Anatomy and Disorders of the Oral Cavity of Ornamental Fish

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KEYWORDS

• Fish • Infectious disease • Oral anatomy • Feeding behavior • Neoplasia

KEY POINTS

- Oral anatomy in fish varies greatly by taxonomic family, feeding behavior, life stage, and natural habitat; failure to provide the appropriate husbandry and diet type can result in fish disease and deaths.
- An oral examination should always be included as part of the minimum database when examining fish.
- The oral cavity is subject to infectious diseases, trauma, and neoplasia.
- In-house exfoliative cytology is a quick, easy tool to use as an aid in the diagnosis of oral cavity diseases.
- Differentiation of lesions that seem similar helps determine effective treatments rather than using a polypharmacy approach.

INTRODUCTION

Pet (or ornamental) fish represent the largest and most diverse group of exotic animals kept as pets. It is estimated there are more than 4500 species of freshwater fish and 1450 species of marine ornamentals traded[1] to be kept in captivity privately, or displayed, worldwide. There is an immense variety of anatomic adaptations in fish.

ANATOMY AND PHYSIOLOGY OF THE ORAL CAVITY IN FISH

The oral anatomy of each family or a single species has evolved to best suit the local natural habitat or environment, feeding behaviors, food or prey type, location of the food or prey in the water column, and as an aid in reducing interspecific competition for food within a habitat. The function of the oral cavity is not only for the prehension and ingestion of food but can also include raising offspring (mouthbrooding) and as an

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aid in the detection of environmental chemical changes. The anatomy can change or be fixed over the life of the animal, from fry to adult.

Skeletal Structure of the Oral Cavity

The skeletal components of fish vary according to the phylogenetic changes from less advanced fish, the cartilaginous fishes, including elasmobranches (*Chondrichthyes*), to the bony fish (*Actinopterygia*). In general, the fish oral cavity is composed of the lower jaw, the upper jaw, the palate (dorsally), and the hyoid apparatus ventrally (**Fig. 1**).

In contrast to terrestrial animals, the upper jaw consists of the premaxilla and the maxilla (caudal to the premaxilla) in most fish.[2] The caudal portion of the maxilla is often more mobile in comparison with other vertebrates, contributing to the complex series of muscle and skeletal movements required to produce an effective gape (open mouth) for food prehension. During feeding, the premaxilla protrudes rostrally to provide the dorsolateral aspect of the gape. In most fish, this movement enhances the suction required for feeding. Ventral and posterior movement of the mandible passively enables premaxillary protrusion by the presence of a ligament connecting the caudal aspect of the premaxilla to the caudal end of the dentary bone of the mandible.[3]

One study found a specialized adaptation of the *adductor mandibulae* muscle in some cyprinodontiform fish (*Fundus, Gambusia,* and *Poecilia* sp).[3] This adaptation enables the premaxilla to actively retract producing a forceps like control of the upper and lower jaws giving more dexterity to the mouth.[3] Instead of using suction feeding methods, these fish pick the prey from the water column or graze on substrate. In some species of loricariid and synodontid (*Siluriformes*) catfish, this adaptation works very well for algal scraping from substrates, the preferred feeding mode of these fish.[3]

The lower jaw, the mandible, consists of 3 bones: the more anteriorly placed dentary bone, the central angular bone, and the articular bone. Some fish have an intramandibular joint (IMJ) between the dentary and fused angular-articular bones.[2,4,5] Interestingly, fish species that have an IMJ have better dexterity in feeding; these fish commonly feed by removing food attached to a substrate or by biting pieces off sessile structures.[2,3] A common freshwater aquarium fish, *Helostoma temminckii*

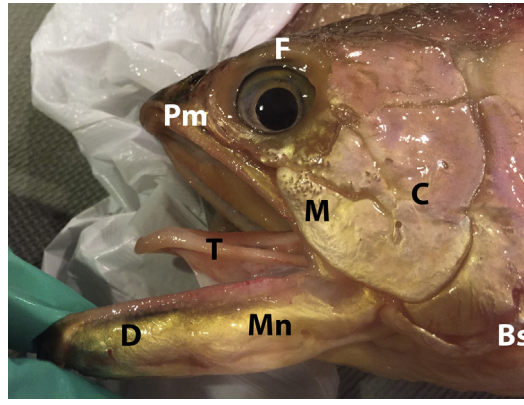

Fig. 1. Skeletal structure of the head. Bs, branchiostegal membrane; C, cheek; D, dentary bone; F, frontal bone; M, maxilla; Mn, mandible; Pm, premaxillary bone; T, tongue. (*Courtesy of* Helen Roberts-Sweeney, DVM, Williamsville, NY; with permission.)