

The cuttlefish *Sepia officinalis* L. (Mollusca: Cephalopoda) in the English Channel and the Bay of Biscay - is there a single panmictic population?

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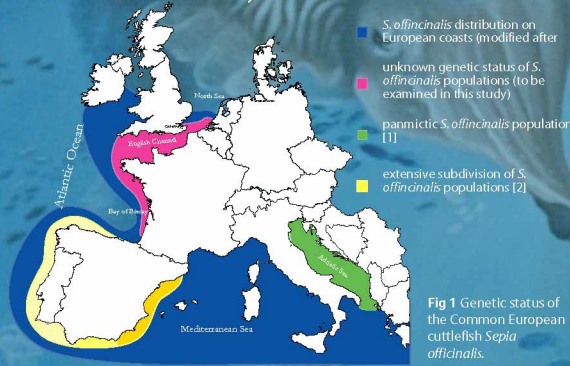


Introduction

Population substructure of the common European cuttlefish *Sepia officinalis* (Mollusca: Cephalopoda) has never been investigated in its northern distribution range from the Bay of Biscay through the English Channel into the North Sea.

For the southern distribution range, cuttlefish population substructure has been reported to be weak in the semi-enclosed Adriatic Sea [1] and extensive around the Iberian Peninsula [2] (Fig 1).

So far, the existence of separated *Sepia officinalis* populations has been postulated by numerous authors due to differences in reproductive behaviour [3, 4], migration behaviour [5, 6, 7] and *in vitro* oxygen binding properties of the respiratory pigment haemocyanin [8]. Yet, population structure has never been investigated on the genetic level, which was the aim of this study.



Material and Methods

To examine genetic variation among the sampling sites, lengths of seven DNA microsatellites were analysed for 220 individuals from the Bay of Biscay (n = 58), the English Channel (n = 63), the southern North Sea (n = 25) and Southern Portugal (n = 74). Statistical data analysis was carried out and genotypes at the seven loci were compared within the individuals from the northern distribution range and with those from Southern Portugal.

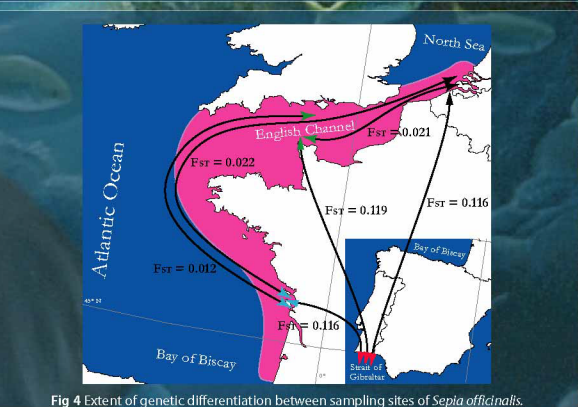
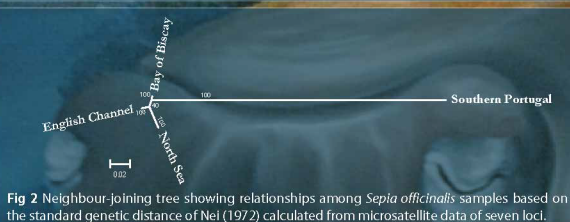
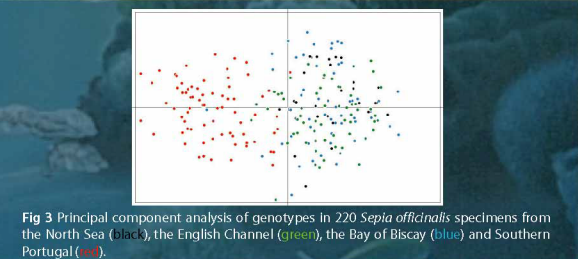


Results

Microsatellite analysis for the first time indicates the existence of a panmictic *Sepia officinalis* population in the northern distribution range [9].

The level of genetic substructure of the English Channel, Bay of Biscay and North Sea cuttlefish (measured as F_{ST}) is comparable to the weak population subdivision reported for the panmictic Adriatic cuttlefish [1] (Figure 4). The genetic divergence between cuttlefish from the northern distribution range and specimens off Southern Portugal, however, is comparable to the genetic variability between Iberian cuttlefish on either side of the Strait of Gibraltar, which are thought to be genetically distinct subpopulations [2].

This was also confirmed by neighbour-joining trees (Figure 2) and principal component analysis (PCA, Figure 3): Neighbour-joining trees exhibited a much larger genetic distance (standard genetic distance of Nei 1972) between Southern Portugal cuttlefish and northern cuttlefish than between either of the northern sampling areas. PCA revealed a clear discrimination of individuals from South Portugal and



Conclusion

The cuttlefish *Sepia officinalis* in the Bay of Biscay, the English Channel and adjacent waters should be regarded as a panmictic population displaying only minor subdivision. Ability of organisms to adapt to climate also depends on the genetic variation or polymorphisms present amongst populations of a species.

For example, across a latitudinal gradient, populations with appropriate mutations to survive higher temperatures may exist, leading to selective sweeps within the panmictic population.

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