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Octopus - red grouper interaction in the exploited ecosystem of the northern continental shelf of Yucatán, México

Francisco Arreguín Sánchez

Octopus (*Octopus maya*) and red grouper (*Epinephelus morio*) are the most important fisheries resources on the northern continental shelf of Yucatan, Mexico, with annual yields fluctuating between 9000 and 16[punctuation space]000 t. Octopus is an important component of the diet of red grouper, particularly when the abundance of octopus increases during summer and autumn in shallow waters. A previous mass-balanced model using the Ecopath program described the main flows of biomass in this ecosystem, with emphasis on the commercially important stocks. In this paper, a dynamic structured model of exploited ecosystems, Ecosim, is used to simulate changes in vulnerability of octopus to predation by the red grouper under three scenarios of fishing mortality (F): (1) F low and constant; (2) gradual increments in F reflecting historical development of the octopus fishery; and (3) high values of F representing the current state of the fishery. A fourth scenario is also presented, based on scenario 2, to observe biomass patterns of other groups. For all scenarios, when vulnerability of the octopus to predation was reduced, their biomass pattern was inverse to that when their vulnerability to predation increased. A similar behavior was found at high levels of vulnerability when octopus were submitted to high fishing effort. The impact of the combined effect of changes in vulnerability with fishing intensity suggests the presence of important compensatory mechanisms tending to maintain a thermodynamic stability, where growth efficiency and consumption play important roles. Even when fishing intensity appears to produce larger impact on the octopus biomass, vulnerability has an important role when it is reduced and when the stock is submitted to very high levels of exploitation. After simulations, the biomasses of octopus and red grouper exhibited a similar picture to historical catch trends, suggesting that Ecosim could provide useful guidance for fisheries managers.

Palabras clave: Ecopath, Ecosim, ecosystem, Trophic model, Vulnerability to predation

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