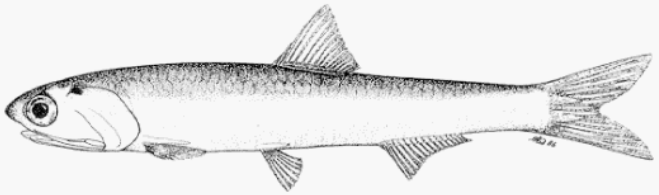
Tendenze evolutive dello stato trofico nel sistema padano-adriatico.
Cesenatico, 4 dicembre 2017

Stato e tendenze nel lungo periodo dei piccoli pelagici in Adriatico

Santojanni A., Leonori I., Angelini S., Belardinelli A., Biagiotti I., Canduci G., Colella S., Costantini I., Croci C., De Felice A., Domenichetti F., Donato F., Martinelli M., Panfili M., Tesauro C.

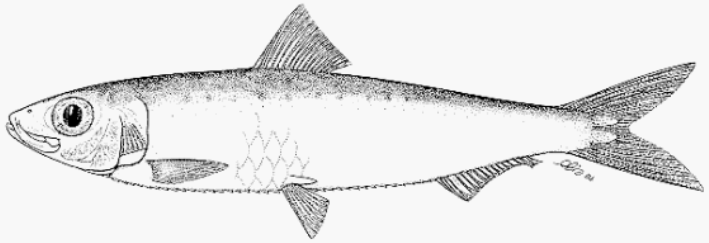
Consiglio Nazionale delle Ricerche CNR IRBIM Ancona

Alice (*Engraulis encrasicolus*)

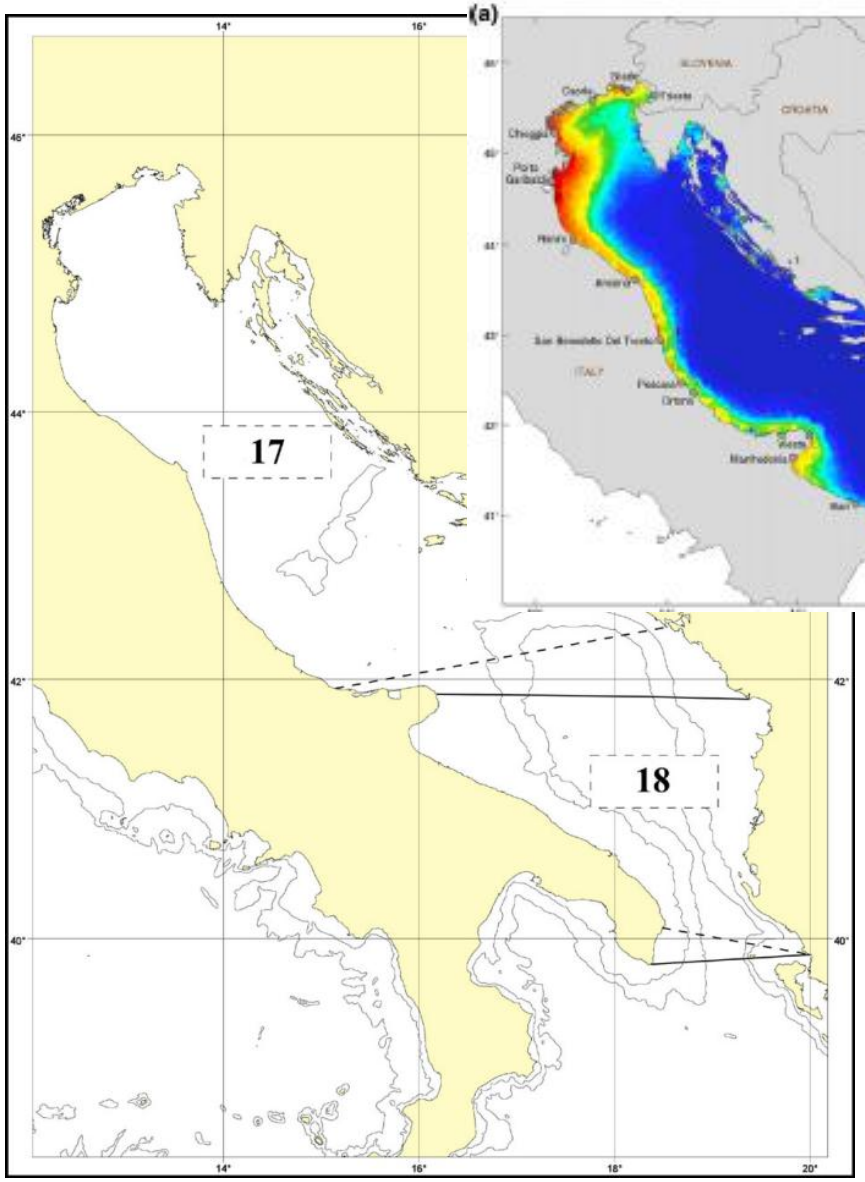


FAO

Sardina (*Sardina pilchardus*)



FAO



General Fisheries Commission for the Mediterranean

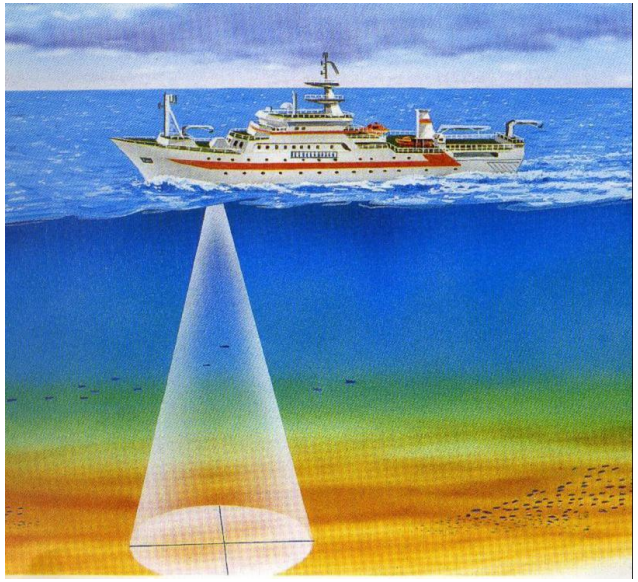
"GFCM is a regional fisheries management organization (RFMO) established under the provisions of Article XIV of the FAO Constitution (http://www.fao.org/gfcm/en/)".

Stock assessment dell'alice e della sardina dell'Adriatico, i.e. GSA 17 e GSA 18,

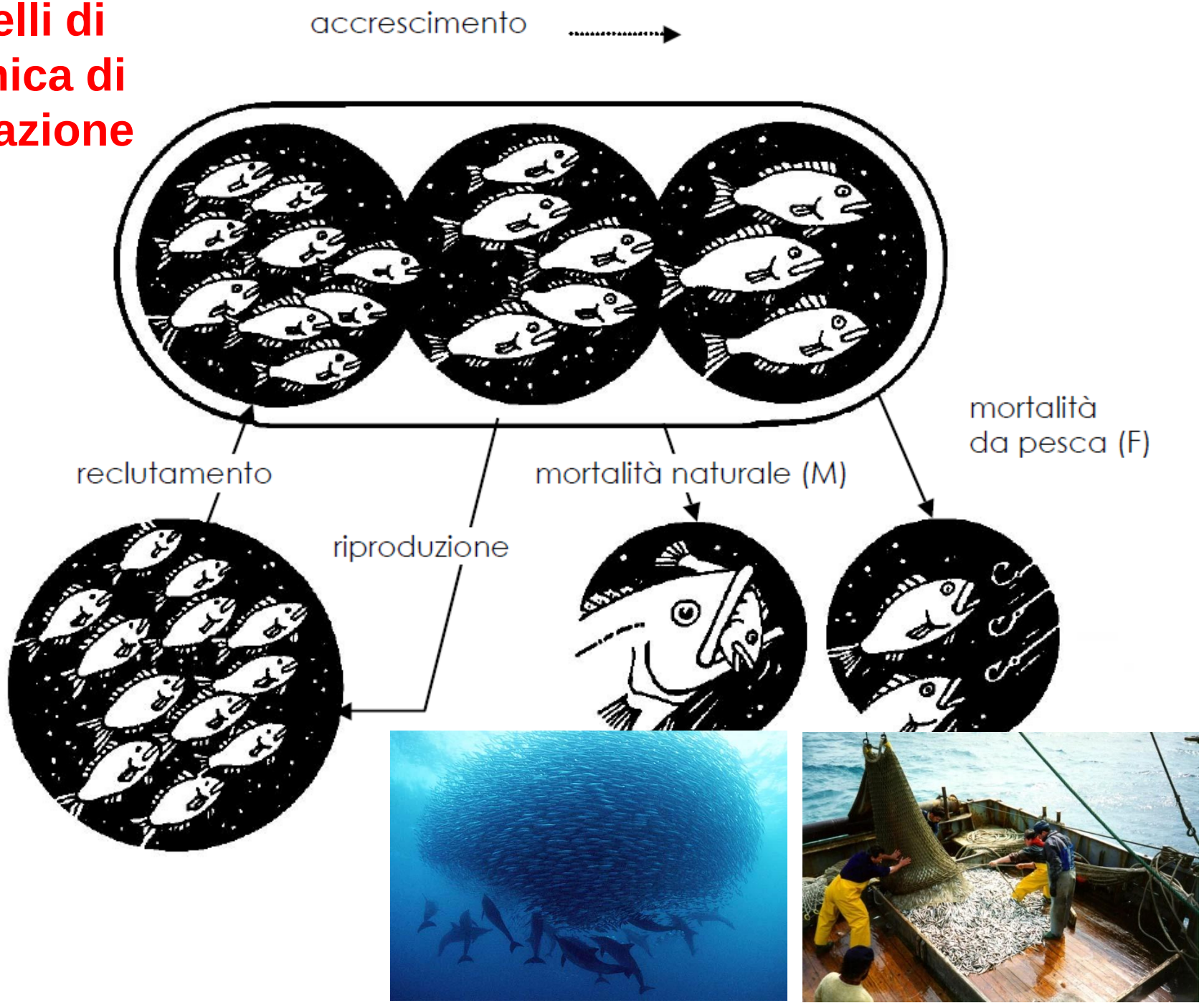
presentati nell'ambito della

General Fisheries Commission for the Mediterranean e da questa approvati

(Roma, 7-12 novembre 2016).



Modelli di dinamica di popolazione



Stock condivisi da Italia, Slovenia, Croazia, Montenegro e Albania.

Food and Agriculture Organization of the United Nations

Cooperazione Scientifica a Supporto della Pesca Responsabile nel Mare Adriatico

ADRIAMED

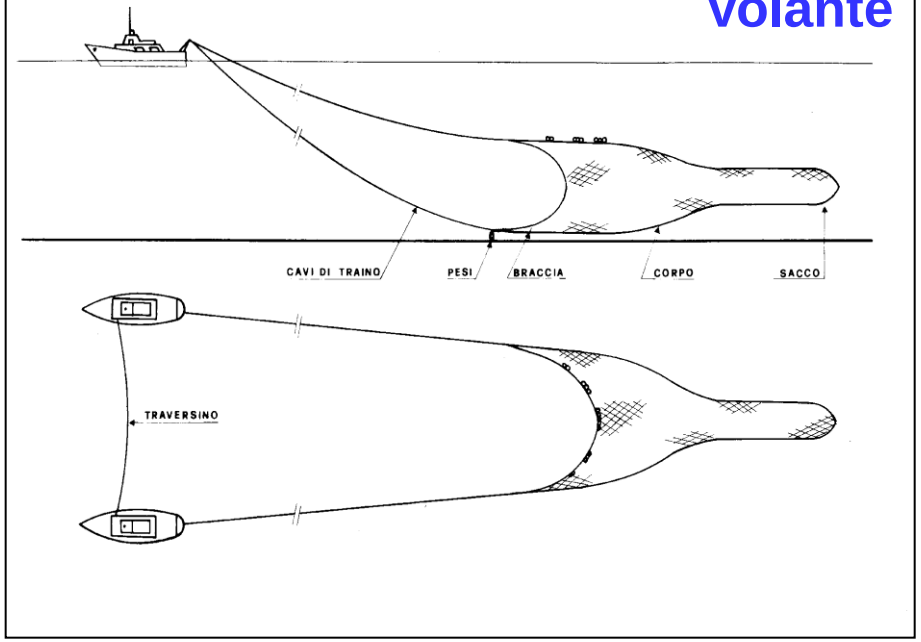
Ministero Croato dell'Agricoltura

Ministero delle politiche agricolee alimentari e forestali

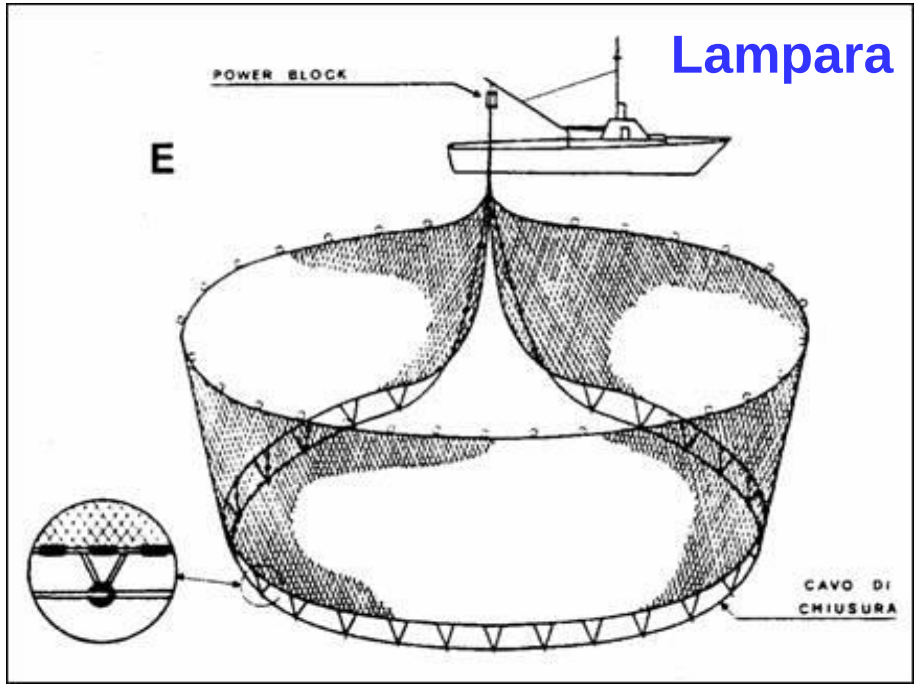
Commissione Europea

Frazione di popolazione non inclusa

Volante

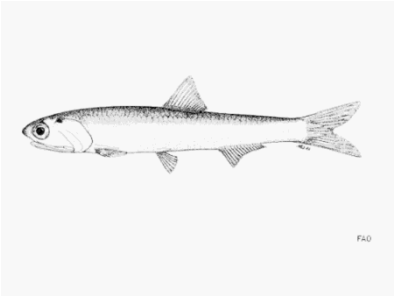


Lampara

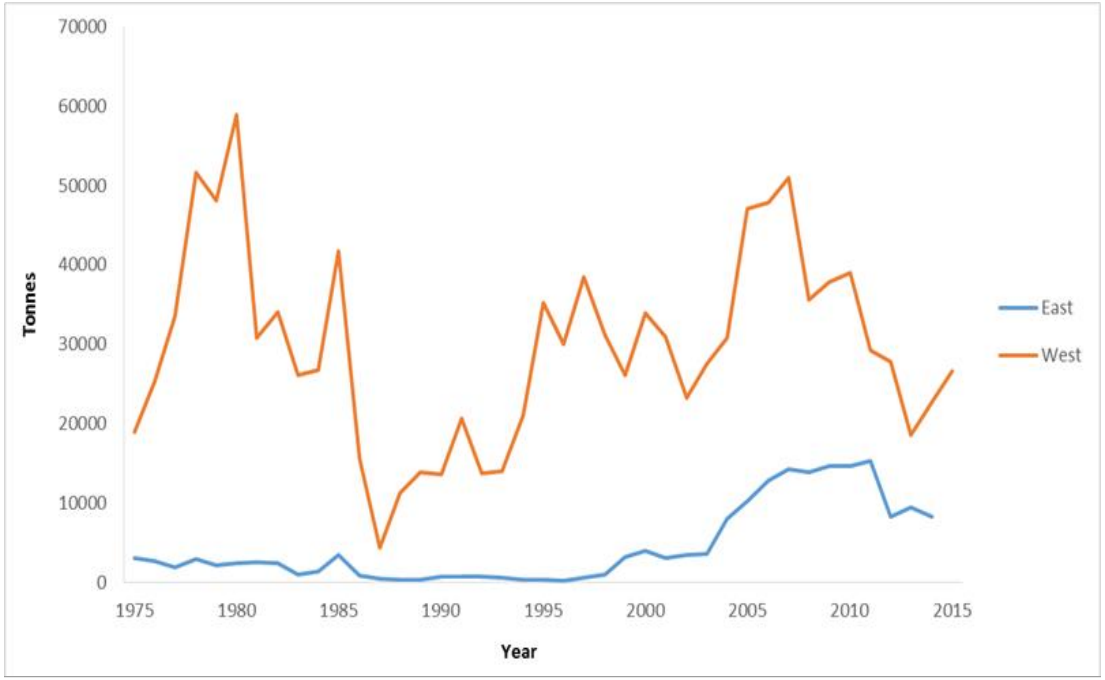


Catture in peso di volanti e lampare dell'Adriatico dal 1975 al 2015

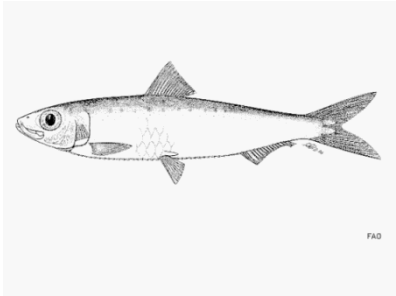
Alice (*Engraulis encrasicolus*)



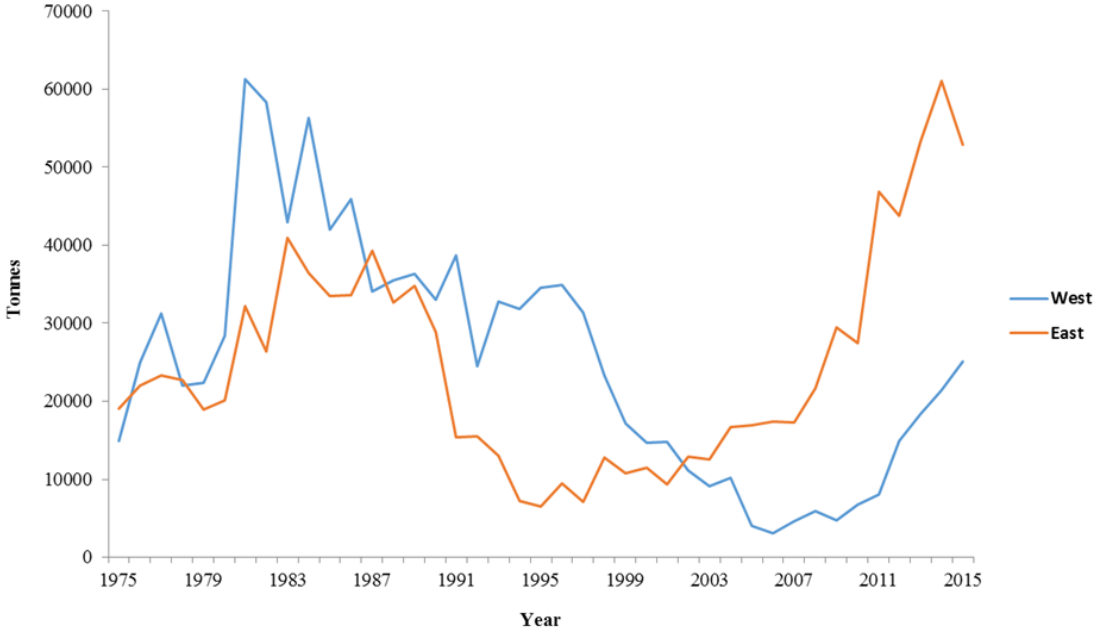
2015
Italia 26.673 t
Slovenia 15 t
Croazia 12.747 t
Montenegro 52 t
Albania 250 t
Totale 39.737 t



Sardina (*Sardina pilchardus*)

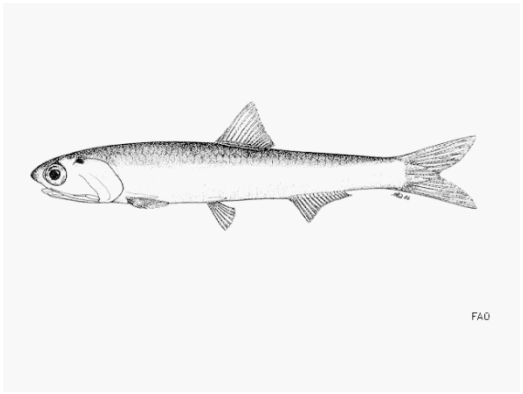


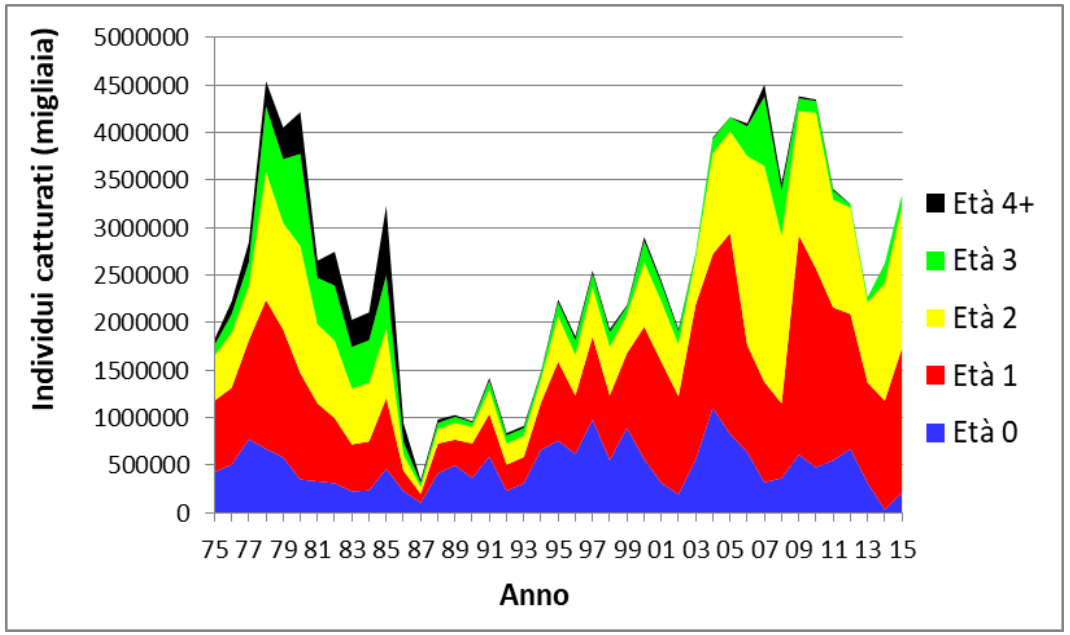
2015
Italia 25.072 t
Slovenia 44 t
Croazia 51.601 t
Montenegro 95 t
Albania 1.200 t
Totale 78.012 t



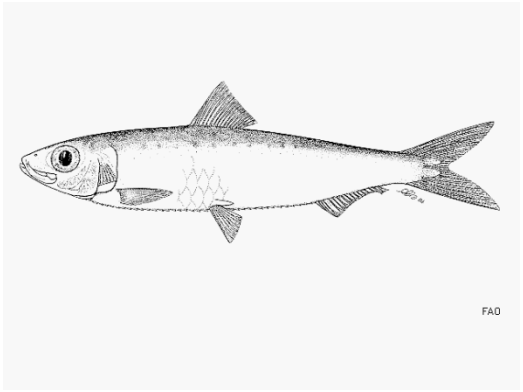
Numero di individui per classe di età catturati dalle volanti e dalle lampare dell'Adriatico dal 1975 al 2015

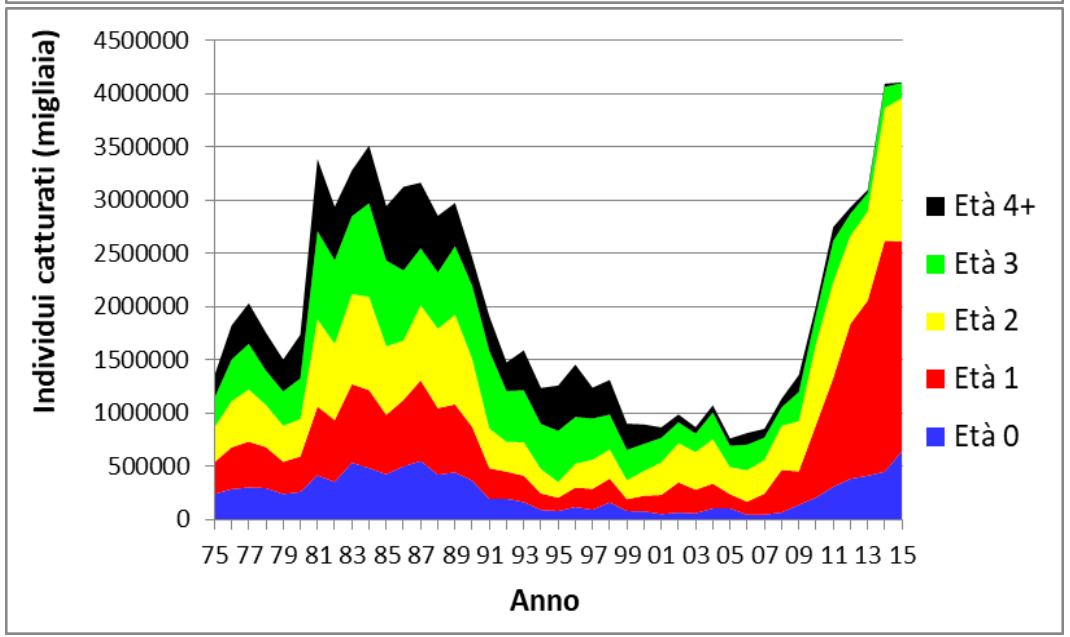
Alice (*Engraulis encrasicolus*)



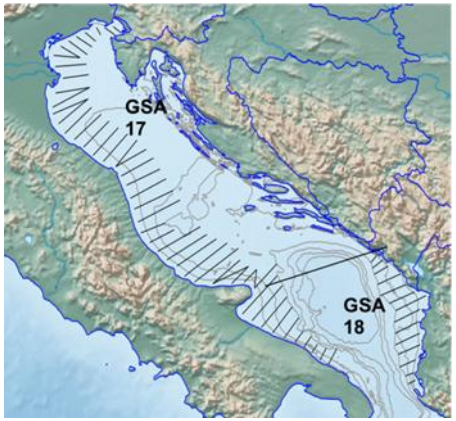


Sardina (*Sardina pilchardus*)



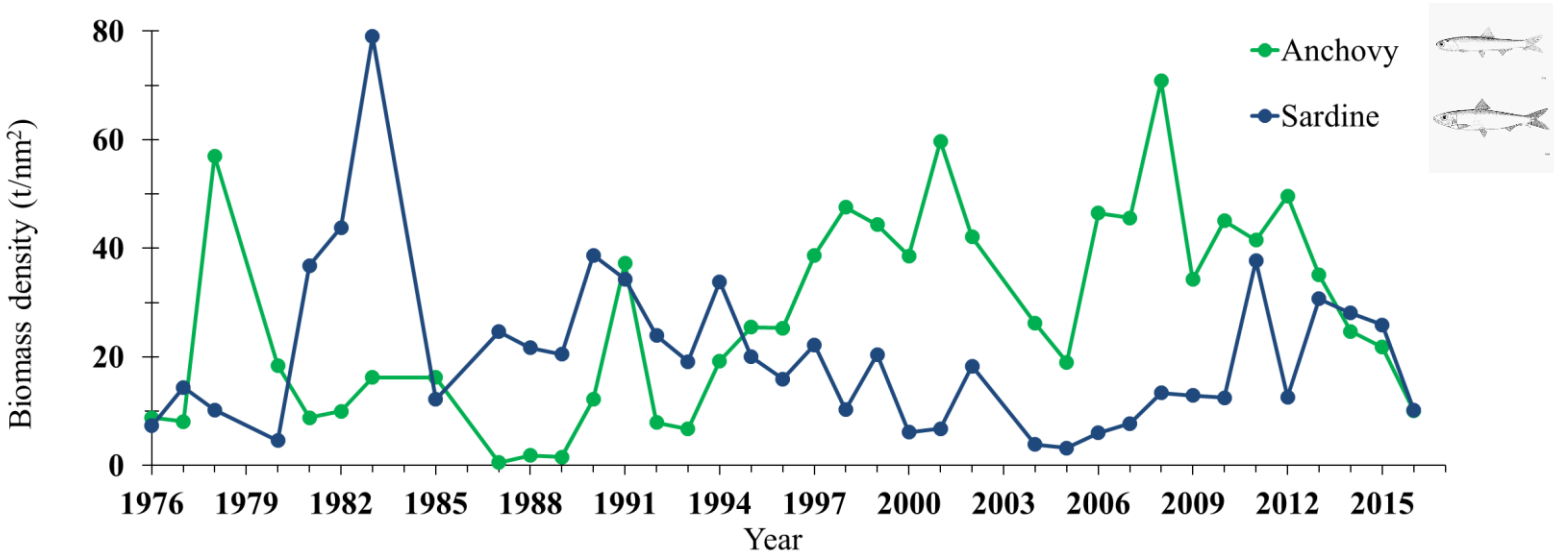


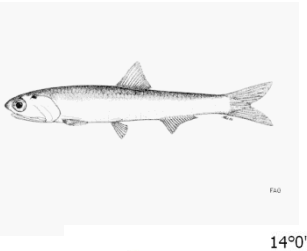
Dati di abbondanza input per il «tuning» nello stock assessment: numero di individui per classe di età nel Mare Adriatico dal 2004 al 2016 stimato sulla base della metodologia acustica



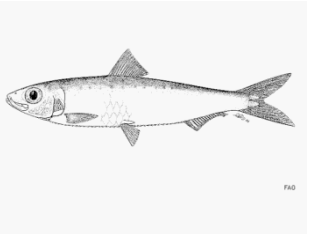
Echo-survey “italiano”

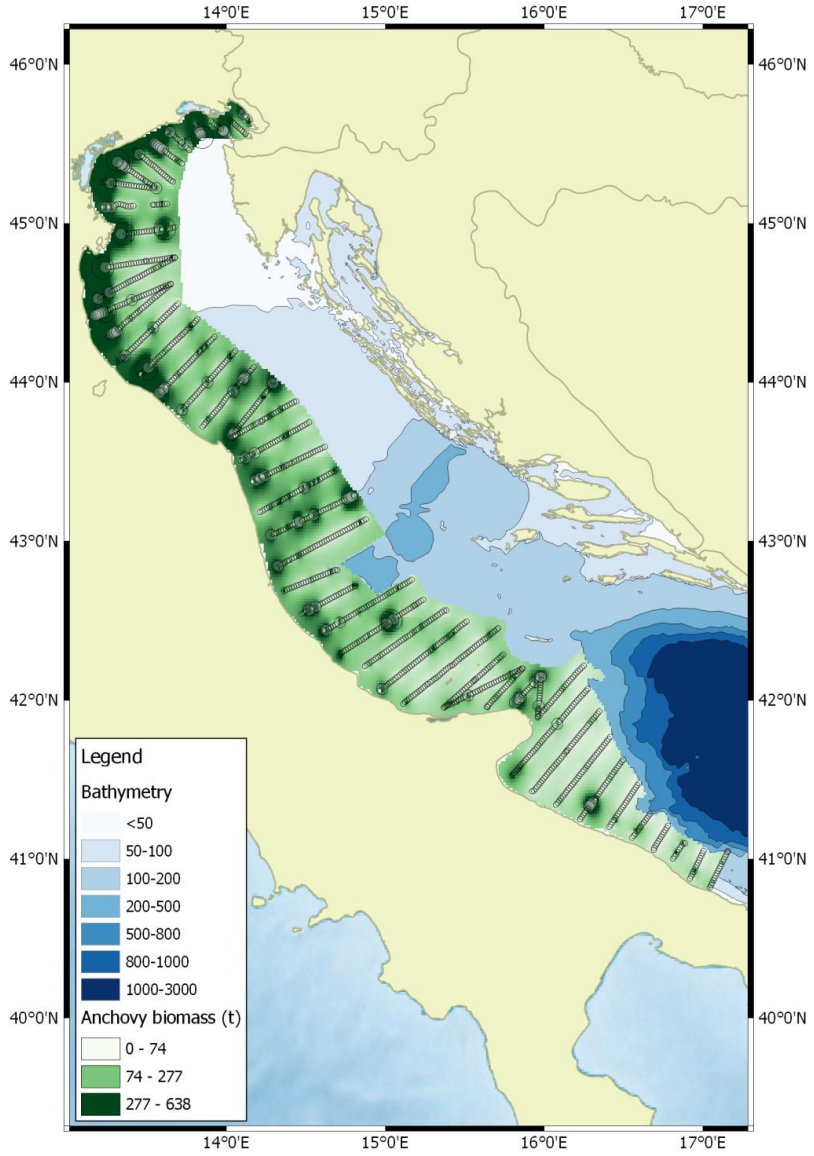
Serie storiche 1976-2016 nella parte occidentale della GSA 17 (con limite sud a Giulianova anzichè a Vieste)

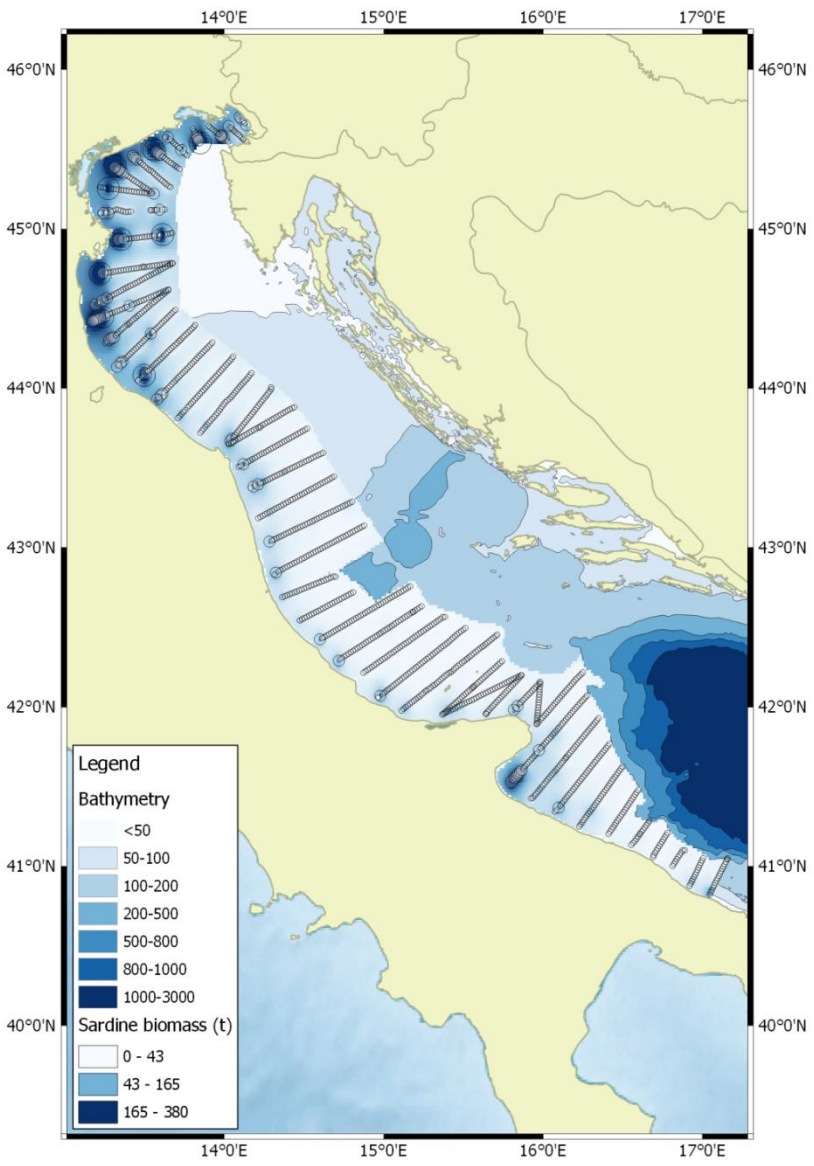




MEDIAS 2017
Distribuzione spaziale di alice e sardina nel versante occidentale delle GSA 17 e 18

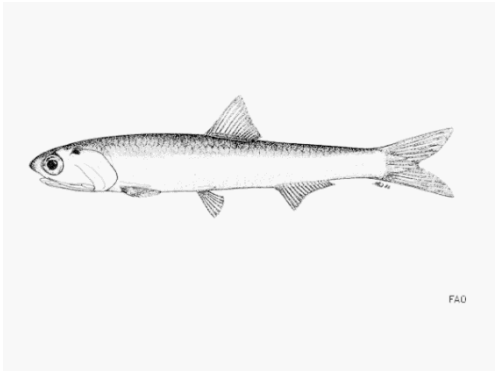


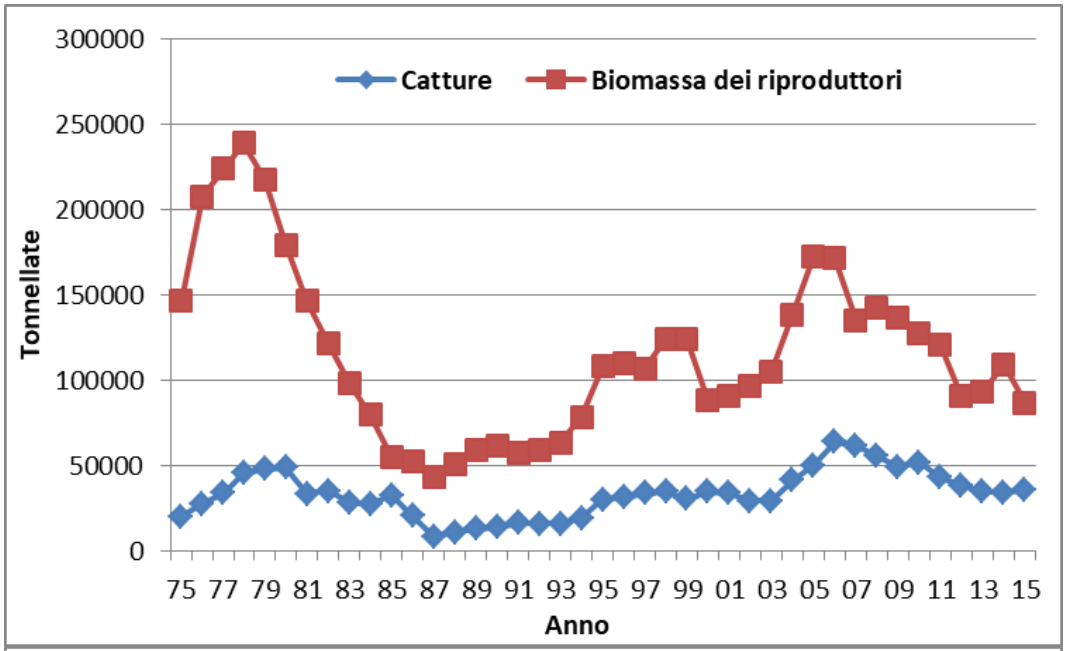




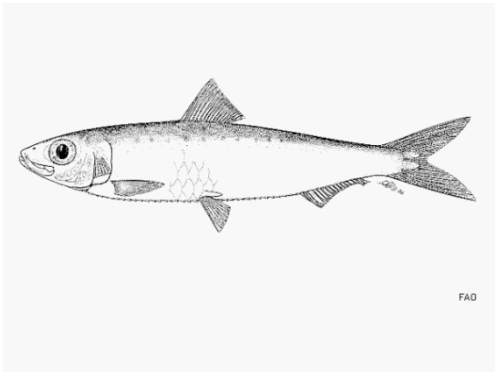
Catture in peso e stima annuale della biomassa dei riproduttori in Adriatico dal 1975 al 2015

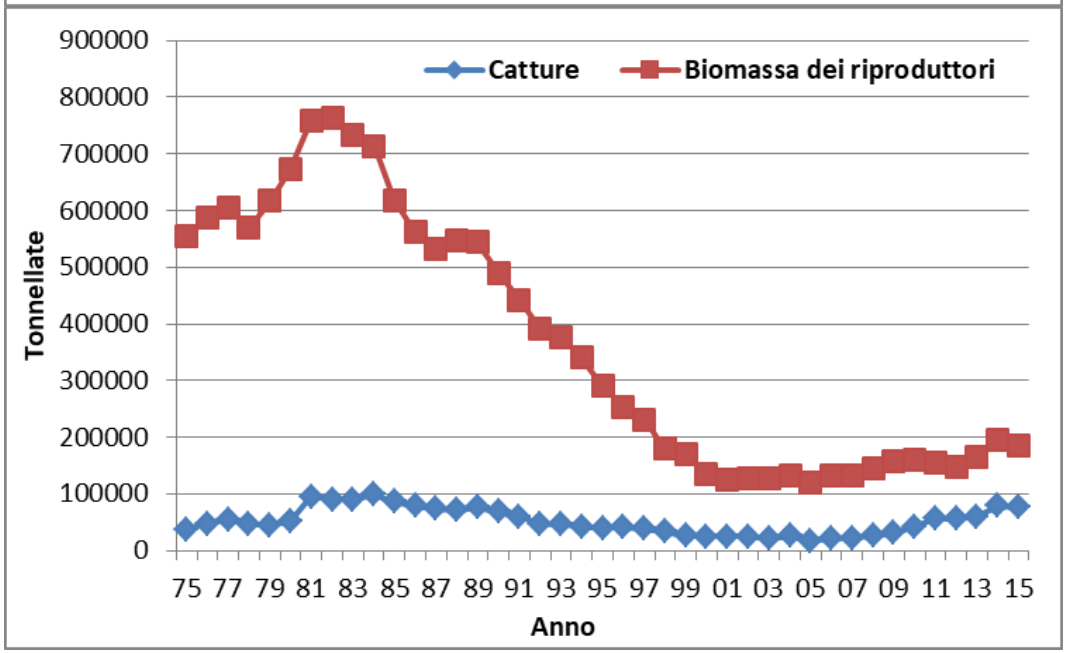
Alice (*Engraulis encrasicolus*)





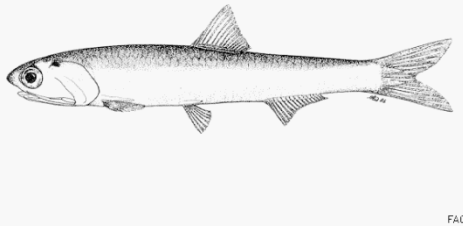
Sardina (*Sardina pilchardus*)



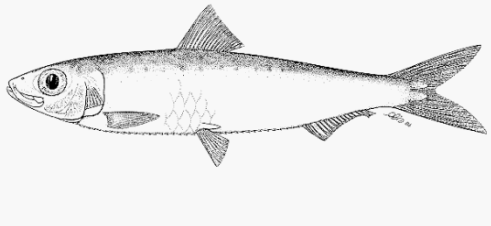


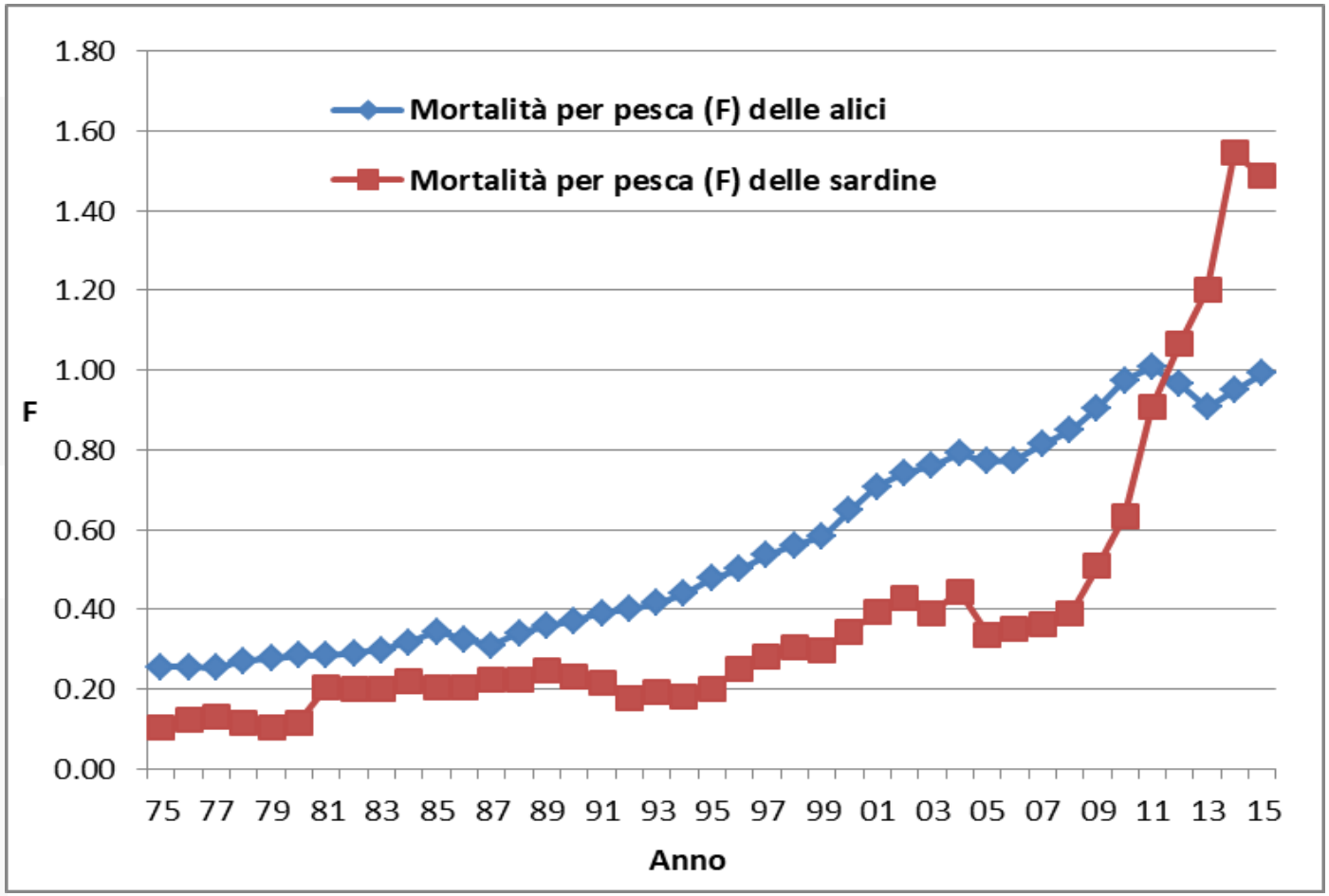
Tasso di mortalità per pesca (F) dal 1975 al 2015

Alice
(*Engraulis encrasicolus*)



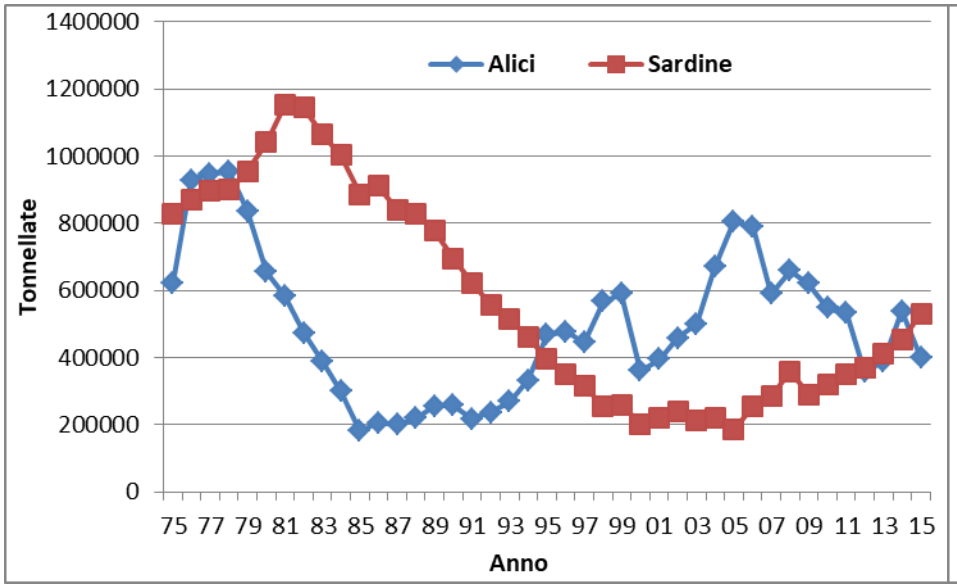
Sardina
(*Sardina pilchardus*)

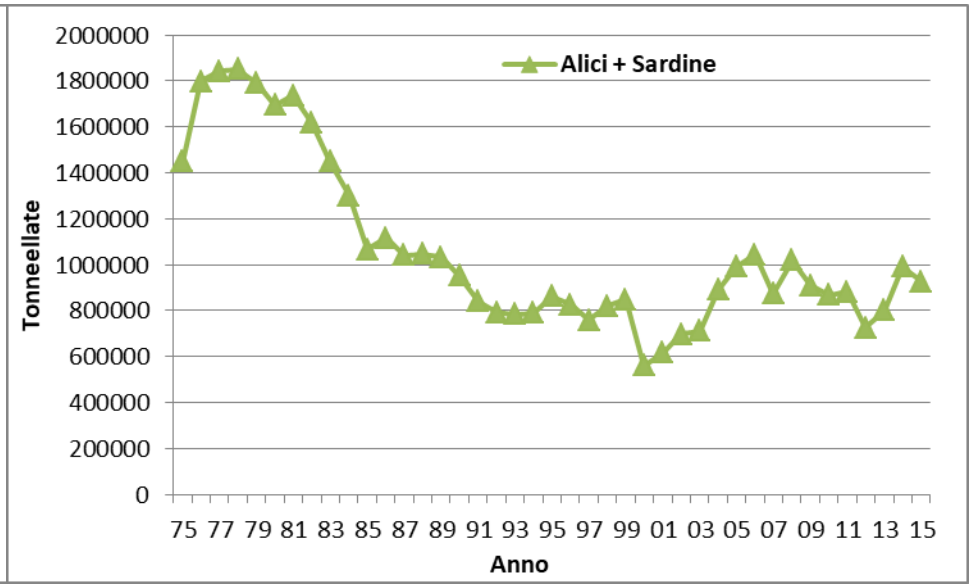




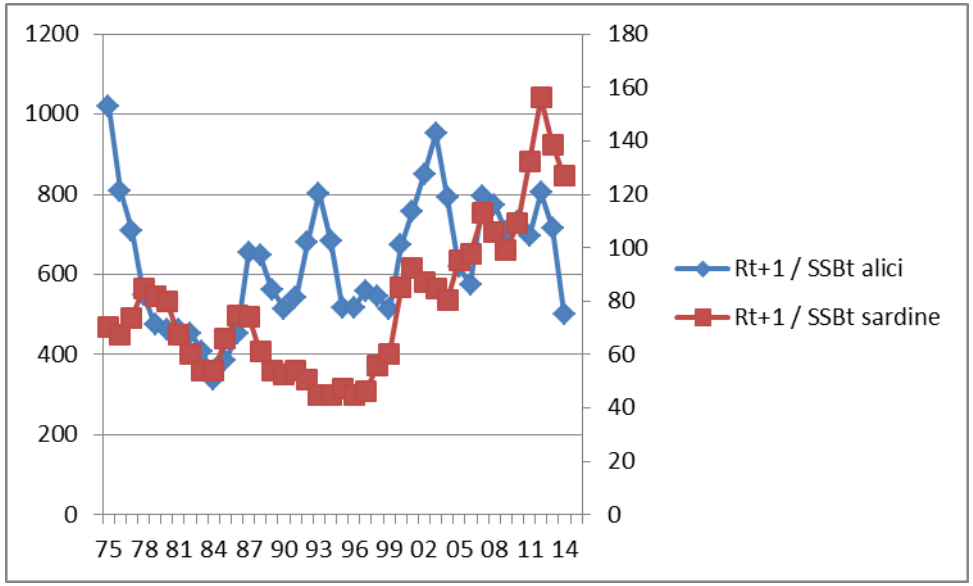
Stato degli stock: indicazioni dai biological reference points basati sulla biomassa dei riproduttori e sul tasso di mortalità per pesca.

Total stock biomass dal 1975 al 2015



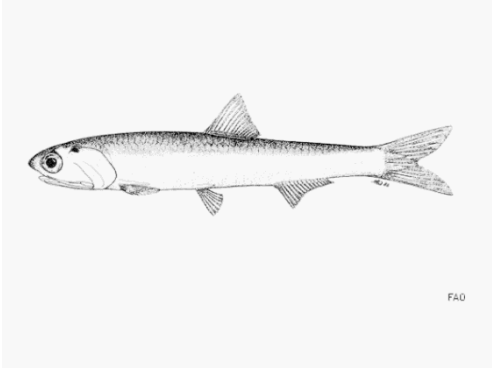


Rapporto Reclute t+1 / Riproduttori t dal 1975 al 2014

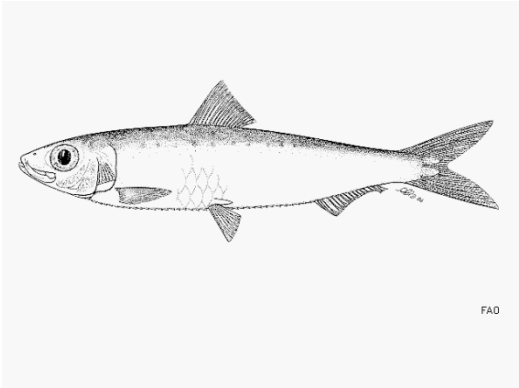


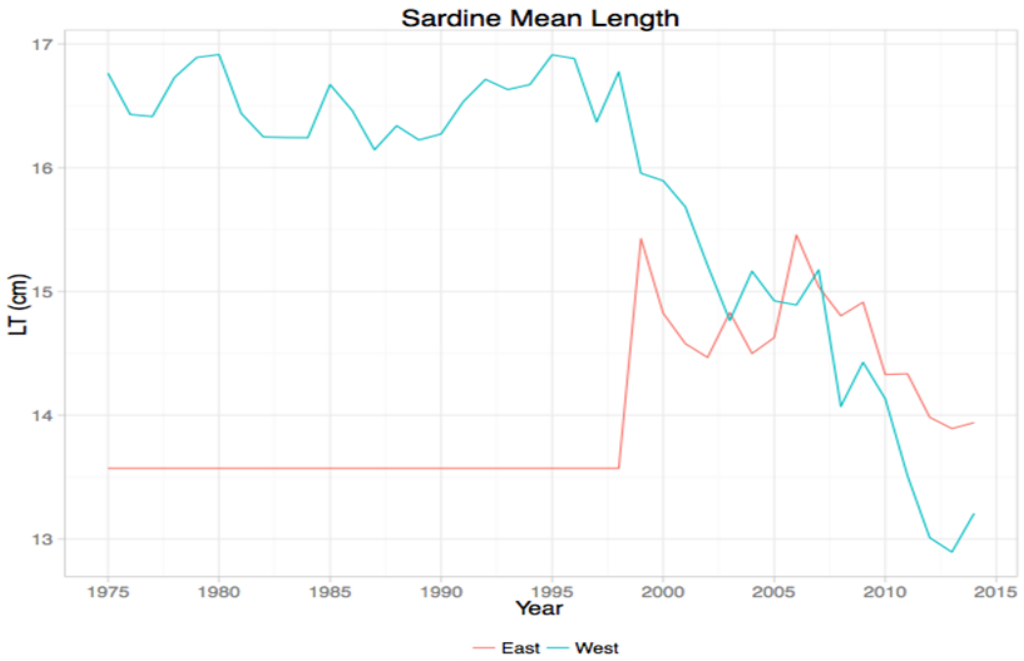
Cambiamenti nella composizione per taglia e per età

Alice (*Engraulis encrasicolus*)



Sardina (*Sardina pilchardus*)





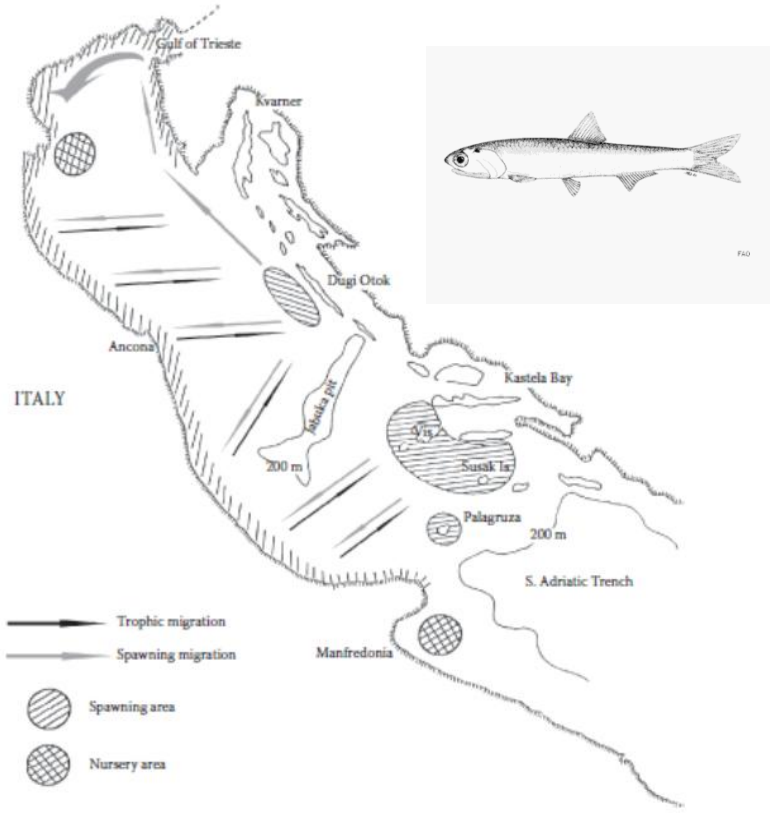
Progress in Oceanography 151 (2017) 149-162.

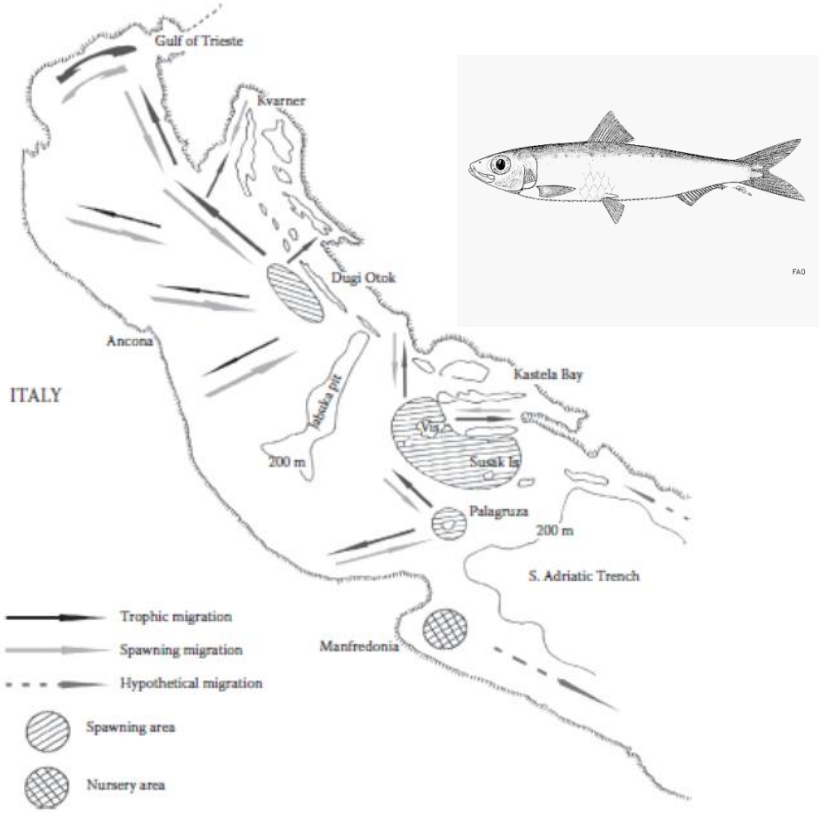
Spatio-temporal patterns and environmental controls of small pelagic fish body condition from contrasted Mediterranean areas

"Anchovy and sardine exhibited a decreasing trend in body condition in most of the studied areas, i.e. four or five over six for anchovy and sardine, respectively. None of the studied species in the different Mediterranean areas displayed a long term increase in body condition. (…..) A general and rapid change affecting the entire Mediterranean Sea could thus be involved to explain the synchrony observed. Small pelagic fish body condition is known to be primarily affected by food availability, especially the zooplanktonic compartment which constitutes the bulk of small pelagic fish preys (Basilone et al., 2006; Brosset et al., 2015b). Lower quality and/or quantity in food resources may have negatively affected fish growth, lowering overall mean and maximum fish size. Changes in the zooplanktonic community have been observed in different parts of the Mediterranean. For example, a shift towards smaller zooplankton biomass in 2003 in the Adriatic (Mozetic et al., 2012) or a change towards smaller plankton species in the Northern Spain area since 2000 related to increasing temperature and stratification (Calvo et al., 2011) were described".

Anchovy and Sardine in the Adriatic Sea - An Ecological Review

Oceanography and Marine Biology: An Annual Review, 2009, 47, 209-256.





ANCHOVY (*Engraulis encrasicolus*)

"In contrast to sardine, anchovy spawning takes place in the warmer months, generally between April and October, although eggs have been reported as early as February and as late as November.

The main spawning activity takes place in the coastal waters of the western Adriatic between the Gulf of Trieste and the Gargano peninsula and the largest number of eggs occurs in the Gulf of Trieste and off the river Po delta.

The presence of anchovy eggs in the Adriatic has been reported at temperatures between 11.6 and 28°C, and at salinities ranging from 9.1 to 38.7 psu. Spawning peaks occur at the higher temperatures in the range, between 18 and 28°C whereas egg density is inversely proportional to salinity".

[I riferimenti bibliografici sono stati omessi]

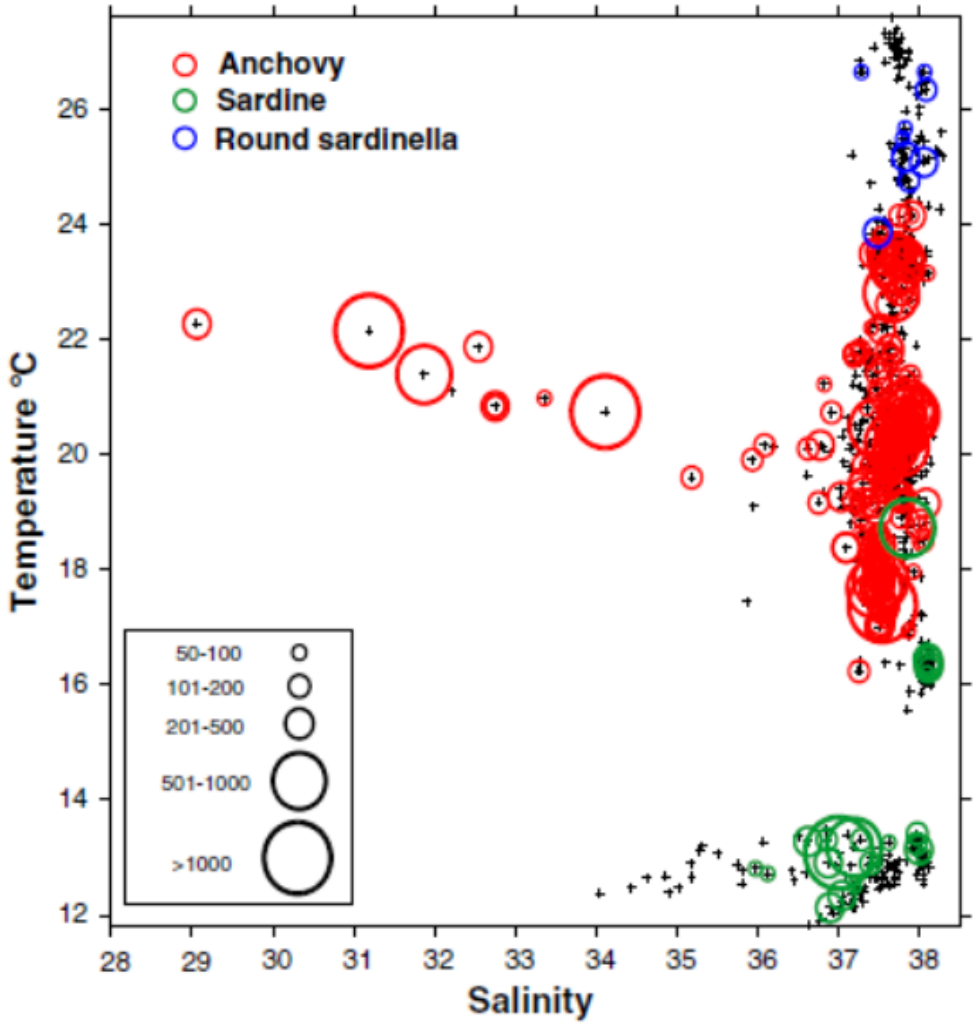
SARDINE (*Sardina pilchardus*)

In the Adriatic Sea spawning takes place mainly in winter, generally between October and May, although eggs have been reported as early as September and as late as June.

The available scientific literature regarding the spawning areas of sardine in the Adriatic Sea reports a series of contrasting results. Although the presence of eggs has been observed in all continental shelf waters of the Adriatic Sea, there is general consensus on the existence of a number of areas where spawning is more intense.

Spawning, in the Adriatic Sea, has been reported to take place between 9 and 20°C at salinities ranging from 35.2 to 38.8 psu, with spawning peaks occurring between 11 and 16°C.

[I riferimenti bibliografici sono stati omessi]



Surface temperature – salinity plots for anchovy, sardine and round sardinella eggs from surveys carried out in North Western Mediterranean waters (only abundances >50 egg m-2 are drawn).

Effects of environmental variables on recruitment of anchovy in the Adriatic Sea

Climate Research, 31: 181-193, 2006

The main mechanism of recruitment strength determination could be related with the behaviour of the Western Adriatic Coastal Current (WACC) in the previous autumn. This current has a strong eastern boundary separating coastal nutrient-rich freshwaters from open sea oligotrophic Adriatic waters. The presence of high Po River flow rates together with moderate SSE and ESE wind stress will expand a nutrient rich WACC offshore, sustaining an increased phytoplankton and zooplankton biomass and thus increasing the extension of the area favourable to recruitment of post-larval anchovies.

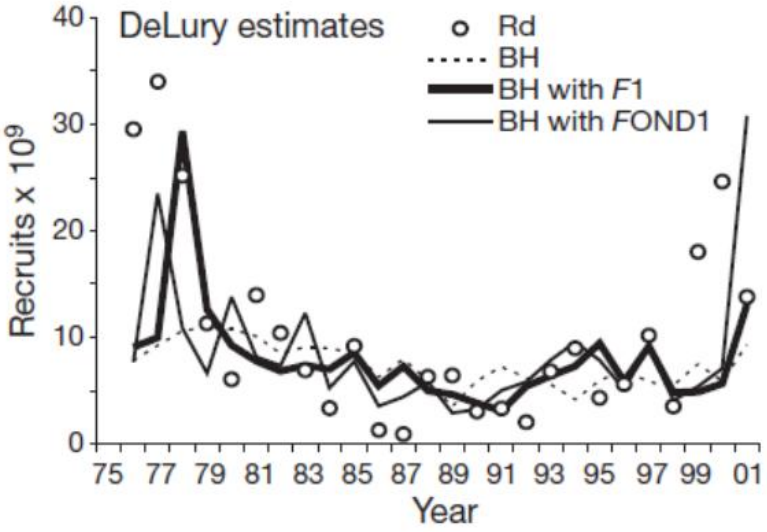


Fig. 12. *Engraulis encrasicolus*. Observed and expected values of recruits (Rd, in thousands) over time. Expected values obtained by fitting the Beverton-Holt (BH) model to log recruits estimated by calendar year DeLury model. The BH model was simple or ad hoc modified with predictor variable *F*1 or *F*OND1 (annual and autumn Po River flow rate in Calendar Year $x-1$, respectively; see Table 3)

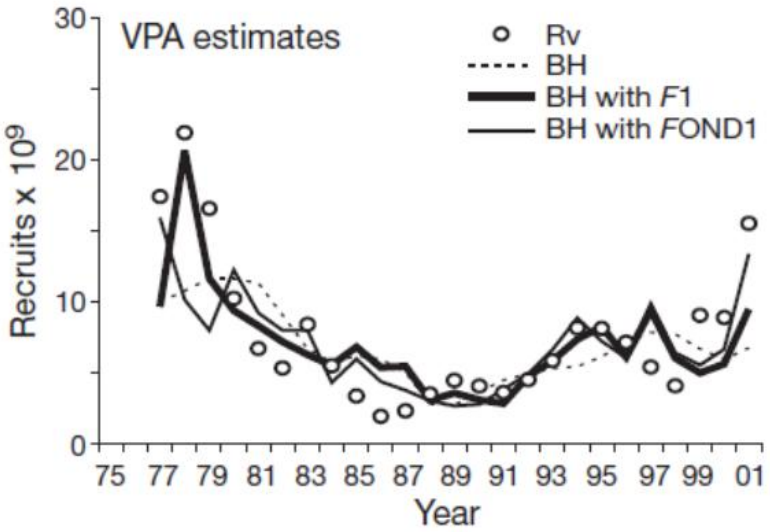


Fig. 13. *Engraulis encrasicolus*. Observed and expected values of recruits (Rv) over time. Expected values obtained by fitting the Beverton-Holt (BH) model to log recruits estimated by split-year VPA. The BH model was simple or ad hoc modified with predictor variable *F*1 or *F*OND1 (annual and autumn Po River flow rate in Calendar Year $x-1$, respectively; see Table 3)

Rete trofica

Journal of Marine Systems 67 (2007) 119–154