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## Insights on the drivers of genetic divergence in the European anchovy

Gaetano Catanese<sup>1,7</sup>, Romain Watteaux<sup>1</sup>, Iratxe Montes<sup>2</sup>, Marco Barra<sup>3</sup>, Paola Rumolo<sup>3</sup>, Diego Borme<sup>4</sup>, Bruno Buongiorno Nardelli<sup>3</sup>, Vincenzo Botte<sup>3</sup>, Maria Grazia Mazzocchi<sup>1</sup>, Simona Genovese<sup>3</sup>, Iole Di Capua<sup>1</sup>, Mikel Iriondo<sup>2</sup>, Andone Estonba<sup>2</sup>, Paolo Ruggeri<sup>5,6</sup>, Valentina Tirelli<sup>4</sup>, Vincenzo Caputo-Barucchi<sup>5</sup>, Gualtiero Basilone<sup>3</sup>, Angelo Bonanno<sup>3</sup>, Daniele Iudicone<sup>1</sup> & Gabriele Procaccini<sup>1</sup>

Anchovies represent the largest world's marine fish catches and the current threats on their populations impose a sustainable exploitation based on sound scientific information. In the European anchovy (*Engraulis encrasicolus*), the existence of several populations has been proposed but a global view is missing. Using a multidisciplinary approach, here we assessed the divergence among different ecotypes and its possible causes. SNPs have revealed two functionally distinct ecotypes overlapping in the Central Mediterranean, with one ecotype confined near the river estuaries. The same SNPs outliers also segregated two distinct populations in the near Atlantic, despite their large spatial distance. In addition, while most studies suggested that adaptation to low salinity is key to divergence, here we show that the offshore ecotype has higher environmental tolerance and an opportunistic feeding behaviour, as assessed by the study of environmental conditions, anchovy diet and trophic levels, and passive egg dispersal. These results provide insights into the anchovy evolutionary history, stressing the importance of behaviour in shaping ecotypes.

The European anchovy (*Engraulis encrasicolus*) represents one of the most important European fishery resources<sup>1</sup>. This species is ubiquitous from tropical to temperate areas of Atlantic Ocean, Mediterranean Sea, and Black Sea. Active dispersal of adult individuals plays an important role in species distribution. Moreover, the recruitment of European anchovy is in part influenced by pelagic transport of eggs and larvae from spawning to nursery areas and by diel vertical migration of larvae<sup>2</sup>.

European anchovy shows high levels of genetic structure attributed to habitat heterogeneity<sup>3</sup>, specific environmental features<sup>4,5</sup> and limited gene flow over wide geographic distances<sup>6</sup>. Overall, the European anchovy populations are thought to belong to two co-existing ecological groups (or ecotypes), named wide- (or marine) and narrow-shelf (or coastal), whose differences reflect ancient dispersal and colonization events of the species<sup>6-9</sup>. The current distribution of the marine ecotype is likely attributable to founding events into the Mediterranean Sea, Bay of Biscay and northern European seas by a common ancestral population that fled to the Mediterranean during last glaciation<sup>6,10</sup>. In contrast, the current distribution of the coastal ecotype could derive from the colonization of the Atlantic front after the end of the last glaciation<sup>6</sup> by an ancestral population probably sheltered in the West African coast<sup>10</sup>.

<sup>1</sup>Department of Integrative Marine Ecology, Stazione Zoologica Anton Dohrn, Villa Comunale, 80121, Napoli, Italy. <sup>2</sup>Department of Genetics, Physical Anthropology and Animal Physiology, University of the Basque Country (UPV/EHU), Sarriena auzoa z/g, Leioa - Bizkaia, Spain. <sup>3</sup>Institute for Coastal and Marine Environment (IAMC), Consiglio Nazionale delle Ricerche (CNR), Detached Units of Capo Granitola (TP) and Naples, Napoli, Italy. <sup>4</sup>Department of Oceanography, Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (OGS), Via A. Piccard 54, 34151, Trieste, Italy. <sup>5</sup>Dipartimento di Scienze della Vita e dell'Ambiente (DiSVA), Università Politecnica delle Marche, via Brecce Bianche, 60131, Ancona, Italy. <sup>6</sup>University of Miami, RSMAS, 4600 Rickenbacker Causeway, 33149, Miami, Florida, USA. <sup>7</sup>Present address: Laboratorio de Investigaciones Marinas y Acuicultura (LIMIA) Govern de les Illes Balears, Av. Gabriel Roca 69, 07158, Port d'Andratx - Mallorca, Spain. Gaetano Catanese and Romain Watteaux contributed equally to this work. Correspondence and requests for materials should be addressed to A.B. (email: [angelo.bonanno@cnr.it](mailto:angelo.bonanno@cnr.it)) or D.I. (email: [iudicone@szn.it](mailto:iudicone@szn.it)) or G.P. (email: [gpro@szn.it](mailto:gpro@szn.it))