

LUIGI PISCITELLI<sup>1</sup>, ALESSANDRO DE MADDALENA<sup>2</sup>

<sup>1</sup>Mercato Ittico, Via Lombroso, 95, I-20137, Milano, Italy - E-mail: dotlulu@tiscalinet.it

<sup>2</sup>Banca Dati Italiana Squalo Bianco (Italian Great White Shark Data Bank),  
via L. Ariosto 4, I-20145, Milano, Italy - E-mail: a-demaddalena@tiscali.it

**EVIDENCE OF A PREDATORY ATTACK ON A LARGE  
PAROMOLA, *PAROMOLA CUVIERI* (RISSO, 1816),  
BY A KITEFIN SHARK, *DALATIAS LICHA*  
(BONNATERRE, 1788)**

**RIASSUNTO**

Nella primavera del 2000, una paromola, *Paromola cuvieri* (Homolidae) di grosse dimensioni fu catturata al largo di San Remo, Italia (Mar Ligure), e portata al Mercato Ittico di Milano. Essendo questo esemplare uno dei più grandi della specie registrati sino ad oggi, con una lunghezza del carapace pari a 20 cm, venne tassidermizzato e conservato. Il crostaceo presenta i segni del morso di uno squalo sul terzo arto locomotore sinistro. A seguito dell'analisi della ferita, si è stabilito che fu provocata da uno scimmorino, *Dalatias licha* (Dalatiidae). A quanto è dato di osservare, la durezza del carapace della paromola e forse i suoi grandi chelipedi, furono in grado di dissuadere il predatore. Questo è il primo caso documentato di attacco predatorio di *D. licha* su *P. cuvieri*.

**SUMMARY**

In spring 2000 a large paromola, *Paromola cuvieri* (Homolidae) was caught in the Ligurian Sea off San Remo, Italy and transported to the Fish Market in Milan, Italy. This paromola is one of the largest specimens ever recorded, with a carapace length of 20 cm. A taxidermic specimen of the crustacean was prepared. The crab shows a bite scar on its third left walking leg. The scar was identified as being made by a kitefin shark, *Dalatias licha* (Dalatiidae). It is likely that the hardness of the paromola's carapace and perhaps its large chelipeds were effective for dissuading the attacker. This is the first documented case of a predatory attack on *P. cuvieri* by *D. licha*.

## INTRODUCTION

The paromola, *Paromola cuvieri* (Risso, 1816) is a large decapod crustacean of the family Homolidae. The maximum size that has been reported in the literature for this crustacean is carapace length of 21.5 cm. The paromola is found at depths from 10 to ~1000 m (BELLEMANS *et al.*, 1988).

The kitefin shark, *Dalatias licha* (BONNATERRE, 1788) is a deepwater species of the family Dalatiidae, that has a maximum total length of about 180 cm (COMPAGNO, 1984). This species is fairly common in the Western and Central Mediterranean Sea (TORTONESE, 1956; MACPHERSON, 1980; MATALLANAS, 1982; DE MADDALENA, 2001; DE MADDALENA and PISCITELLI, 2001; BARRULL and MATE, 2002; KABASAKAL and KABASAKAL, 2002).

In the Mediterranean Sea *D. licha* feeds on a wide variety of bony fishes, small sharks, crustaceans (amphipods, isopods, decapods), cephalopods, ophiuroids, polychaetes and siphonophores (MACPHERSON, 1980; BARRULL and MATE, 2002; KABASAKAL and KABASAKAL, 2002). There is considerable variation in the diet of kitefin sharks from one location or season to the next. In the Catalan waters of Spain, kitefin sharks eat more small sharks during the spring and winter, more crustaceans during the summer and more cephalopods during the fall, while bony fishes are eaten throughout the year (MATALLANAS, 1982).

In the kitefin shark, the teeth of the upper jaw are very different in shape from those of the lower jaw. The teeth in the upper jaw are small, with pointed cusp, narrow and elongated, oblique and with cutting edges, without cusplets. Teeth in the lower jaw are larger and the cusp is erect at the symphysis and slightly oblique in all other teeth, with serrated margins and without cusplets. These large teeth are interlocked and form a sort of cutting wall.

Here we report what is, at our knowledge, the first evidence of interspecific interaction between the kitefin shark and the paromola from the Mediterranean Sea.

## MATERIALS AND METHODS

In early spring 2000, one of the authors (L.P.) had the opportunity to collect a huge paromola, *Paromola cuvieri*. The giant crab was caught in the waters of the Ligurian Sea off San Remo, Italy, and was transported to the Fish Market in Milan, Italy. This paromola was one of the largest specimens ever recorded, having a carapace length of 20 cm. The paromola was preserved for a private collection. During the taxidermic preparation of the paromola, it was noticed that the large crustacean had a small scar on its long third left walking leg (pereiopod), located on the merus, very close to the articulation with the carpus. The scar was immediately identified as being caused by a small shark's bite.

Bite scars and fresh wounds are used to identify species of sharks responsible for predation and scavenging on various animals. Shark bite scars are more frequently observed on wounded or dead marine mammals, teleosts and elasmobranchs. The possibility of a conclusive identification from a shark's bite scar on a relatively small-sized animal such as a crustacean is by far less common. The bite scar found on the large paromola was compared with the wide Mediterranean shark species jaws collection held by one of the authors (L.P.); among other species, the collection also includes kitefin sharks' set of jaws, one of which has a size almost equal to that of the bite scar found on the paromola's walking leg. Species identification was possible on the basis of tooth number, shape, size and spacing of the cuts.

## **RESULTS AND DISCUSSION**

Following close examination of the scar, the authors were able to identify the species of shark responsible for the attack as a kitefin shark, *Dalatias licha*. The presence of the kitefin shark in the Ligurian Sea, where the paromola was caught, is already known, and has been reported recently by DE MADDALENA and PISCITELLI (2001). The anterior part of the wounded walking leg shows a deep scar made of regular marks, inflicted by the kitefin shark's large lower teeth. The posterior part of the leg shows a less important scar with irregular marks, that was produced by the shark's small, narrow, pointed and oblique upper teeth. Therefore, we conclude that the kitefin shark bit the paromola during a frontal attack. The kitefin shark is equipped with huge serrated lower teeth and heavy jaws with great power, but the paromola has a massive and resistant carapace and hard spines: it appears that the hardness of the carapace and the powerful large chelipeds of the crab were effective for dissuading the attack of the kitefin shark.

The *P. cuvieri* specimen object of this note has itself an importance, being one of the largest of its species ever recorded and perhaps is the largest preserved complete. This taxidermic specimen will be soon exhibited in a public natural history museum. To our knowledge, this specimen represents the first documented case of predatory attempt on *P. cuvieri* by *D. licha*.

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Figs. 1, 2 - Walking leg of one of the largest paromola, *Paromola cuvieri* (Risso, 1816), ever recorded, showing a bite scar on the merus, inflicted by a kitefin shark, *Dalatias licha* (Bonnaterre, 1788). Fig. 1: Anterior part of the wounded walking leg with a scar produced by kitefin shark's large lower teeth. Fig. 2: Posterior part of the wounded walking leg with scar produced by kitefin shark's small narrow upper teeth Photos by L. Piscitelli.



Fig. 3 - Set of jaws of the kitefin shark, *Dalatias licha* (Bonnaterre, 1788). Photo by Eric Olijnyk.