

BIOMASS ESTIMATES OF THE TRANSPARENT GOBY STOCK IN THE NORTHERN TYRRHENIAN SEA

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Abstract

The transparent goby is fished in Italy by nearby 400 boats with trawl or purse seine nets and can produce an annual yields over 70 tons. It is one of the most valuable target species of the artisanal fishery in wintertime. In Tuscany 50 boats operates in wintertime with the purse seine on this species and daily catch and effort data are available for the last 10 years. Depletion models suggest that, even if stock abundance is fairly stable, catches can fluctuate because of changes in recruitment timing.

Keywords : stock assessment, biomass, fisheries, models, Tyrrhenian Sea

Introduction

The transparent goby *Aphia minuta* is fished with an artisanal gear and represents a typical single-species fishery. This small fish, less than 6 cm long, is traded similarly to the frylings of anchovies and sardines, but while the catches of these small pelagics came out from stocks which are mainly exploited later on in the adult stages, the goby lives only one year and it can be fished only in the 0+ age class.

Because of the relevant economic value of the Italian production (more than 1.5 million EURO's a year), several research programs have been carried out in the recent years (1,2,3,4).

A. minuta is strictly coastal and lives spottily on sandy-muddy bottoms mainly at depths less than 20-30 m. After the hatching of benthic eggs, planktonic larvae attain in few months the size of 15-20 mm and recruits near the bottom. In this stadium, up to 35 mm, they concentrate in abundant and relatively compact shoals, which can be detected with the echo-sounder and captured with the purse seine. From 35 to 50 mm, when gonads mature, the transparent goby moves closer to the bottom, and became vulnerable to the trawl net. By the end of this period, immediately after the reproduction, they die, and hence the whole life cycle of the species doesn't last more than one year. The recruitment of *A. minuta* can extend from the spring to the autumn, but with extremely varying intensity, sometimes concentrated in spring and in other years with summer-autumn peaks (5).

In Tuscany, the transparent goby fishery with the purse seine is relevant for about 50 boats with an average GRT of 6.5 tons and power of 68 kW.

Materials and methods

When a fish stock (in closed zones such as lakes or rivers) is intensely fished, in a relatively short period of time and with a noticeable decrease of its abundance, the classical depletion method of Leslie - De Lury (6) can be applied. This is a simple regression of CPUE (i.e. kg/day/boat) and the cumulative catch (kg): the intercept on the X axis represents the stock size at the beginning of the fishing period. This approach was also used in open sea, mainly for short living species such as cephalopods and the same *A. minuta* (7,8). Since in Tuscany the licenses are linked to the compilation of recording sheets by the fishermen, the daily catch for each boat of the fleet was recorded since 1989.

Results and discussion

The legal fishing season begins in November and concludes in April: operative boats can vary from 20 to 45 each month. The yearly fishing effort of the whole fleet is however fairly constant (around 1000 daily trips) but catch rates are highly variable (from a couple of kilograms up to half a ton/day/boat) and globally they can vary between 29 tons/year (in 1992-93 season) and 9 tons/year (in 1994-95).

The depletion model applied to the Tuscany area suggest for each year the presence of a fairly stable stock, between 40 and 60 tons. The higher CPUE (at the beginning of the fishing season) can range from around 40 kg/boat/day (Fig.1) down to 10-20 kg/boat/day (Fig.2), but such noticeable fluctuations in the catch time series have also been reported from other authors (7).

In order to link the annual steady standing stock with the variable catches, the structure of the Tuscany transparent goby stock was implemented into a dynamic model which simulates the population growth and exploitation through the year (5). When the recruitment is concentrated during the spring, in autumn most of the population has already gone beyond the vulnerable size for the purse seine and the commercial catches will be very low. Massive recruitment in the summer-autumn period is instead most profitable for the commercial fishing, whereas in the fishing season the gobies reach the size of 20-35 mm, for which the seine catches are elevated. Nevertheless the stock

size can be assessed every year around 50 tons, even if more precise estimates of the effort are needed (e.g. taking into account engine power, net size, boat efficiency, etc).

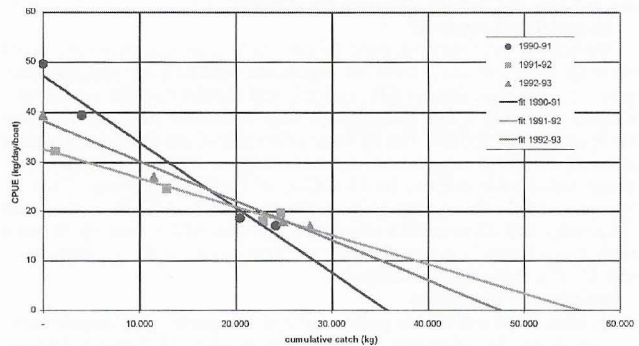


Fig. 1 - Depletion models from 1990 to 1993

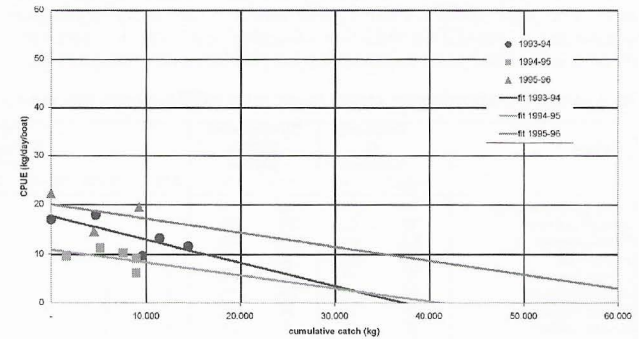


Fig. 2 - Depletion models from 1993 to 1996

In conclusion this single-gear and single-species fishing activity in Tuscany indicates that commercial yield is lower than half of the standing stock in the sea, and so a policy of licenses regulation to the actual number seems enough to assure the fishery sustainability.

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