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Assessment and management of the Abalone (*Haliotis mariae*, Wood 1828) stock in the Omani waters

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By

Alawi Salim Ali Al-Hafidh
B.Sc. Marine Science, University of Qatar, Qatar. 1991
PGD in Aquaculture Planning and Management,
University of Hull, Hull, U.K. 1999
M.Sc. in Aquaculture Planning and Management
University of Hull, Hull, UK, 1999

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SUMMARY

This study investigates the status of Abalone fishery (*Haliotis mariae*) in the southern region of Oman. This fishery has been an important and valuable resource to both the population in this region as well as for the country. The fishery began around 1970 and produces annually between 29-56 t of fresh meat with the highest production during 2003 valued at 8.4 million US$, (but most of the landing during the last few years is below the minimum legal size of 90 mm shell length). This extraordinarily value has resulted in intensive fishing operations and the fishery today faces a serious decline in stock density and availability of large individuals.

This study aims to assess the reasons for the decline, and provide information on the status of the fishery to develop a management plan. The study was carried out over two years including monthly sampling from three selected permanent stations: Mirbat, Hadbin and Sharbithat, following by an intensive survey along the whole coastline. It covers aspects of the ecology and dynamics of this fishery and presents information on the abalone distribution, abundance, morphometry and size composition structures, habitat, competitors, predators, commercial production and marketing, biochemical composition, environment parameters, preservation, genetics, biology including growth, reproduction, spawning season, sex distribution, maturity stages and size at first maturity.

The fishery is restricted to the southern coastline, which is strongly influenced by the monsoon winds, which result in major changes in the environmental conditions and the upwelling of deep-cold nutrient-rich water. This could regulate the limited distribution of this fishery between Ras Mirbat and Suqrah. They occurred at more exposed shores at depths up to 20 m, but most of the populations are found between 5-10 m. Abalone habitats were mostly destroyed and showed signs of degradation in algal cover. Sea urchin is the main competitor present at 25 times the number of abalone. Sea star also abundant and shows sign of predation on abalone. Abalone population density was 0.07 individuals/m^2, which is inadequate to support a good reproductive level and maintain a sustainable fishery. The remaining stock was calculated at 707000 pieces (54.5 t of flesh wet weight).

This fishery is regulated through a fishing season for two months a year combined with a MLS of 90 mm SL, but 50% of the divers catch is below this limit. Most of remain populations are of small and medium sizes. In addition, females are larger than males resulting in fishing selectivity; therefore, fewer females remain in the population, which has an impact on reproduction and recruitment.

The species sexually matured at sizes over 60 mm SL. Spawning occurs from November to March/April at all the three sites. Growth is faster in the first year and decrease with age. Fishing mortality is high and egg production very low. Populations of *Haliotis mariae* found in all the three study areas of Oman were genetically linked.

The *H. mariae* stock is considered seriously compromised and the remaining population seems unsustainable under current fishing pressure combined by environment destruction and other biological failures. Reduction of exploitation rate by 50%, increasing the size at capture, relocating the fishing season, adequate monitoring, controlling and surveillance with strong enforcement of existing legislation are necessary to conserve and protect the fishery. The resource user groups need to be involved in management process of this fishery and education programms and awareness campaign should be introduced to highlight the need for divers to change attitudes and practices to make the fishery more sustainable. Research and further studies on more aspects of this fishery are recommended.