

REVIEW ON MARINE BIODIVERSITY IN THE COASTAL WATERS OF NINH HAI - NINH THUAN

The report made are based on reviewing of available data and information from several previous studies relating to marine biodiversity conducted in the coastal waters of Ninh Hai. Major projects conducted at the area are followings: Zoning for sustainable use of marine resources in Vinh Hai waters, Ninh Thuan Province conducted by Institute of Oceanography in 2001 – 2002 (Vo Si Tuan and Nguyen Van Long, 2003); Rapid ecological assessment of marine biodiversity conducted by WWF in 2003 (DeVantier, 2004); Additional surveys and recommendations for sustainable use of coral reefs in coastal waters of Ninh Thuan Province implemented by Institute of Oceanography in 2003 – 2004 (Vo Si Tuan, 2004); The application of remote sensing for coral reefs mapping in coastal waters of Ninh Thuan Province implemented by Institute of Oceanography in 2004 – 2005 (Tong Phuoc Hoang Son, 2005); Monitoring of coral reefs in coastal waters of Ninh Hai District, Ninh Thuan Province by Institute of Oceanography in 2006 – 2010 (Nguyen Van Long *et al.*, 2011).

A large expanse of sub-tidal reef extends well offshore from the vicinity of My Hoa - Thai An - Hang Rai, ranging between eight to 15m in depth. Further north, levels of reef development declined, becoming narrow fringes along the coast (e.g. Hon Tai and Binh Tien area) and small patch reefs (e.g. Bai Nho). Here, with the notable exception of Bai Lon, the coral communities were separated by intervening sandy or rocky areas devoid of corals or with low coral cover. The proposed area with coral reefs involved of Vinh Hai - Nhon Hai Communes, Ninh Hai district, Ninh Thuan Province offering great opportunities for ecologically sustainable use was roughly estimated 1,070 ha.

Some total of 188 species (86 genera and 32 families) of reef-associated macroalgae, 5 species (2 families) of seagrasses, 295 species (60 genera and 16 families) of reef-building scleractinian corals, 102 species (65 genera and 34 families) of reef-associated molluscs, 22 species of 10 genera of polychaetes, 24 species (19 genera and 13 families) of crustaceans, 13 species (8 genera and 8 families, included Asteroidea, Ophiuroidea, Echinoidea and Holothuroidea) of echinoderms and 244 species of reef-associated fishes (102 genera and 39 families) were found in the waters of Ninh Hai district. Sites supported richest species of corals are Bai Nho, Bai Hom and Hang Rai (> 100 coral species). There were 3 species of turtles including *Chelonia mydas*, *Eretmochelys imbricata* and *Caretta caretta*.

The results from manta tow surveys conducted in 2002 show that there were 16.7 % reef in good condition, 41.7 % reefs in fair condition and 41.6 % reefs in poor condition. Cover of living corals at 10 study reefs conducted in 2010 ranged between 16.3 - 55.9 %, giving mean value of 36.9 ± 13.5 %. Solf coral cover was recorded at very low value, with highest mean value being 1.3 % on the shallow transect at Hang Rai.

Fish at size range < 10 cm in length were the most abundant, making up 95 % of all fish counted on the reefs. The total number of fish recorded in 2002 at 10 sites ranged from 361 (Hang Rai) to 1,984 individuals/500m² (Dam Dang), giving mean value of 740.3 ± 618.2 individuals/500m². Fish at the majority of the transects were dominant by pomacentrids and labrids. In general, the reefs in the northern part of the area were more diverse and abundant in both species and density of coral reef fish compared to other sites (Mui Thi, My Hoa), and fish at size range 11 - 20 cm and 21 - 30 cm long were also occurred in this part. Some species such as *Siganus spinus*, *Chromis viridis*, *Pomacentrus chrysurus* and *Acanthurus nigrofuscus* schooled in group with 50 - 100 individuals per species.

Resources of macro-invertebrates were also recorded at extreme low densities. Mean density of reef-associated molluscs ranged from 5 (Dam Dang) to 21 individuals/400m² (Thai An), averaged at 11 ± 5.9 individuals/400m². Some indicators following Reefcheck method, including *Tridacna*, *Trochus* and triton shell (*Charonia*) were recorded at very low number, of which giant clam (*Tridacna crocea*) was the main contributor to the density of this group. However, the density of this species was no more than 3 individuals/400m² at all reefs. Although *Tridacna squamosa*, *T. maxima*, *Trochus niloticus* and *T. maculatus* were recorded on the reefs but it was very hard to find them on the transects. Lobsters (*Panulirus* spp.) were not recorded at all reefs while banded coral shrimp (*Stenopus hispidus*) was only recorded at Dam Dang with density being 5.0 individuals/400m². Density of echinoderms following Reefcheck method ranged from 0.0 to 32 individuals/400m², giving mean value of 7.3 ± 12.6 individuals/400m². Crown-of-thorn seastar (*Acanthaster planci*) was not found at the study reefs and density of sea urchin (*Diadema* spp.) were recorded at low number on the reefs with an exception at Dam Dang (8 individuals/400m²). Edible sea cucumbers (Holothuria) were absent at all reefs while inedible species were found in few number. This indicates that commercial invertebrates on coral reefs in the area are over-exploited.

Overfishing, destructive harvestation (dynamite fishing, poisoning), construction and dredging are considered as major present impacts to coral reefs in this area. Predation of crown-of-thorns seastars, pollution from the mainland and shrimp farming may cause serious problems to coral reefs and the marine environment. Poverty situation and serious decline of marine products in the shallow waters, low investment from different sectors, lack of training and equipped management unit, low knowledge and awareness of local communities on environment protection and conservation are the biggest challenges and threats to managing the nature resources of the area.