COMPARISON OF TWO METHODS TO DETERMINE THE MATURITY PERIOD IN PENAEID SHRIMPS (DECAPODA, PENAEIDAE)

BY

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ABSTRACT

Most studies of the reproductive period of shrimps are based on the percentage of mature females (PMF). The objective of this work was to determine the reproductive period of penaeid shrimp by applying an egg production index (EPI), combining fecundity, size structure, and density of mature females. We also intended to make a comparison with the PMF method. The months of maximum maturity obtained with PMF did not match those of the actual maximum egg production period. This is because PMF does not take into account the abundance, but rather the proportion of mature females. It is concluded that, in order to define the period of maturity of penaeid shrimp, we need at least three indices (fecundity, size structure, and density of mature females) as proposed here, and as comprised in the EPI.

RESUMEN

La mayoría de los estudios sobre el periodo reproductivo de las especies de camarones peneidos están basados en el porcentaje de hembras maduras (PHM). El objetivo de este estudio fue determinar el periodo reproductivo de camarones peneidos mediante la aplicación de un índice de producción de huevos (IPH) que combina la fecundidad, estructura de tallas y la densidad de las hembras maduras. Así como la comparación con el PHM. Los meses de máxima madurez obtenida con el PHM no concuerdan con el periodo de máxima producción de huevos. Esto debido a que el PHM no toma en cuenta la abundancia de las hembras maduras sino solamente la proporción de estas. La conclusión es que para poder determinar el periodo de madurez de los camarones peneidos se necesita contar con un índice como al aquí propuesto de producción de huevos.

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INTRODUCTION

The core strategy in fishery management is to protect the reproductive period and reproductive areas of the species subject to exploitation. So, studies on reproduction of such species are critical for fishery managers. Also, reproduction studies have a general scientific interest because spawning is the basis of the renewal mechanism and stock conservation of any species.

In the Gulf of California, the shrimp fishery is the most important fishery from both economical and social standpoints (Magallón-Barajas, 1987). The target species in the central and northern part of the gulf are the brown shrimp, *Farfantepenaeus californiensis* (Holmes, 1900) and the blue shrimp, *Litopenaeus stylirostris* (Stimpson, 1874). As each species belongs to a separate group of penaeid (i.e., “white” or “brown”), this facilitates comparison among the penaeid shrimps (García, 1985). In many countries, both groups are present and support commercial fisheries.

For the framework of this study, it should be mentioned that the “white shrimp” group has a well-defined maturity period in the late spring through early summer, with a massive maturation peak from May to July in the northern Gulf of California (Mathews, 1981). In contrast, the “brown shrimp” group displays two patterns: continuous breeding throughout the year, or two peak periods of reproduction (Leal-Gaxiola et al., 2001). In Mexico, for both economic and environmental reasons, there have been studies dealing with the maturity period of these two species of penaeid shrimps based on the percentage of mature females as an index of reproductive behaviour (Edwards, 1978; Mathews, 1981; Leal-Gaxiola et al., 2001; López Martínez et al., 2005). This, however, should be considered a biased index of reproduction, which should be modified by an index that includes both abundance data and data on fecundity-at-size (García, 1985). Courtney & Masel (1997) proposed an egg production index, EPI, composed of fecundity-at-size data, and data on the proportions of mature females. They found that this new index is a more quantitative measure of egg production in a population at a particular sampling station or sampling time. If one wants to find the most important period for population renewal, studies of the reproductive biology of shrimp must take into account more than just the percentage of mature females. This may be considered a gonad index of the egg production for the whole population, among others. Aragón-Noriega (2005) used an EPI generated from size structure, fecundity-at-size, and abundance of mature females, in order to determine the maturity period of the blue shrimp, *Litopenaeus stylirostris*, in the central Gulf of California.

To date, the percentage of mature females is the most widely used method to determine a shrimp’s maturity period, and therefore, this study attempts to compare...