

# New record of *Ocythoe tuberculata* (Cephalopoda: Ocythoidea) in the North-east Atlantic related to sea warming

Ángela M. Caballero-Alfonso\*, Unai Ganzedo-López†, Guzmán Díez-Díez† and José J. Castro\*

\*Universidad de Las Palmas de Gran Canaria, Campus Universitario de Tafira, Ciencias Básicas, 35017, Las Palmas, Spain.

†AZTI-Tecnalia, Marine Research Division. Txatxarramendi Ugarte a z/g 48395, Sukarrieta, Bizkaia, Spain.

Corresponding author, e-mail: jcastro@pesca.gi.ulpgc.es

The capture of two females of *Ocythoe tuberculata* during the summer of 2006, in the North-east Atlantic is reported. This pelagic cephalopod species are rare beyond subtropical waters and were caught at the sea surface by two live bait boats. The appearance of this species in the area is related with an anomalous sea warming.

During the summer of 2006, two live specimens of football octopus (*Ocythoe tuberculata*, Rafinesque, 1814) were captured at the sea surface by live bait boats off the north-west Iberian Peninsula, at the northernmost limit of the species distribution in the North Atlantic according to Nesis (1985). The first individual was caught on the 27 June at 41°/42°N 13°/14°W (west of Portugal), and the second on the 18 July at 44°/45°N 14.5°/15.5°W (north-west of Spain).

This species is known to be cosmopolitan in tropical and temperate seas (Sweeney et al., 1992; Vechione, 2002), especially in the northern hemisphere (Roper & Sweeney, 1975). In the North-east Atlantic, it has been reported off the Azores and Canary archipelagos (Cardoso, 1991) and in the western Mediterranean (Naef, 1923; Petrus & Pablo, 1993; Ezzeddine-Najai & El Abed, 2001). However, in the southern hemisphere, this species seems to be less common. In this way, a single catch has been reported off South Africa, associated with a storm in this area (Roper & Sweeney, 1975), and some others specimens were obtained in New Zealand and Australian waters (O'Shea, 1997; Landsdell & Young, 2007). The majority of the specimens, however, have been found in the stomach of its predators (swordfish, yellowfin tuna and dolphins), probably associated to their seasonal migrations.

Little is known about the biology and behaviour of *Ocythoe tuberculata*, except that it has pelagic habits and is found near the surface waters at night (Vechione, 2002). There is a strong sexual dimorphism in this species, where males are usually smaller than 3 cm in mantle length, and females are significantly larger with mantle lengths that could reach 35 cm (Roper & Sweeney, 1975; Cardoso & Paredes, 1998). Curiously, females of this species are the only known cephalopods with a swimbladder, a feature that makes them able to control their buoyancy (Packard & Wurtz, 1994), and are the only known cephalopods that give birth to live young that hatch internally (Naef, 1923).

## Morphological features

The measurement of both specimens was taken according to Pickford & McConnaughey (1949), Thomas (1977), Roper & Voss (1983) and Clarke (1986). In both females, the pairs of tentacles II and III were shorter than the pairs I and IV. The mantle was muscular and strong. The ventral side was wrinkled, totally covered with hard pyramidal protuberances, but the dorsal side was smooth (Figure 1a & b, respectively). The head was more spherical than in other octopus species, and it showed two ventral pores. In Table 1 the weights and body lengths of both octopus individuals are shown.

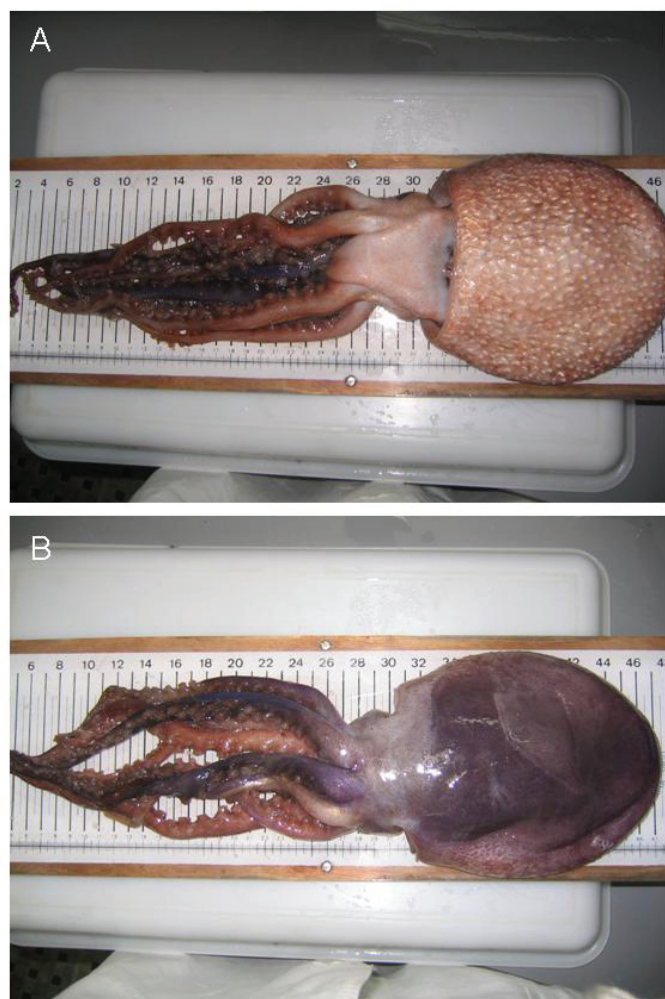


Figure 1. Female of *Ocythoe tuberculata* captured in the North-east Atlantic in June 2006. (A) Ventral view; (B) dorsal view.

### Environmental features

Although this species has been reported in the Gulf of Biscay in 1936, when Bouxin & Legendre found one specimen in the stomach content of an albacore (*Thunnus alalunga*), the presence of live specimens northern of Azores (41–45°N) has not been observed in the scientific literature. It has been normally reported in more temperate waters and probably its capture in this higher latitude area was associated with a seasonal warming process (Figure 2). Furthermore, in June–July of 2006, the sea surface temperature in the west of Portugal and north-west of Spain was 1°C warmer than the mean temperature in both months in this area (Figure 3). This warming process was also associated with an anomalous peak of jellyfish abundances in June 2006 in the coastal areas of the north-west of Spain (La Voz de Galicia, 7/06/2006).

The anomalous warm summer of 2006 could favour the presence of *Ocythoe tuberculata* in the oceanic area off the west of Portugal and off the north-west of Spain, and probably associated with the high abundance of jellyfish. Males are sometimes found inhabiting the tests of salps as are young females (Naef, 1923; Okutani & Osuga, 1986), and both phenomena could be related.

The progressive south-north warming process is a normal annual environmental event which occurs at the end of the spring in the North-east Atlantic. But, this is the first time that the presence of *Ocythoe tuberculata* has been reported associated to this event, as it has been observed in other oceanic species like *Ranzania laevis* off the Canary Islands (Castro & Ramos, 2002). In this way, the capture of football octopus may support the idea that populations can displace temporarily to higher latitudes when anomalous water warming occurs.

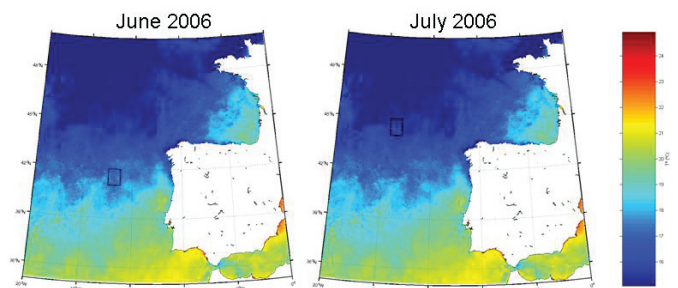
Our thanks to the crews of the fishing boats 'Leporre Anaiak' and 'Oskarbi', for making possible these new records.

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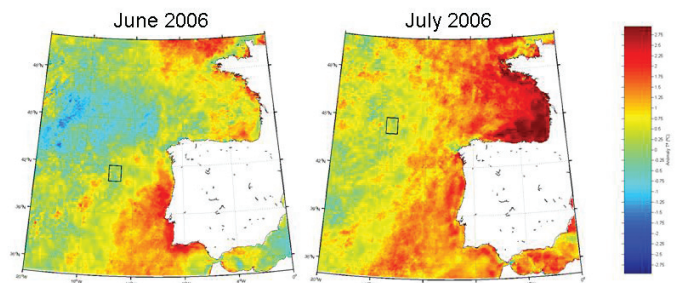
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**Table 1.** Geographical and morphological data of the two females *Ocythoe tuberculata* caught in the North-east Atlantic.

	Female 1	Female 2
Date of capture	27 June 2006	18 July 2006
Location	41/42°N 13/14°W	44/45°N 14/14°W
Weight (g)	708.18	1929.0
Total length (cm)	58.8	74.5
Mantle length (cm)	18.8	24.5
Head length (cm)	4.0	6.5
Foot length (cm)	39.0	52.4
Mantle perimeter (cm)	28.2	45.8
Mantle wide (cm)	15.4	22.9



**Figure 2.** Mean sea surface temperature (SST) for June (left) and July (right) 2006 (night tracks) from the MODIS sensor of the AQUA satellite (MODISA Level-3 Standard Mapped Image), which has a space resolution of 4 km. The squares represent the approximate location of football octopus captures.



**Figure 3.** SST anomaly result of the subtraction, in the left image, of the mean June (left) and July (right) SST from 1985 to 2001, obtained in the night tracks from AVHRR sensor in the NOAA satellite (Casey, 2004) in order to take out the climatological component for the temperature. The squares represent the approximate location of football octopus captures.

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