

Innovation and Application of Remediation Techniques on Coastal Habitat and Resources in Typical Temperate Bays of Shandong Peninsula

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Abstract: Coastal habitat and bio-resource have severely threatened by frequent human activity and global environment changing. Effective protection and remediation is essential to cope with the worsening ecological degradation situation. Systematic bio-remediation techniques were innovated and applied in three typical bays: Laizhou Bay, Rongcheng Bay and Haizhou Bay, Shandong Peninsula, North China.

The fishery resource status and ecosystem health status were first assessed and key problems of the three bays were raised out. As for habitat remediation, a series of seeding and transplanting technique of Eelgrass, *Zostera marina* were innovated and Eelgrass area expanded by 30%, biomass increased by 70% in Swan Lake, Rongcheng, China. The bio-remediation potential of seaweed *Laminaria japonica* and *Gracilaria lemaneiformis* and sea cucumber *Apostichopus japonicus* were evaluated. The seaweed-bivalve-sea cucumber integrated remediation potential was also assessed considering yield, feeding ability and C, N, P content. Several new types of artificial reefs were designed and deployed for habitat remediation. Concrete reef is used for fish attraction, sea cucumber and seaweed bottom culture; oyster/scallop shell reef, cluster stone reef and wreck boat reef is for sea cucumber culture and fish attraction. Key species of five function groups (seaweed, bivalve, sea cucumber, fish, crustacean) were screened out for stock enhancement in three bays. Bio-tagging techniques for sea cucumber *A. japonicus*, *Octopus S. esculenta*, rockfish *S. schlegeli* and flounder *P. olivaceus* were innovated. Contactless monitoring techniques including Biotelemetry (VPS), stereo-vision measuring system and video-based sea cucumber wet weight measuring technique were used in field investigation of stock enhancement effect. The overall remediation effect on three bays were assessed on two aspects: water quality was improved especially indicated by nutrients; bio-resource was improved indicated by elevated biodiversity, biomass and species number.

Key words: Remediation, Habitat, Resource, Bay, Shandong Peninsula