

## New information about late cretaceous pycnodont fishes (Actinopterygii, Pycnodontiformes) from the near east

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**Abstract-** Over roughly the last decade, the Lebanese Cenomanian localities have revealed high numbers of newly discovered pycnodont taxa and even two new families of pycnodonts. Here, two new taxa of pycnodont fishes from the Near East are presented, one from Lebanon and the other from Israel. The new Lebanese specimens show us that Lebanon is still a major site for discovering new pycnodont taxa and can give major insights into their evolution and possible life history. Conversely, the new taxon from Israel shows that lesser known fossiliferous sites may tell us more about the true state of diversity of pycnodonts in the Late Cretaceous.

**Keywords:** Neopterygii, Lebanon, Israel, Cenomanian, new species

### 1. Introduction

Over roughly the last decade, the Lebanese Cenomanian localities (Haqel, Hjoula and En Nammoura) have revealed high numbers of newly discovered pycnodont taxa and even two new families of pycnodonts (Nursall and Capasso, 2004; Taverne and Capasso, 2013). All of these Lebanese fossil sites are Cenomanian in age, which was considered to be a time of great species diversity and morphological disparity for pycnodonts (Marrama *et al.*, 2016).

Here, two new taxa of pycnodont fishes from the Near East are presented, one from Lebanon and the other from Israel (Fig. 1).

### 2. Results

The first taxon is from Haqel, Lebanon. All three specimens of this new taxon are housed in the Muséum national d'Histoire naturelle (MNHN), Paris. The specimens are immediately recognisable due to their diamond-like body shape and their whip-like dorsal fin. This dorsal fin is best preserved in specimen MNHN.F.HAK2003 (Fig. 1a). The presence of a post parietal process indicates that this taxon belongs to the family Pycnodontidae. There is also a very steep anterior profile common to all of the specimens studied. Specimen MNHN.F.HAK2003 has a particularly pronounced anterior profile, being sloped at an angle of 54 degrees in relation to the vertebral column. This gives the

fish a 'humpback' appearance, which is similar to *Arduafrons* but easily distinguishes it from other pycnodontids.

In contrast to Lebanon, the pycnodont fossil record of Israel is far sparser with only two records of material published so far (Haas, 1979; Lewy *et al.*, 1992). However, a single mostly complete specimen from the Late Cretaceous of Israel (Fig. 1b) has been in the collection of the State Museum of Natural History Karlsruhe (SMNK) in Germany since the early 1980s and this specimen has not yet been described in any detail. Its distinctive morphological features indicate that it is a new taxon (Cawley and Kriwet, in press). This new pycnodont fish is from the early to mid-Cenomanian, of the 'Ein Yabrud' quarry in Israel and is the first pycnodont fish to be described from this locality, which otherwise is well-known for fossil fishes (Raab and Chalifa; 1987). The palaeoenvironment of the locality corresponds to reefal waters interspersed with lagoons in the eastern Tethys Sea. Distinguishing characters include a protruding hook shaped first dorsal ridge scale above a large triangular dermatocranum, deeply sloped and antero-posteriorly shortened skull and bifurcated modified cloacal scales.

A phylogenetic analysis was also performed on the Israeli taxon using the original data set of Poyato-Ariza and Wenz (2002), which reveals that the new taxon is member of Pycnodontidae and is included in the subfamily Pycnodontinae.



**Figure 1.** (a) New pycnodont species MNHN.F.HAK 2003 from Haqel, Lebanon. (b) New pycnodont species SMNK-PAL. 8613 from 'Ein Yabrud, Israel. Scale bar = 1 cm.

### 3. Discussions and conclusions

In the Lebanese taxon, MNHN.F.HAK2001 has no spines on its dorsal ridge scales, lacks the whip-like extension to the dorsal fin and possesses a gap between corresponding arcocentra. These features along with its smaller size leads us to interpret this specimen as a juvenile. MNHN.F.HAK2003 has a dorso-ventrally shortened and obliquely orientated skull with elongated jaws. Its laterally flattened and deep-bodied morphology indicates that this fish inhabited complex structured habitats and could have used its snout to feed from crevices similar to other pycnodonts such as *Iemanja palma* and possibly *Acrorhynchthys*. The deeper bodied lower jaw of MNHN.F.HAK2001 differentiates this specimen from specimen MNHN.F.HAK2003, which hints at this specimen being a more generalised feeder. In order to avoid competition with each other, different ontogenetic stages of a taxon may have occupied different ecological niches in a given environment.

The bifurcating scales in the Israeli taxon are a new character previously unknown in pycnodonts and we have these discovered in two more taxa from the family Pycnodontidae, *Stemmatodus rhombus* and *Proscinetes bernardi*, neither of which are members of the family Pycnodontinae indicating that the character could be widely distributed among Pycnodontidae and may possibly be present in other families of pycnodont fishes. This indicates a new type of character that will be potentially useful as data for

future phylogenetic analyses of pycnodont fishes.

The new Lebanese specimens show us that Lebanon is still a major site for discovering new pycnodont taxa and can give major insights into their evolution and possible life history. Conversely, the new taxon from Israel shows that lesser known fossiliferous sites may tell us more about the true state of diversity of pycnodonts in the Late Cretaceous. This should also encourage researchers to investigate more thoroughly museum collections that have been ignored for decades.

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