

13 Additional presentation on ecosystem/environmental modelling related to the work of WGHANSA

During the WGHANSA 2017, on the first day, three members of the ICES Working Group on Ecosystem Assessment of Western European Shelf Seas (WGEAWESS) presented some of their ongoing works, followed by some exchange on how both groups could increase their interactions. One challenge for WGHANSA (and other ICES WG) is to include environmental drivers into stock assessment and therefore could benefit in the long term from exchanges with WGEAWESS while providing to the latter additional information on fisheries and species dynamics.

Eider Andonegi (AZTI, Spain, co-chair of WGEAWESS) presented the work being developed by WGEAWESS. First, a brief overview of the ICES regional groups in general and WGEAWESS particularly was provided, aiming at answering to the following questions: why do these group exist? How do these groups integrate within the ICES structure? Secondly, practical examples were presented. Different concepts of the Ecosystem Approach were explained in a first step, following the approach given by Link (2010) and Link and Browman (2014). Then, examples of different studies under each of the Term of Reference (ToR) of WGEAWESS were presented but higher emphasis was given to ToRs that could be more valuable for improving current stock assessments. More information can be found in the WGEAWESS 2016 report (ICES, 2016).

Margarita Maria Rincon (ICMAN-CSIC, Spain) presented "Modelling anchovy dynamics in the Gulf of Cadiz: an ecosystem and socio-economic approach". The presentation showed different modelling approaches to assess the stock of European anchovy (*Engraulis encrasicolus*) and its dynamics in the Gulf of Cadiz. This work builds on fifteen years of research in the Gulf of Cadiz conducted at the ICMAN-CSIC Ecosystems Oceanography group. This research trajectory is also presented since it conforms most of the existing knowledge on the natural and human forcings on this stock that is included in the models, including also the main social and economic aspects to be considered in the fishery as identified in consensus with the main stakeholders (fisheries and environmental departments at the state and regional ministries, fishery sector, Doñana National Park, WWF and other environmental NGOs, . . .).

Marcos Llope (IEO, Spain) presented "Estuarine and marine environmental effects on GoC anchovy dynamics". The Gulf of Cadiz socio-ecosystem is characterized by a focal ecosystem component, the estuary of the Guadalquivir River that has an influence on the marine ecosystem (serves as a nursery area), and at the same time concentrates a great number of sectoral human activities. This nursery role particularly affects the anchovy fishery, which is the most economically and culturally important fishery in the region. As a transition zone between terrestrial and marine environments, estuaries are particularly sensitive to human activities, either developed directly at the aquatic environment or its surroundings. A dam 110 km upstream from the river mouth regulates freshwater input (mainly for agriculture purposes) into the estuary with consequences on turbidity and salinity. Using time-series analysis we (1) quantify the effects that natural (nekton, temperature, winds) and anthropogenic-influenced variables (freshwater discharges, turbidity, salinity) have on the abundance of anchovy larvae and juveniles, and (2) relate the abundance of these estuarine-resident early stages to the abundance of adult anchovy in the sea. Water management stands out as a key node where potentially conflicting interests (agriculture, power generation, aquaculture, fisheries) converge. Linking land-based

activities to its impact on stock biomass represents the main challenge to ecosystem-based management in this particular regional sea. By focusing on the effects that these activities ultimately have on the anchovy fishery, via recruitment, our study aims to provide alternative management scenarios by quantifying trade-offs between sectors.

Finally, interesting discussions were opened, both about the proper official way of establishing interactions between the groups (workshops, requests, etc.) and the real options of bringing all these ideas into practice, due mainly to the lack of funding. Nevertheless, both groups recognize that establishing links and collaborations between assessment groups and more ecosystem focused groups should happen especially when current fisheries management approaches do not solve existing problems.