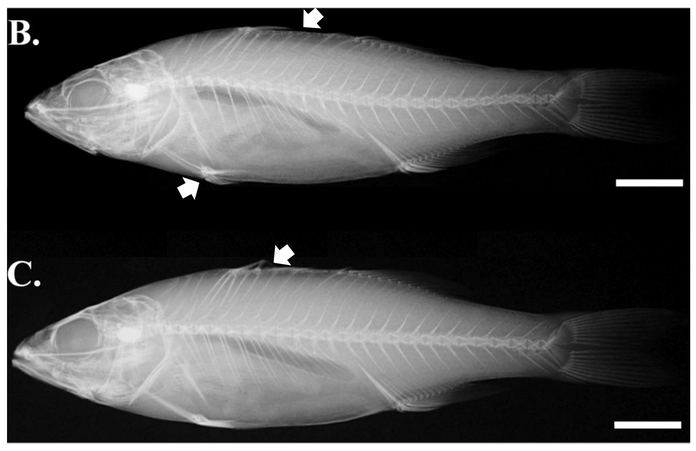

Fig. 1: Skeletal deformities in juveniles. **A**. Normal. **B**. Juvenile with lack of rays of the dorsal fin and with deformed pelvic fins (arrow). **C**. Juvenile with convergence of the first rays of the dorsal fin (arrow). Scale bars =10mm

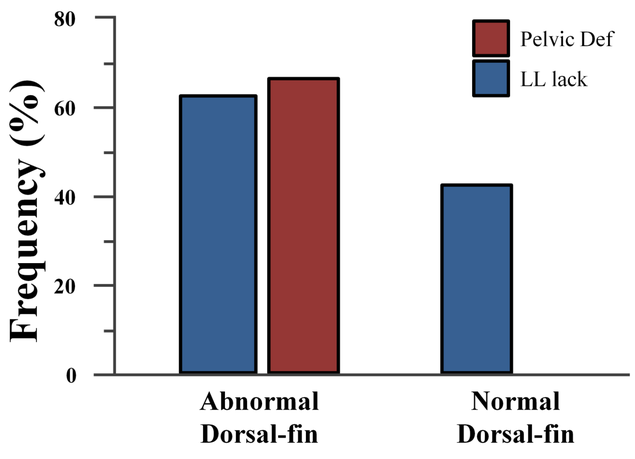

Fig. 2: Frequency of the pelvic-fin deformities and of the abnormalities of the lateral line (*LL*) in the juveniles with normal and abnormal dorsal fin.

Both SBS and non-SBS juveniles presented a high frequency of abnormalities of the lateral line, mainly in the form of bilaterally or unilaterally lacking sectors (Fig. 3B-B'), as well as of bilaterally double-overlapping lateral line (Fig. 3C-C', 10%-16%).

The abnormality of the lateral line was significantly more frequent in the SBS than in the non-SBS fishes (62% vs. 42%, p<0.05, Fig. 2).

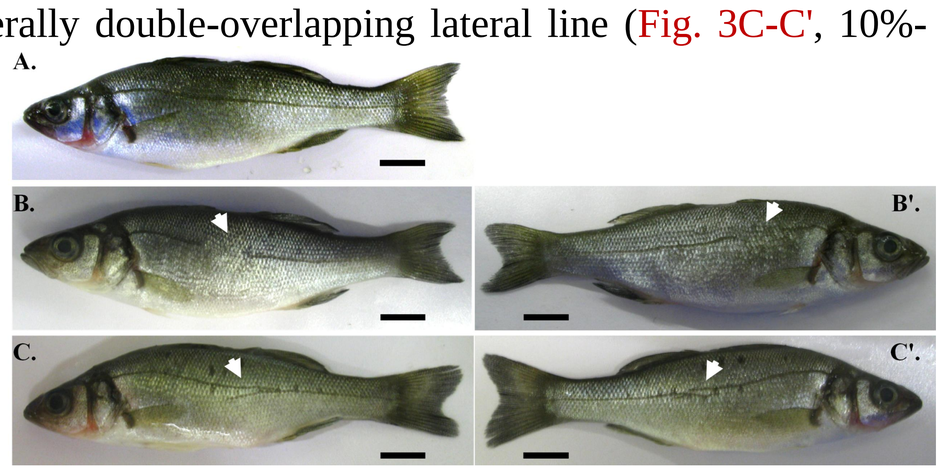

Fig. 3: Abnormalities of the lateral line. **A**. Normal fish. **B-B'**, bilateral lack of a part of the lateral line. **C-C'**, bilaterally double-overlapping lateral line. Scale bars =10mm

The new SBS type was also observed in six larval samples of 13-16mm SL (Fig. 4B, 4D). Unlikely to juveniles, in some larvae SBS was correlated with deformed pterygiophores (Fig. 4C). In all cases, the high correlation of SBS with pelvic-fin deformities was significant (54-81% of the SBS vs. 10-30% non-SBS larvae, p<0.05, Fig. 6). Pelvic-fin deformities presented a wide diversity and affected both sides of the body (Fig. 5B-5D).

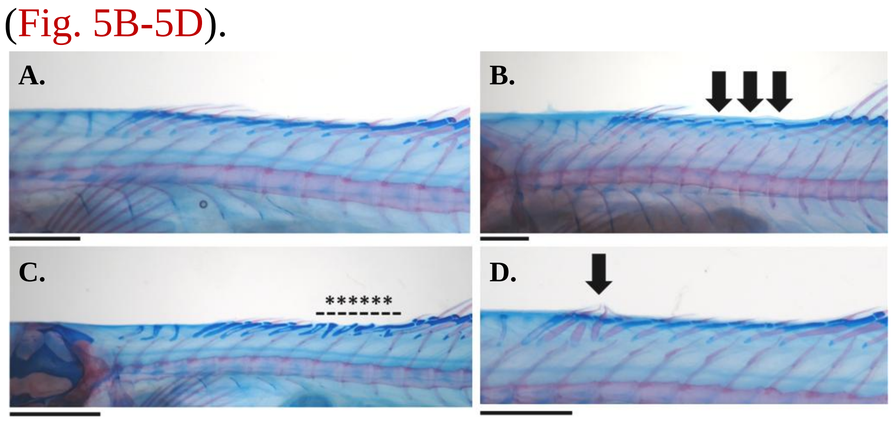

Fig. 4: SBS deformities in larval samples. **A**. Normal fin. **B**. Lack of internal rays without deformed pterygiophores (arrows). **C**. Lack of internal rays with deformed pterygiophores (dashed line). **D**. Convergent first rays without other deformities (arrow). Scale bars =1mm

The examination of the same populations at earlier ontogenetic periods (9-11mm SL) revealed some larvae with abnormalities of the primordial marginal finfold (Fig. 7). Following the results of previous studies (Koumoundouros et al. 2001) these abnormalities could be considered as the prodrome of SBS.

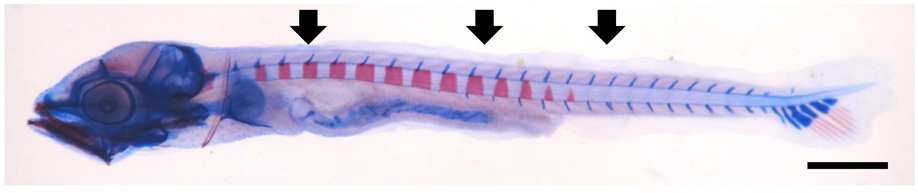

Fig. 7: European sea bass at the flexion stage. Arrows indicate abnormalities of the primordial marginal finfold. Scale bar =1mm

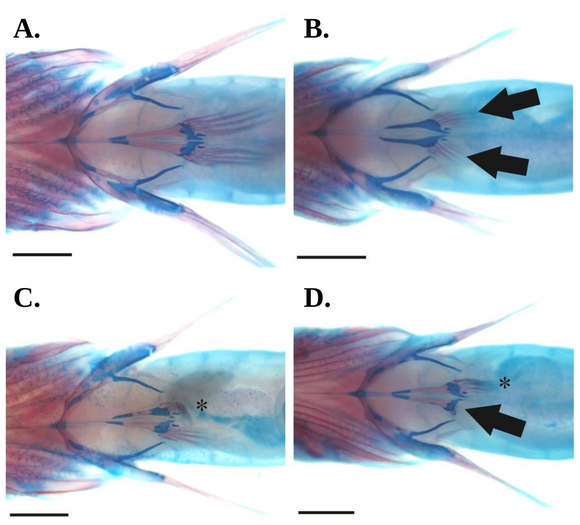

Fig. 5: Skeletal deformities of the pelvic fins at the larval stage. **A**. Normal fins. **B**. Imperfect rays (arrows). **C**. Curved and imperfect rays. **D**. Total lack of rays of the right pelvic fin (arrow). Asterisks indicate the curved rays (C, D).
Scale bars= 1mm

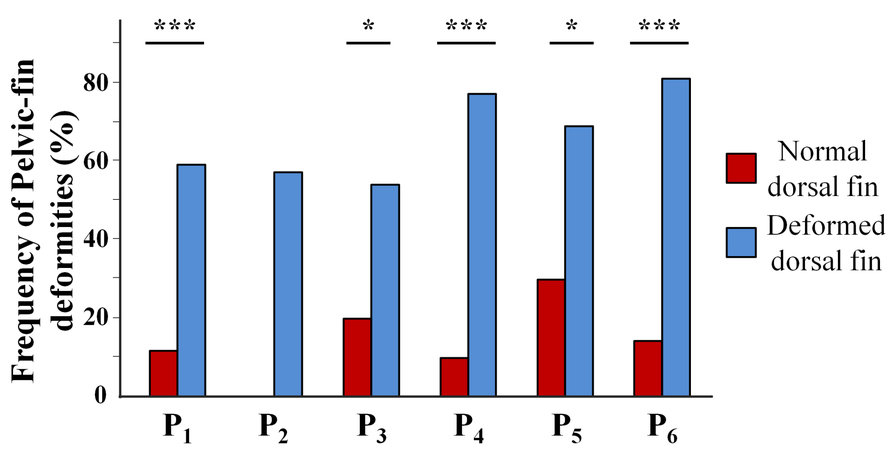

Fig. 6: Frequency of deformed pelvic fins, in larvae with deformed or normal dorsal fin. P_1-P_6, the different populations. Asterisks indicate statistical significant differences. *, p<0,05. ***, p<0,001

Take home message

- ✓ New deformities continue appearing in commercial hatcheries
- ✓ Further research and frequent quality monitoring is needed for the identification of the causative factors

References

Boglione C., Gisbert E., Gavaia P., Witten P.E., Moren M., Fontagné S., Koumoundouros G. (2013). A review on skeletal anomalies in reared European larvae and juveniles Part 2: Main typologies, occurrences and causative factors. Reviews in Aquaculture 5 (SUPPL.1) , pp. S121-S167

Koumoundouros G., Divanach P. and Kentouri M. (2001). The effect of rearing conditions on development of saddleback syndrome and caudal fin deformities in Dentex dentex (L.). Aquaculture 200: 285-304

Koumoundouros G. (2010) Morpho-anatomical abnormalities in Mediterranean marine aquaculture. In: Recent Advances in Aquaculture Research, G. Koumoundouros (ed), pp. 125-148. Transworld Research Network, Kerala, India

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