AGONISTIC SOUNDS IN CLOWNFISHES (AMPHIPRIONINI, POMACENTRIDAE): SOUND PRODUCTION MECHANISM AND POTENTIAL ROLE IN THE GROUP HIERARCHY

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Currently, more than 50 fish families include species with the ability to emit sounds. The majority of acoustic signals are used for communication in different behavioural contexts such as aggressive behaviour (territorial defence, agonistic interactions) or reproductive activities (mate identification and choice, courtship).

The damselfishes (family Pomacentridae) are prolific callers that produce a wide variety of sounds in different kinds of behavioural contexts. Within this family, clownfishes are well known because of their amazing association with sea anemones that host them. Due to this symbiotic relationship, these fishes are highly territorial and they notably produce agonistic sounds to defend their territory.

Although clownfish sounds were recorded as early as 1930, the mechanism of sound production has remained obscure for a long time. However, it has been demonstrated recently that they produce agonistic sounds using a jaw teeth snapping due to a fast mouth closing. It appears that an unusual ligament was responsible for the rapid mouth closing. This ligament joins the hyoid bar to the internal part of the mandible. Acting as a cord, it forces the mandible to turn around its articulation during the lowering of the anterior part of the branchial basket, forcing the mouth to close.

At present, this mechanism has highlighted the onset of the sound but has not explained yet which structure is responsible for the sound modulation. Interestingly, some acoustic features such as dominant frequency and pulse duration are highly related to fish size. The more fish size increases, the more sound duration increases and the more dominant frequency decreases. Such variations are linked to a morphological constraint. The existent relationship between fish size and swimbladder size also implies that the swimbladder is involved in the sound production by acting as a resonant chamber.

Additionally, the fact that pulse duration and dominant frequency are morphologically determined signals related to fish size could be of significant importance in clownfishes. In this context, smaller individuals produce shorter duration and higher frequency sounds than larger individuals. Both sonic features are signals conveying information related to the size of the emitter. These fishes live in social groups within which there is a size-based dominance hierarchy. In such a system, agonistic interactions are usual and play an important role in social organization by maintaining size differences between individuals adjacent in rank. Sounds are known to be associated with agonistic interactions. Acoustic signals might thus help to understand one of the mechanisms that carry the clue for individual recognition within the group hierarchy.