

# A Simple Robust Approach for Virtual Population Analysis Using Spreadsheets with an Application to the Red Snapper Fishery from the Campeche Bank

JULIO A. SÁNCHEZ-CHÁVEZ<sup>1</sup>

F. ARREGUÍN-SANCHEZ<sup>1</sup>

MARÍA E. GONZÁLEZ<sup>2</sup>

ANTONIO DÍAZ DE LEÓN<sup>3</sup>

<sup>1</sup>*Centro de Investigación y de Estudios Avanzados del IPN*

*A.P. 73-CORDEMEX, 97310*

*Mérida, Yucatán, México*

<sup>2</sup>*Centro Regional de Investigaciones Pesqueras de Yucalpetén, INP*

*A.P. 73*

*Progreso, Yucatán, México*

<sup>3</sup>*Renewable Resources Assessment Group*

*Imperial College*

*8 Princes Gardens*

*SW7 1NA, London, United Kingdom*

## ABSTRACT

Virtual Population Analysis (VPA) has been one of the most useful techniques for the study and comprehension of population dynamics of exploited resources. There are several versions developed for application to specific or generalized cases of study. In this contribution, a general but robust application approach is presented to solve VPA using spreadsheets. Two routines are defined for age-structured information: (1) using catch composition data, and (2) using catch composition and fishing effort data, assuming an exponential tendency for catchability with age/length. For length-structured information only the first routine has been implemented.

For both cases a bias minimization routine for selection of terminal values of fishing mortality (F) or exploitation rate (F/Z) was incorporated based on the sum of squared differences (SSQD) between real and estimated catch structures. For the first two cases a graphical presentation of SSQD versus F or F/Z is presented. For all cases, minimum values for SSQD were selected as the best terminal F or F/Z and this was also considered for fishing mortalities and population sizes.

As an example to demonstrate the application of this approach, data for the red snapper (*Lutjanus campechanus*) fishery from the Campeche Bank are analyzed.

**KEYWORDS:** fisheries, population dynamics, VPA.