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Short Communication

Fishery and biology of the octopus, *Cistopus indicus* (Orbigny, 1840) from Mumbai waters

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Abstract

Fishery of *Cistopus indicus* by trawlers at New Ferry Wharf from 2000 to 2009 in Mumbai waters is described. The catch showed an increasing trend up to 2006 and declined thereafter. The catch ranged from 2 t (2002) to 324 t (2006) and the catch rate from 0.002 kg/hr (2002) to 0.181 kg/hr (2006). The relationship between dorsal mantle length (DML) and total body weight (TBW) for males was $TBW = 0.001053 * DML^{2.69321}$ and for females was $TBW = 0.009 * DML^{2.19221}$. Fish formed the major food item of both the sexes. Majority of the males in the landings was in mature stage, while the maximum number of females was gravid. The size (DML) at 50% maturity for females was estimated as 82.7 mm. The diameter of mature ova ranged from 2 to 6 mm and fecundity was 13,260.

Keywords: Octopus, *Cistopus indicus*, biology

Introduction

Among the cephalopods, the octopods are the least studied group for biological aspects from the Indian waters. However, the available publications on Indian Octopods are as follows: Oommen (1966, 1967, 1971, 1975, 1976, 1977), Silas *et al*. (1985) and Sivasubramanium (1991) on the species occurrence; Victor and Jayabalan (1998) on the landing of a giant octopus from Gulf of Mannar; Sarvesan (1969), Paul (1997) and Chandage *et al.* (2006) on the brooding behavior; while Ignatius and Srinivasan (2006) on embryonic development of octopus; Hornell (1917), Sarvesan (1974) and Sundaram and Dias (2008) on the traditional methods of octopus fishery; Varghese (1981) on the status of small-scale octopus fisheries from Lakshadweep; Kripa and Joseph (1994) and Kripa *et al.* (2000) on the landings of octopus from Kochi waters; and Sundaram and Sarang (2004) on the octopus fishery from Mumbai waters. An attempt has been made to study the fishery and biology of *Cistopus indicus* landed by trawlers at New Ferry Wharf, Mumbai.

Material and Methods

The trawlers of New Ferry Wharf operated 70-80 km off northwest coast of Mumbai at a depth of 30-60 m. The data on landings of octopus species by the trawlers were collected by observing 10 to 20% of the boats randomly once a week during January 2000 - December 2009. The total number of boats and the total fish landings were obtained from the database maintained at Mumbai Research Centre of Central Marine Fisheries Research Institute. The catch recorded from the observed number of boats was raised to the total number of boats landed in a day, which, in turn, was raised to the month by taking into consideration the number of fishing days in a month and the monthly estimated number of boats. The monthly estimates were pooled to arrive at annual estimates.

The specimens of *C. indicus* were brought to the laboratory for biological analysis and dorsal mantle length (DML) was measured using digital calipers and total body weight (TBW) by an electronic balance ($\pm$ 0.01 g) after the specimens were dried on

a blotting paper. The measurements were taken as described in CMFRI manual (1995). A total of 212 males ranging in DML from 40 to 175 mm with body weight ranging from 15 to 1,285 g; and 76 females ranging in DML from 54 to 190 mm with the body weight ranging from 49 to 939 g were studied for length-weight relationship, gut content, maturity condition and fecundity.

The length-weight relationship was obtained by the method of 'least squares' based on individual measurements. The relationship of DML and TBW was expressed as parabolic equation of the form, $W = a * L^b$. The stomach condition was analysed following Kore and Joshi (1975). As the food items were in well-crushed and macerated condition, it was possible to categorise up to the level of groups only (such as fish). The Index of Preponderance was estimated as suggested by Natarajan and Jhingran (1961). Maturity studies were carried out following Silas (1985). The size at first maturity was estimated by King's (1995) method. To estimate fecundity, the ovaries were removed from fresh specimens and a few drops of formalin (4%) were added and teased to facilitate easy separation. Ova diameter measurements were made following Prabhu (1956).

Results and Discussion

The estimated annual catch by trawlers and the catch rate of *C. indicus* for the period 2000-2009 from NFW showed an increasing trend up to 2006, but decreased thereafter. The landings ranged from 2 t (2002) to 324 t (2006) and the catch rate from 0.002 kg/hr (2002) to 0.181 kg/hr (2006) (Fig. 1). The contribution of *C. indicus* to the cephalopod landings ranged between 0.1% (2002) and 6.3% (2006). The sudden growth of octopus fishery along the northwest coast indicates demand-driven exploitation. The landed octopuses were taken to the processing unit within 4-6 hours, where they are degutted and mainly exported. The fishermen preserved the catch in the boat in a tank containing chilled seawater. The monthwise catch rate averaged for the period 2000-2009 showed peaks in April and August (Fig. 2). The dorsal mantle length of *C. indicus* in Mumbai waters during 2000-2009 ranged between 20 and 229 mm. Large sized specimens were observed in September. The price of *C. indicus* increased from Rs.13/kg in 2000 to Rs. 70/kg in 2009 at the landing center.

C. indicus was the dominant species contributing about 95% to the octopus landings at Mumbai while *O. membranaceous* is the dominant species in Kochi waters with 82% of the landings (Kripa and Joseph, 1994). The other octopus species which occur in Mumbai waters are *O. membranaceous, O. defilippi* etc. (Sundaram and Khan, 2009; Sundaram and Deshmukh, 2010). The relationship between dorsal mantle length (DML) and total body weight (TBW) showed exponential relationship. Therefore the values of length and weight were transformed into logarithm to linearise the equation. The equation for males is expressed as $TBW = 0.001053 * DML^{2.69321}$ ($r^2 = 0.8908$) and for females as $TBW = 0.009 * DML^{2.19221}$ ($r^2 = 0.8271$). According to Roper *et al.* (1984) the maximum DML for the species is 180 mm. However specimens as large as 229 mm DML

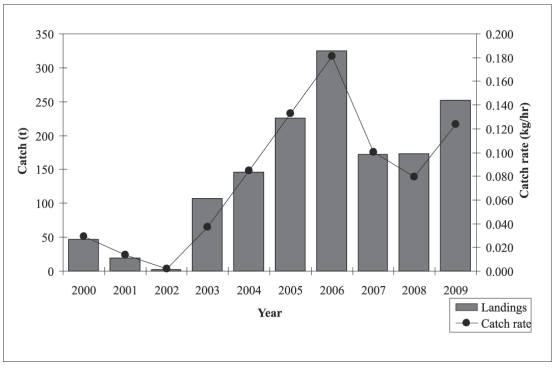

Fig. 1. Catch and catch rate of *Cistopus indicus*

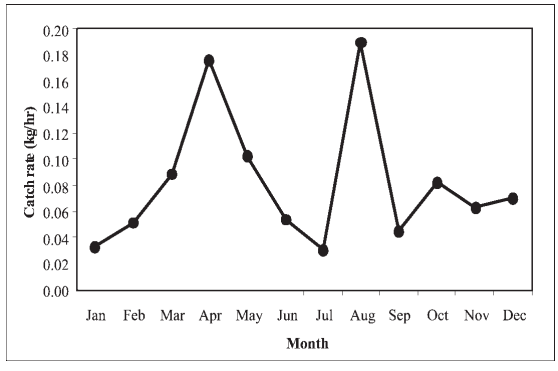

Fig. 2. Monthly catch rate of *Cistopus indicus*

were recorded in Mumbai.

The Index of Preponderance revealed that in males, fish formed the major food (54.7%) followed by prawns (24.9%), cephalopods (14.6%), crabs (0.6%) and digested matter (5.1%). In females, fish (66.2%) was followed by prawns (17.8%), cephalopods (13.3%), crabs (0.4%) and digested matter (2.2%). In males 54.7% of the guts analysed were empty, 25.9% were ¼ full, 9.4% were ½ full, 7.1% were ¾ full and 2.8% were gorged. In females 63.2% of the guts analysed were empty, 25% were ¼ full, 6.6% were ½ full, 3.9% were ¾ full and 1.3% were gorged. There seems to be no difference in the feeding habits between males and females.

As in all species of octopods, males were dominant and the male:female sex-ratio was 1:0.36. Of the total, 29.7% males were immature, 55.7% mature and 14.6% gravid. Among females, 5.3% were immature, 30.3% mature and 64.4% gravid. All females were mature above 130 mm DML. The size at 50% maturity for females was estimated as 82.7 mm DML. In the present study the maximum fecundity was 13,260 and the ova diameter ranged from 2 to 6 mm. The Gonado-Somatic Index (GSI) of females increased from October onwards and reached a peak in March and thereafter there was decline till November (Fig. 3). The observations indicate that the peak spawning season is from March to May.

The octopus was earlier discarded at sea by the fishermen because of poor demand but due to increasing export market they are now sought after for export. Further studies on the biology would prove useful to evolve effective fishery management measures for judicious exploitation of the resource.

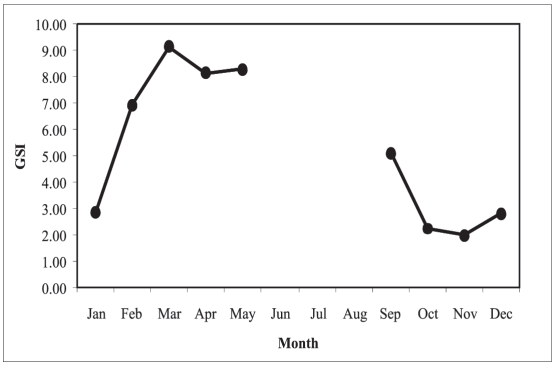

Fig. 3. Gonado-Somatic index of *Cistopus indicus*

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