Food Preference of *Eledone moschata* Lamarck, 1799 (Cephalopoda: Octopodidae) in Captive Conditions

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Abstract

In this study, the preferability of some food organisms for maintaining Eledone moschata in captive conditions was investigated. The study was carried out at four different periods from 2005 to 2006: March 28-April 15 2005 (E1); January 18-April 12 2006 (E2); April 4-May 4 2006 (E3); and 5-27 May 2006 (E4) with 120 individuals of E. moschata (body weights ranging 90 to 600 g). To determine food preference of the musky octopuses, a total of 50 species including 20 crustaceans, 16 fish, 5 bivalves, 4 gastropods and 5 cephalopods were given as live and freshly dead or frozen. The musky octopuses showed significant preferences amongst food items in this order: crustacean > molluscs > fish. Furthermore, E. moschata mostly preferred live or freshly death crustacean, but frozen fish and cephalopods were consumed as well.

Key words: *Eledone moschata,* captivity, food organisms, feeding.

INTRODUCTION

The musky octopus, *Eledone moschata*, belongs to the medium size octopus of octopodidae and is a commercial and an important species in coastal countries of Mediterranean Region [1-2]. The musky octopus inhabits depths of 10 to 400 m over muddy bottoms throughout the Mediterranean Sea as well as The Sea of Marmara, Aegean Sea, Adriatic Sea and The Gulf of Cadiz (Atlantic) [3-11].

There are limited studies on the diet and feeding activities of *E. moschata.* Boletzky [12] reported that juveniles of *E. moschata* consume small pieces of shrimp (*Leander spp.*) and crab (*Carcinus maenas*) or live crabs (*C. maenas*, *Philocheras* spp.), while molluscs (bivalves and gastropods) and fishes were generally rejected. On the soft sandy and muddy bottoms where *E. moschata* lives, crustaceans are various and abundant; it seems likely, therefore, that they are the main food items as in the related species *E. cirrhosa* [2].

The aim of this study is to determine some consumable food organisms for maintenance of adult *E. moschata* in captive conditions.

MATERIAL AND METHODS

The study was carried out at four different periods from 2005 to 2006: March 28-April 15 2005 (E1); January 18-April 12 2006 (E2); April 4-May 4 2006 (E3); and 5-27 May 2006 (E4). *E. moschata* individuals were captured off the Izmir Bay by bottom trawling. They were transported in a tank with 100 l of sea water being renewed every 20 min during 4-hour shipping from the fishing area to indoor facilities at Ege University Fisheries Faculty in Urla, Izmir. A total of 120 musky octopuses with body weights ranging between 90 to 600 g were used. Four cylindrical plastic tanks (1 m in diameter x 0.55 m in height, 450 l of water volume) and one square polyester tank (2 m in length x 2 m in width x 0.6 m in height, 2000 l of water volume) with an open flow-through filtered seawater system were used for experiments. The average water temperatures in E1, E2, E3, and E4 were monitored as 14.7±1.9°C, 11.3±2.3°C, 17.2±0.7°C and 19.8±2.1°C, respectively. Salinity was 37 ppt, and saturation content was kept above 80%. Photoperiodicity was adjusted naturally

A total of 50 species including 20 crustaceans, 16 fish, 5 bivalves, 4 gastropods and 5 cephalopods were given as food for *E. moschata* (Table 1). The foods were given to the octopuses as live, freshly dead and frozen. The live foods were kept in a 400 l cylindrical polyester tank with the same conditions as those mentioned above during the trials. Live foods were held from 3 to 10 days and fresh and/or frozen food only 1 day in the experiment tanks. The following day, uneaten items were removed from the tanks by siphoning.

RESULTS

Eledone moschata showed significant preferability behaviour amongst food organisms in this order: crustacean > mollusc > fish. The crustaceans *Maja squinado*, *M. crispata*, *Macropodia rostrata*, *M. longirostris*, *M. rostrata*, *Pisa tetraodan*, *Dorippe lanata*, *Lisa chiragra*, *Lambrus angulifrons*, *L. massena*, *Inachus dorsettensis*, *Carcinus aestuarii*, *Pachygrapsus marmoratus*, *Xantho poressa*, *Pilumnus hirtellus*, *Goneplax rhomboids*, *Pagurus prideauxi*, *Ilia nucleus* and *Squilla mantis*, the bivalves *Clamys varia*, *Mytilus galloprovincialis*, the cephalopods *Sepia orbigniyana*, *Illex coindeti*, *Alloteuthis subulata*, and the fishes *Engraulis encrasicolus*, *Sardina pilchardus*, *Mullus barbatus*, *Diplodus annularis*, *Merlluccius merluccius*, *Merlangius merlangus*, *Lepidotrigla cavillone*, *Trachurus trachurus* and *Trisopterus minutus* were preferred as food by the musky octopuses in the trials. On the contrary, *Macropipus corrugatus*, *Dromia personata*, *Murex brandaris*, *M. trunculus*, *Aporhais pespelicani*, *Cerithium vulgatum*, *Sepia elegans, Rossia macrosoma*, *Pagellus erythrinus*, *Scomber*

scombrus, *Cepola macrophthalama*, *Serranus scriba*, *Gobius niger*, and *Arnoglossus laterna* were not consumed. The musky octopuses attacked to *Ostrea edulis, Venus verrucosa* and *Callista chione* but they couldn't able to consume because of their strong and hard shells (Table 1).

Two types of feeding strategy were observed on *E.* moschata individuals during the trials; (*i*) as they near the food they decelerate and drop over it with the interbrachial web expanded, (*ii*) on nearby prey, which involved rapidly extending the rolled arms closest to the prey, which was seized and hauled under the web.

Table 1. Food items and preference of *Eledone moschata*.

Crustacea	Mollusc	Fish
Maja squinado (Herbst, 1788)	*Chlamys varia* (Luc., 1982)	*Engraulis encrasicolus* (Linnaeus, 1758)
Maja crispate (Risso, 1827)	*Venus verrucosa* (Linnaeus, 1758)**	*Sardina pilchardus* (Walbaum, 1792)
Pisa tetraodon (Pennant, 1777)	*Callista chione* (Linnaeus, 1758)**	*Boops boops* (Linnaeus, 1758)*
Macropodia rostrata (Linnaeus, 1761)	*Mytilus galloprovincialis* (Lamarck, 1819)	*Scomber scombrus* (Linnaeus, 1758)*
Carcinus aestuarii (Nardo, 1847)	*Ostrea edulis* (Linnaeus, 1758)**	*Pagellus erythrinus* (Linnaeus, 1758)*
Macropipus corrugatus (Linnaeus, 1758)*	*Murex brandaris* (Linnaeus, 1758)*	*Mullus barbatus* (Linnaeus, 1758)
Macropodia longirostris (Fabricius, 1775)	*Murex trunculus* (Linnaeus, 1758)*	*Lepidotrigla cavillone* (Lacep, 1801)
Ilia nucleus (Linnaeus, 1758)	*Aporhais pespelicani* (Linnaeus, 1758)*	*Trachurus trachurus* (Linnaeus, 1758)
Dorippe lanata (Linnaeus, 1767)	*Cerithium vulgatum* (Bruguiere, 1789)*	*Trisopterus minutus* (Linnaeus, 1758)
Lisa chiragra (Fabricius, 1775)	*Sepia orbignyana* (Férussac, 1826)	*Diplodus annularis* (Linnaeus, 1758)
Lambrus angulifrans (Latreille, 1825)	*Sepia elegans* (Blainville, 1827)*	*Cepola macrophthalma* (Linnaeus, 1758)*
Lambrus massena (Roux, 1830)	*Rossia macrosoma* (Chiaje, 1830)*	*Merluccius merluccius* (Linnaeus, 1758)
Goneplax rhomboides (Linnaeus, 1758)	*Illex coindeti* (Vérany, 1839)	*Serranus scriba* (Linnaeus, 1758)*
Pagurus prideauxi (Leach, 1815)	*Alloteuthis subulata* (Linnaeus, 1758)	*Gobius niger* (Linnaeus, 1758)*
Inachus dorsettensis (Pennant, 1777)		*Merlangius merlangus* (Nordman, 1840)
Dromia personata (Linnaeus, 1758)*		*Arnoglossus laterna* (Walbaum, 1792)*
Pachygrapsus marmoratus (Fabricius, 1787)		
Xantho poressa (Olivi, 1792)		
Pilumnus hirtellus (Linnaeus, 1761)		
Squilla mantis (Linnaeus, 1758)		

* rejected, ** failure

Mostly *E. moschata* grasped crabs not only from their posterior, but also from their anterior parts rarely. Once crabs were captured, octopuses began to eat them first from their abdomen. The exoskeleton of the crab was separated from its joints. Then, the soft parts were ingested and the hard parts expelled in the tanks. *E. moschata* did not drill to the exoskeletons of the crabs during the experiments. Furthermore, soft bodies of the fish, except their head, tail and skeleton were consumed by the specimens. The bivalves were eaten after their shells opened, and the hermit crabs were eaten after cracking shell entrance and taking the crab outside the shell; drilling of the shells was not observed in this study.

Eledone moschata preferred live or freshly dead crustaceans, also they prefer the easiest food depending on the food type (dead or live crustacean, fish, mollusc, etc.) or size, and preferred the dead cuttlefish and fish, although live foods were availed in the tanks

DISCUSSION

Boletzky [12] and Boyle and Knoblach [13] reported that juvenile and adult *E. moschata* drilled the carapaces of crabs. In this study, *E. moschata* exhibited different feeding behaviors than the laboratory reared musky octopuses by Boletzky [12] and the related species *E. cirrhosa* [13].

Boucher-Rodoni et al.[14] pointed out that all cephalopods are active carnivores, feeding on live prey during the whole of their life cycle, but several species accept dead food in captivity, if no live prey is available. The present study showed that although live food were available in the experimental tanks, dead cephalopods (*S. orbigiyana*, *I. coindeti*, *A. subulata*) and teleost fish (*E. encrasicolus*, *S. pilchardus* and *M. barbatus*) were mainly preferred by *E. moschata*. Clearly, this phenomenon might be suggested that they tend to feed effortless because of their opportunistic behaviour.

E. moschata have feeding strategies such as the *parachute attack* and the *side arm attack which were* described for *Octopus briareus* by Hanlon and Wolterding [15]. Individuals did not use more tactics such as *pincer feeding approach* as described by Hanlon and Wolterding [15] for hunting. Probably, this

situation could be result of the limited maintenance area and the variable attacking distances in the present experiment.

In conclusion, the present results showed that *E. moschata* is an active and opportunist predator like other cephalopods, and also consuming mainly crustaceans, molluscs and fishes. The captive *E. moschata* fed with unmarketable or low priced species. These results provide advantages for the future commercial opportunities like easy maintaining for culture and laboratory studies. However, more detailed studies on acceptable food organisms and diets for *E. moschata* are required for the future studies.

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