

## **MONITORING OF CORAL REEFS IN THE COASTAL WATERS IN NINH HAI – NINH THUAN IN 2013**

Monitoring of coral reefs is one of the important activities that have been annually conducted since 2011 within the framework of the UNEP/GEF project entitled “*Demonstration of Sustainable Management of Coral Reef Resources in the Coastal Waters of Ninh Hai District, Ninh Thuan Province, Viet Nam*”. In June 2013, the monitoring activity was carried out at 9 permanent monitoring sites using line transect methods, in which 3 sites (Dam Dang, Mui Thi and My Hoa) are located in the unprotected area, 3 sites (Bai Nho, Hang Rai and Mui Do) in the protected area and 3 sites (Lach Nuoc Ngot, Bai Thit and Hon Chong) in the restoration area established previously. Indicators used for monitoring in 2013 are similar to that used previously following Reefcheck (Hodgson and Waddell, 1998) and Global Network of Coral Reef Monitoring (English *et al.*, 1997) with some additional local indicators. Some of major results are highlighted as followings:

- Mean cover of hard corals was generally stable between 2005-2013; however this value was significantly increased between 2011-2013 in the unprotected area (increase of 2.0%), protected area (increase of 8.1%) and restoration area (increase of 23.1%). Covers of macro-algae, recent killed corals and coral rubbles were temporally stable or declined in the two periods mentioned above. The significant increase of cover of hard corals were recorded at the sites located in the protected and restoration areas including Bai Thit (increase of 39.7%), Bai Nho (increase of 31.9%), Hon Chong (increase of 19.1%) whereas the sites located in the non-protected area showed a stable or a slight temporally increase. This indicates that condition of habitats of coral

reefs in the coastal waters of Ninh Hai – Ninh Thuan have been temporally recovered, especially in the period of 2011-2013 since the UNEP/GEF project has been mainly implemented.

- Temporal fluctuation of density of reef fish communities was not so clear with an increase of mean total density was found in the unprotected area (about 2.1 times) whereas a slight decline recorded in the protected area (1.3 times) between 2005-2013, however this value was gradually declined in the 3 areas in the period of 2011-2013 (decrease of 1.6 times). The increase of total density was mainly recorded for the families of parrotfishes (Scaridae) and rabbitfishes (Siganidae) belonging to group of target fishes. Sites supported a significant increase of fish density were My Hoa ( 4.0 times), Hang Rai (2.2 times) and Mui Thi (1.5 times). This shows that the recovery of fish resources has been slowly taken although several management activities have been conducted before and after the UNEP/GEF project implemented, even in the protected and restoration areas.

- Most of indicators of macro-invertebrates belonging to molluscs, crustaceans and echinoderms were recorded a very low densities ( $< 1.0$  inds./100m<sup>2</sup>) and showed no temporal changes between 2005-2013 with an exception of increase of density of sea urchins (*Diadema* spp) being found in the unprotected area (5.7 times) in the same period. This indicates that resources of macro-invertebrates have not been recovered, even in the restoration area (Hon Chong, Bai Thit and Lach Nuoc Ngot) that have been fully protected with combination of restoration of hard corals and some associated resources (giant clams, snail, sea cucumbers) since 2012 under support of the UNEP/GEF project.

- The density of major indicators showing impacts to coral reefs (crown of thorn starfish (COTS), dynamite fishing, anchors, fishing net and other trash) was recorded at very low density and had no temporal change between years of monitoring. This notes that potential of these impacts to the coral reefs in Ninh Hai coastal waters are low and management activities conducted during the last some years have been gradually generated. Although, the density of COTS was found at very low value at all monitoring sites, however the presence of this predator species recorded in a large area of coral reefs in the coastal waters of Ninh Hai – Ninh Thuan in 2013 should be fully considered in management strategies in the future.