Population dynamics of the tropical oyster magallana bilineata (mollusca, bivalvia, ostreidae) in Mengkabong Bay, Tuaran, Malaysia

ABSTRACT

Knowledge about the population dynamics within a specific spatial area is vital for the effective planning and management of important fishery resources. Population parameters, including the asymptotic length (L∞), growth coefficient (K), mortalities (Z, F, and M), recruitment pattern, exploitation level (E), and yield per recruit (Y'/R), of the tropical oyster Magallana bilineata in Mengkabong Bay, Tuaran, Malaysia were analyzed by using the FiSAT software, using on the monthly shell length-frequency data collected from April 2019 to March 2020. A total of 435 oysters with shell lengths ranging from 3.64 to 11.16 cm were analyzed. Habitat water temperature, salinity, dissolved oxygen, hydrogen ion concentration (pH), and chlorophyll concentration were measured at 29.0–33.7 °C, 26.68–35.74 psμ, 3.18–6.99 mg/L, 6.57–8.29 and 1.51–98.93 μg/L, respectively. The logarithmic relationship between the length and weight of Log W = 1.9055 Log L + 0.1049 (R2 = 0.5431) with exponent b of 1.9055 for combined sexes showed a negative allometric growth (b < 3), indicating that the oysters in Mengkabong Bay are skinny. Several management measures have been proposed to promote high meat growth, including the use of genetically selected seeds, selection of new farming sites and adoption of grow-out methods that favour high meat growth. Asymptotic length (L∞) and growth coefficient (K) of the von Bertalanffy Growth Formula (VBGF) for M. bilineata were estimated at 12.13 cm and 1.00 yr^{-1}, respectively. The theoretical ages at length zero (t0) (0.0487) were estimated by substituting L∞ and K in Pauly's equation. The sizes attained by M. bilineata were 3.76, 5.04, 6.13, 7.05, 7.83, and 8.49 cm at the end of 2, 4, 6, 8, 10, and 12 months, respectively. The calculated growth performance index (φ) for M. bilineata in Mengkabong Bay was 2.168, while the estimated lifespan was 3 years. The recruitment pattern was observed year-round, with higher recruitment activities in September–October 2019 and January 2020. The total mortality (Z) was analyzed using the length-converted catch curve and estimated at 3.04 yr^{-1}, fishing mortality (F) at 0.63 yr^{-1}, and natural mortality (M) at 2.41 yr^{-1}. The lower exploitation rate (0.21) compared to the recommended 0.5 and Beverton and Holt's estimated maximum allowable limit of exploitation rate (Emax) of 0.587 indicated that the M. bilineata stock in Mengkabong Bay was under-exploited. Several recommendations that could aid in the development of M. bilineata in Mengkabong Bay include promoting local oysters through collaboration with leading hotels and restaurants,

developing food processing technology for downstream products, and establishing a sanitation programme that includes monitoring and enforcing sanitary conditions in the culture, harvest and processing sectors.