**Assignment #2: Single-species CEATTLE Application**

**Introduction and Objective**

Hake, anchovy, and sardine in the Adriatic are all subject to substantial fisheries. Hake are cannibalistic and also prey on anchovy and sardine. The aim of this assignment is to conduct single-species assessments of the three species using CEATTLE (i.e. multiple single-species assessments) and explore sensitivity to the single-species results to how the data are weighted. There are three surveys for hake and one survey for each of anchovy and sardine. The composition data for hake are length-frequencies and for anchovy and sardine are age-frequencies.

**Tasks**

* Review the *control* sheet in Adriatic\_SS\_Base.XLS.
* The catch and survey biomass data are listed in Ex2.XLS. These data should be moved into sheets *srv\_biom* and *fsh\_biom* in the spreadsheet Adriatic\_SS\_Base.XLS (replace the dummy data).
* Run the model and extract the spawning stock biomass and recruitment series from the object ss\_run using the call *ss\_run$quantities$biomassSSB* and *ss\_run$quantities$R*.
* Store the estimates in a spreadsheet using the command write\_results(ss\_run, file = "Base\_single\_species\_results.xlsx").
* View the diagnostic plots (does the model fit the catch data, the survey data and age- and length-frequencies adequately). Commands to do this are:
  + plot\_catch(Rceattle = ss\_run)
  + plot\_index(Rceattle = ss\_run)
  + plot\_srv\_comp(Rceattle = ss\_run) # Black like is estimate, grey is observed
  + plot\_fsh\_comp(Rceattle = ss\_run) # Black like is estimate, grey is observed
  + plot\_selectivity(ss\_run)
* Explore sensitivity of the estimates of spawning stock biomass and recruitment to halving and doubling the rates of natural mortality (sheet *M1\_base*).
* Explore sensitivity of the estimates of spawning stock biomass and recruitment to halving and doubling the weights assigned to survey and fishery composition data (sheets *srv\_comp* and *fsh\_comp* column *sample\_size*).