

## MITOCOMMUNICATION 3 OPEN ACCESS

# The European anchovy, a genetically highly diverse species displays null within-sample haplotype diversity on a single study?

Rita Castilho<sup>a</sup> and Gonçalo Silva<sup>b</sup>

<sup>a</sup>CCMAR, Centro de Ciências do Mar, Universidade do Algarve, Campus de Gambelas, Faro, Portugal; <sup>b</sup>MARE – Marine and Environmental Sciences Centre, ISPA – Instituto Universitário, Departamento de Biociências, R. Jardim do Tabaco, Lisboa, Portugal

#### **ABSTRACT**

The European anchovy has been the focus of numerous population genetic studies, most of which exposing high levels of haplotype diversity. However, Keskin and Atar (2012) revealed rather singular results of null haplotype diversities. We therefore call for caution when considering these findings.

#### ARTICLE HISTORY

Received 11 December 2015 Accepted 22 December 2015

#### **KEYWORDS**

European anchovy; population genetics; eastern mediterranean; phylogeography

Keskin and Atar (2012) study "Genetic structuring of European anchovy (*Engraulis encrasicolus*) populations through mitochondrial DNA sequences" report a singular finding for this species: 16 sampled locations have null haplotype diversity, independently from sampling size, which varies from 24 to 202 fishes. Additionally, some locations share the same haplotype (see Keskin & Atar 2012; Table 1). The European anchovy, a highly mobile small pelagic fish, has been subjected to

numerous population genetic studies involving three mitochondrial markers (cytochrome oxidase subunit I, cytochrome b and control region) and, to the best of our knowledge, no single paper on this species has reported null haplotype diversity values (Pappalardo et al., 2015, Viñas et al., 2013, Grant & Bowen, 2006, Borrell et al., 2012, Silva et al., 2014). In fact, the opposite is the rule with sampling locations displaying high haplotype diversities even with modest sampling sizes

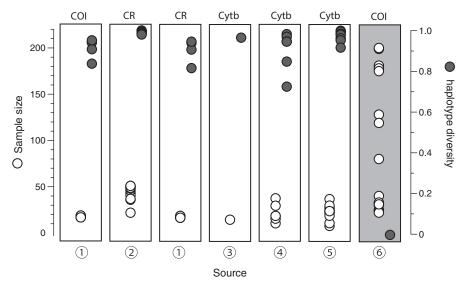


Figure 1. Comparative results of cytochrome oxidase subunit I (COI), Control Region (CR) and Cytochrome b (Cytb) from different sources: (1) Pappalardo et al. (2015), (2) Viñas et al. (2013), (3) Grant & Bowen (2006), (4) Borrell et al. (2012), (5) Silva et al. (2014); (6) Keskin and Atar (2012).



(Figure 1). The unlikely results from Keskin and Atar (2012) should have warranted a thorough explanation in the light of previously known reports (Bembo et al. 1995; Grant et al. 2005; Grant & Bowen 2006; Magoulas et al. 2006; Zarraonaindia et al. 2012) cited in the paper in question. However, no clarification for the null haplotype diversity on each location is produced and we cannot propose any plausible explanation for Keskin and Atar (2012) results. Therefore, we advise extreme caution when dealing with these findings.

### References

- Bembo DG, Carvalho GR, Snow M, Cingolani N, Pitcher T. 1995. Stock discrimination among European anchovies Engraulis encrasicolus, by means of PCR-amplified mitochondrial DNA analysis. Fisheries Bull. 94:31-40.
- Borrell YJ, Piñera JA, Sánchez Prado JA, Blanco G. 2012. Mitochondrial DNA and microsatellite genetic differentiation in the European anchovy Engraulis encrasicolus L. ICES J Marine Sci. 69:1357-1371.
- Grant WS, Bowen BW. 2006. Living in a tilted world: climate change and geography limit speciation in Old World anchovies (Engraulis; Engraulidae). Biol J Linnean Soc. 88:673-689.

- Grant WS, Leslie RW, Bowen BW. 2005. Molecular genetic assessment of bipolarity in the anchovy genus Engraulis. J Fish Biol. 67:1242-1265.
- Keskin E, Atar HH. 2012. Genetic structuring of European anchovy (Engraulis encrasicolus) populations through mitochondrial DNA sequences. Mitochondrial DNA 23:62-69.
- Magoulas A, Castilho R, Caetano S, Marcato S, Patarnello T. 2006. Mitochondrial DNA reveals a mosaic pattern of phylogeographical structure in Atlantic and Mediterranean populations of anchovy (Engraulis encrasicolus). Mol Phylogenet Evol 3:734-746.
- Pappalardo AM, Federico C, Sabella G, Saccone S, Ferrito V. 2015. A COI nonsynonymous mutation as diagnostic tool for intraspecific discrimination in the European anchovy Engraulis encrasicolus (Linnaeus). PLoS One 10:e0143297.
- Silva G, Horne JB, Castilho R. 2014. Anchovies go north and west without losing diversity: post-glacial range expansions in a small pelagic fish. J Biogeography 41:1171-1182.
- Viñas J, Sanz N, Peñarrubia L, Araguas R-M, García-Marín J-L, Roldán M-I, Pla C. 2013. Genetic population structure of European anchovy in the Mediterranean Sea and the Northeast Atlantic Ocean using sequence analysis of the mitochondrial DNA control region. ICES J Marine Sci 71:391-397.
- Zarraonaindia I, Iriondo M, Albaina A, Pardo M, Manzano C, Grant WS, Irigoien X, Estonba A. 2012. Multiple SNP markers reveal fine-scale population and deep phylogeographic structure in European Anchovy (Engraulis encrasicolus L.). PLoS One 7:e42201.