



Movement estimation of *Octopus vulgaris* Cuvier, 1797 from mark recapture experiment



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ARTICLE INFO

Article history:

Received 15 September 2014

Received in revised form 4 May 2015

Accepted 6 May 2015

Available online 20 May 2015

Keywords:

Mediterranean Sea

Movement

Octopus vulgaris

Orientation

Tagging

ABSTRACT

The movements of *Octopus vulgaris* were investigated by a mark–recapture study (1604 specimens tagged), carried out during a commercial octopus traps fishery, at a depth of 20–50 m, over a rocky substrate area of the Sardinian Sea (central western Mediterranean Sea). Overall 87 specimens (56 males and 31 females) were recaptured after 4 and 63 days from the tagging. The difference between the depth at release and recapture varied up to 5.0 m but in 100% of males and in 80% of females the variation was less than 3.0 m. Theoretical straight distances travelled by recaptures ranged from 9 to 5800 m in males and from 9 to 1700 m in females, regardless of the days of freedom.

There was no correlation between distances and sex or body size and no marked orientation was found except for medium males that move preferentially in the south western direction. The movements of *O. vulgaris*, generally linked to the availability of food, partners and/or shelters, in this study were limited within 1 km in most of the recaptures (84–86%). This high site fidelity, within the rocky area investigated, could represent useful information for management plans of this species like the creation of small no-take areas.

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1. Introduction

The common octopus, *Octopus vulgaris* Cuvier, 1797 is a benthic cephalopod perfectly adapted to living in very different habitats, from the coastal line to the slope of the continental shelf (Mangold, 1983). This species is of great commercial interest, therefore under intense pressure from fishing activity, which has led to an intense market decline worldwide over the last decade (FAO, 2006, 2013).

Several aspects of its biology and fishery statistics have been intensively studied (e.g., Cuccu et al., 2013a,b; Domain et al., 2000; González et al., 2011; Guerra, 1975; Katsanevakis and Verriopoulos, 2006; Mangold, 1983; Mereu et al., 2014, 2015; Otero et al., 2009; Prato et al., 2010; Villanueva, 1995) but, little attention has been focused on movement pattern, which is a key element for a proper management design.

Some authors suggest that *O. vulgaris* seems to undergo seasonal movements mainly vertically oriented, at different times, in relationship to the size and/or maturity condition, and that there are animals that probably do not migrate, like those which spawn in deeper waters or stay near the coast during the winter (e.g., Guerra, 1975; Hatanaka, 1979; Mangold, 1983; Mangold-Wirz, 1963). However, when not travelling in/offshore, *O. vulgaris* seems to be a truly sedentary species (Mangold, 1983). There are only a few records of horizontal movements.

Itami (1964) in the Japan Sea branded 1559 *O. vulgaris*, 14 of which were recovered within two months and the longest straight distance from release to recapture was 48 km (see Nagasawa et al., 1993). In the Mediterranean Sea the preliminary data on movements were obtained from 9 recaptured specimens in the same area investigated in the present study (central-western Sardinian Sea). The Authors reported 1.2 km as the longest straight distance travelled by five males (2 mature and 3 spawning specimens), after 8 and 30 days of freedom, respectively (Mereu et al., 2010).

In the present work we tested, through a mark–recapture method, whether or not sex and/or size affect the movements of *O. vulgaris*.

2. Material and methods

From 2010 to 2013 a total of 1604 *O. vulgaris* caught with professional octopus traps in spring–summer by two vessels, at depths from 20 to 50 m in a rocky area of the central western Sardinia Sea (Fig. 1), were used to investigate the movement patterns of the species by means of a mark–recapture experiment (Mereu et al., 2015).

On board the vessels, dorsal mantle length (ML, to the nearest mm), total weight (TW, to the nearest 5 g) and sex were recorded for each specimen caught; according to Fuentes et al. (2006) they were anaesthetised before being tagged with Petersen discs. The tag was placed on the 3rd left arm, after the animal was maintained for about 1 h in a tank (with running seawater and an oxygenator). The tagged specimens were then released into the same fishing area, at the end

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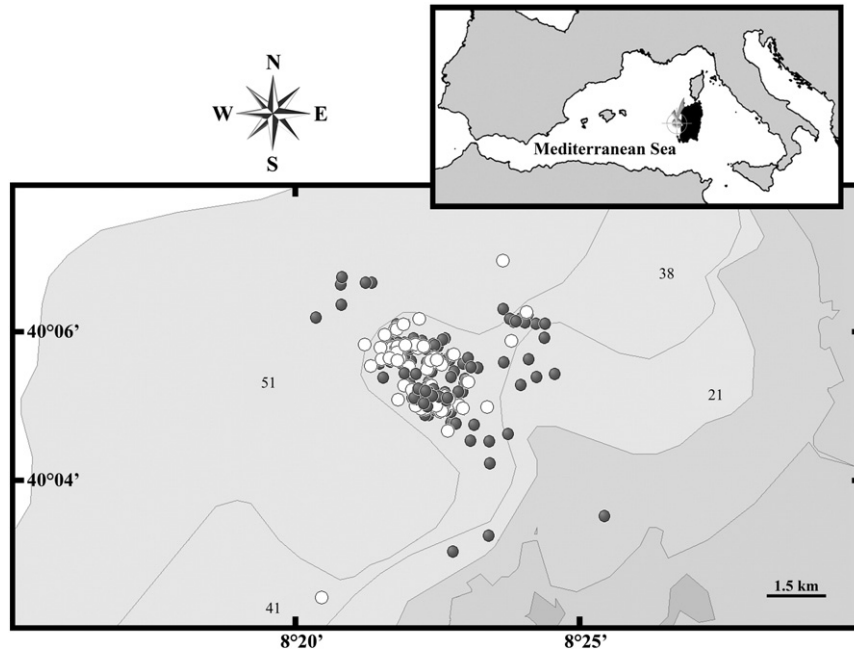


Fig. 1. Map of the investigated area. Black and white circles are respectively the sites of release and of recapture.

point of the traps line (40 traps, spaced 4 m from each other) (Fig. 1). Handling and holding of animals took into account the ethical and welfare considerations reported by Moltschanivskyj et al. (2007).

Geographical position and depth at the release and recapture sites (taken when the animal was found inside the trap) were registered. To increase the probability of recapture, awareness activities were

realised in the neighbourhood of the investigated areas (e.g., some posters showing the project were distributed and put up, a reward was offered for returned tagged specimens with information of the date, and position at recapture; Mereu et al., 2015). After measurements each recapture was again released into the sea.

Days of freedom (DF) were calculated as the time elapsed between release and recapture. The distance moved by the octopuses (in metres)

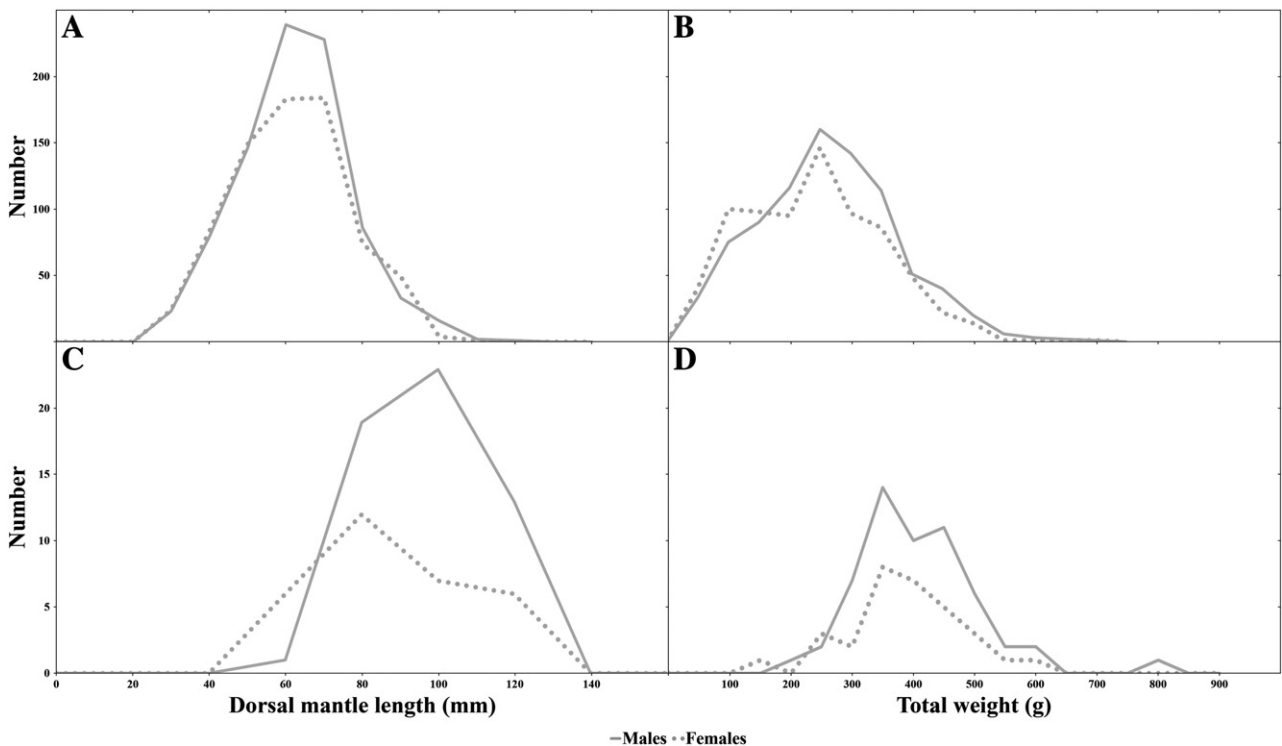


Fig. 2. *O. vulgaris*. Size distribution of the tagged (A, B) and recaptured specimens (C, D) according to sex.

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