Data collection procedure for the inference of stocks of bivalve molluscs populations in shellfish exploitation.

Parada, J. M.
Centro de Investigacións Mariñas. Xunta de Galicia. España.
jose.manuel.parada.encisa@xunta.gal
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The capture of clams and cockles constitutes one of the main resources of artisanal shellfish gathering. In Galicia, about 5,700 t were extracted, reaching a first-sale value of 60 million euros in 2020 (https://pescadegalicia.gal. Anuario de pesca 2020).

Although decree Decree 153/2019, which regulates the exploitation and management of shellfish resources in Galicia, does not focus on estimating the volume of the stock of exploited species, the evaluation of the populations and the inference of their evolution continues to be of great importance for the diagnosis of their status and advice on the management of their exploitation.

This document shows a procedure used to monitor different exploited shellfish banks to obtain mortality and growth values, as well as recruitment rates to feed a virtual population model (**Figure 1**). For this we used data from the daily monitoring of the catches and their size structure, obtained at a control point established in the shellfish bank (**Figure 2**); biannual assessments of the population stock **(Figure 3);** and, optionally, monthly monitoring of mortality and growth from confined individuals **(Figure 4).**

This compilation of data on the populations of bivalve molluscs and their exploitation allows diagnosing their status and inferring their evolution in the short term **(Figure 5).** When applying this procedure to the carpet-shell clam population (*Venerupis corrugata* (Gmelin, 1791)) from As Pías shellfish bank (ria of Ferrol) we have obtained an index of agreement d_2 = 0.97 and Nash-Sutcliffe (N-SI) = 0.84 with respect to the observed values.

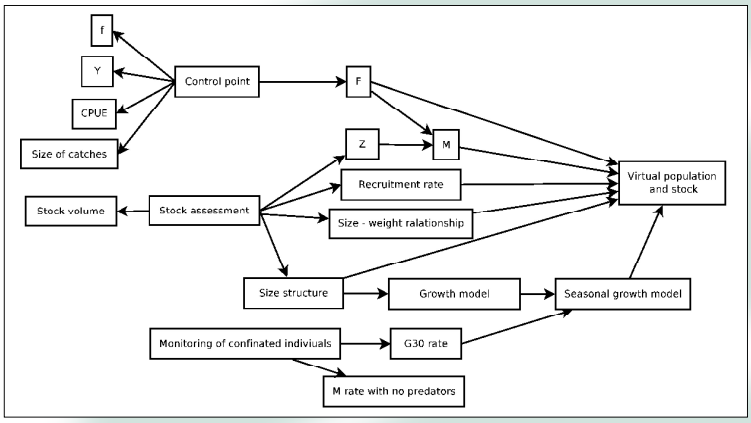

Figure 1.- Procedure data flow. f, fishing effort (number of shellfishers and boats); Y yield; F, fishing mortality; Z, total mortality from cohorts identified in the size structures obtained in the samples of biannual populations.

Figure 2.- Control point. The vessels participating in the shellfish bank management plan must pass through the control point before starting the task and once it is finished. At the control point, data from the time spent (CPUE in terms of catches per person and hour) and the catches are obtained, and a control of the sizes of the captured specimens is carried out.

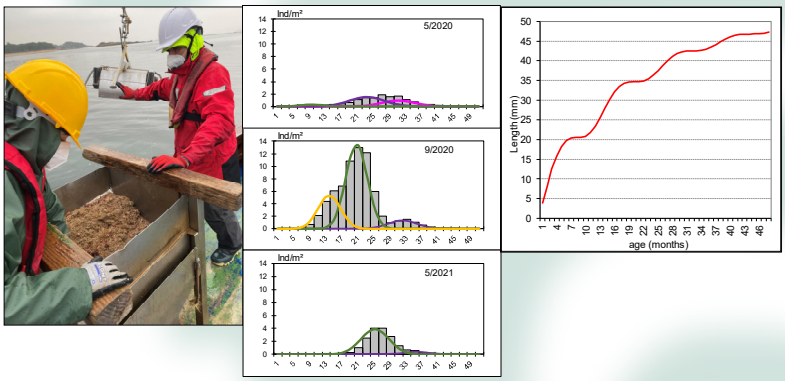

Figure 3.- Semestral stock evaluations. In spring and autumn, stock assessments are carried out with quantitative sampling using vertical insertion dredges or manual trawling gear such as the shellfish racquet. Stock assessments include estimates of stock volume and size structure. The identification of cohorts in these stock assessments allows the calculation of the total mortality rate, the recruitment rate and the parameters of the von Bertalanffy growth model.

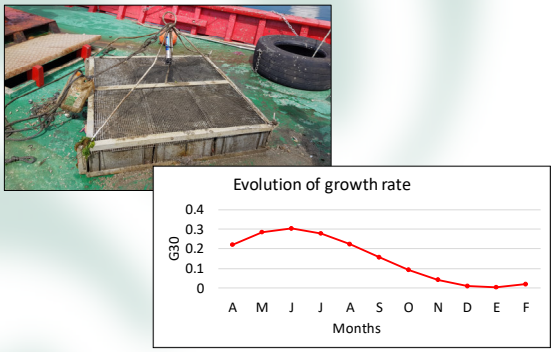

Figure 4.- Monthly monitoring of confined individuals. Six batches of individuals are arranged in 40 x 60 cm confinement boxes with sand and protected from predators. Batches can be juvenile specimens (100 individuals per batch) and kept without substitution or semi-adult specimens (25 individuals per batch) and replaced every month. With monthly frequency the individuals are counted and measured to determine the mortality in the absence of predators and the G30 growth rate. This growth rate is used to improve the fit of the von Bertalanffy seasonal growth model.

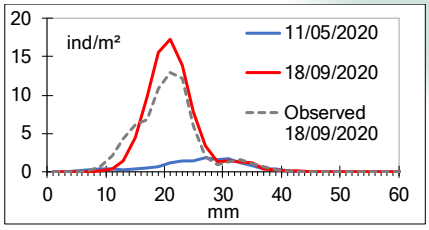

Figure 5.- Application of the model and validation for *Venerupis corrugata* in As Pías shellfish bank.
Variables:
Growth equation: t0 = 0, L_∞ = 52 mm, K = 0.6 years, C = 0.45; WP = 1.81
Mortality: M = 2, F = 0.5, First catch size= 35 mm
Recruitment rate= 6.22; Recruitment start= june; Standard deviation of recruits cohort = 3.4; L50 = 35 mm
Size - weight ralationship: log(weight) = 3.044 · log(size) - 3.862
Validation agreement:
Index of agreement(d_2)= 0.97
Nash-Sutcliffe index (N-SI) = 0.84