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Flows of biomass and structure in an exploited benthic ecosystem in the Gulf of California, Mexico

Francisco Arreguín Sánchez, Nicolás Enrique Arcos Huitrón & Ernesto Aarón Chávez Ortiz

We constructed a mass-balanced model of a benthic ecosystem exploited by shrimp trawlers in the Gulf of California, Mexico. The model is based on the software with Version 4a, which takes into account the contribution of functional groups to bycatch. The model represents the state of the ecosystem in 1978–79, and reflects the exploitation rate of shrimp at that time. We included 27 groups in the model: aquatic birds, marine mammals, shark/rays, 11 groups of teleost fish, five macrocrustaceans, two macromolluscs, polychaetes, meiobenthos, zooplankton, phytoplankton, detritus and dead fish. With respect to the bycatch, it was assumed that fish died on-board the trawlers while macroinvertebrates were returned to the sea alive. The macroinvertebrates would become more vulnerable to predation as a result of this practice but we assumed that this effect would be reflected in diets. The most important families of fish in the bycatch were Haemulidae, Serranidae, Paralichthyidae, accounting for 75% of the total fish catch. These families include important shrimp predators, suggesting that fish mortality in the bycatch could have a positive impact on the shrimp stock. Total system throughput was up 4000 t km⁻² year⁻¹; total consumption 52%; flows to respiration 40%; and flows to detritus 7%. The total system production was almost equal to its consumption as was net primary production to respiration. It is suggested that ecosystem efficiency was relatively low. Ecosystem overhead was 2.4 times the Ascendency, indicating that the shrimp-trawl ecosystem was in a develop stage, probably as a result of fishing. Because a decrease in biomass causes a loss of Ascendency, it is hypothesized that the previous state of the ecosystem (unexploited or with low exploitation rate) was more developed, and probably had a higher production.

Palabras clave: Tendencias espaciales, Specialist, Benthic ecosystem, Shrimp bycatch, Ecosystem structure

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