

Connectivity of sea cucumber populations on Indonesian coral reefs

Neuhaus Anouk¹, Marc Kochzius² and Janne Timm³

¹ Marine Biology Research Group, Ghent University, Krijgslaan 281/S8, 9000 Ghent, Belgium
E-mail: anouk.neuhaus@ugent.be

² Marine Biology, Vrije Universiteit Brussel (VUB), Pleinlaan, 2, 1050 Brussels, Belgium
E-mail: marc.kochzius@vub.ac.be

³ Biotechnology and Molecular Genetics, University of Bremen, Leobener Straße 1, D-28359 Bremen, Germany
E-mail: jatimm@uni-bremen.de

Increasing industrialisation causes anthropogenic climate change, sedimentation and other changes of environmental conditions influencing coastal marine habitats (Wild *et al.*, 2011). Combined with overexploitation this may lead to depletion of populations and eventually local extinctions. This influences the resilience of the whole ecosystem against disturbances.

The recovery of an ecosystem from disturbance is enhanced by high genetic diversity, which gives species the potential to adapt to changing environmental conditions (Hughes *et al.*, 2003; Ehlers *et al.*, 2008). Exchange between populations is necessary to maintain genetic diversity. Therefore, this project aims at studying the genetic connectivity of populations. Specifically, genetic diversities, population structures and dynamics of a minimum of 20 specimens of different sea cucumbers will be investigated at different sites in Indonesia, including the Spermonde Archipelago (South West Sulawesi). Around 20 different species of holothurians are fished and the most valuable ones have been heavily exploited, leading to a serious depletion of stocks (Kinch *et al.*, 2008). Because of their limited mobility and slow mode of reproduction, as well as low recruitment rates, they are easily targeted and overexploited (Uthicke & Benzie 2000, Uthicke *et al.*, 2004), making it necessary to get background data for a sustainable management of these little investigated but ecologically and economically important marine animals.

We will apply the mitochondrial cytochrome oxidase I (COI) sequence, which is applicable to many holothurian species (Uthicke *et al.*, 2010), and/ or nuclear microsatellites to investigate the genetic population structure of sea cucumbers. Since overexploitation might lead to very low abundances and local extinctions, the choice of the model species depends on the results of initial surveys. So far, *Holothuria nobilis* and *Stichopus chloronotus* are the most promising candidates.

Knowledge on the genetic diversity and connectivity to other conspecific populations allows assessing the state of the studied ecosystems and estimating the resilience of disturbed and/ or exploited populations. Management and conservation strategies such as the design and management of MPA networks could be improved on the basis of this information.

This thesis project takes place in the framework of the marine and coastal research program SPICE (Science for the Protection of Indonesian Coastal Marine Ecosystems), a cooperative project coordinated by the Leibniz Center for Tropical Marine Ecology (Bremen).

References

- Ehlers A., B. Worm and T.B.H. Reusch. 2008. Importance of genetic diversity in eelgrass *Zostera marina* for its resilience to global warming. *Marine Ecology-Progress Series* 355:1-7.
- Hughes T.P., A. Baird, D.R. Bellwood, M. Card, S. Connolly, C. Folke, R. Grosberg, O. Hoegh-Guldberg, J. Jackson and J. Kleypas. 2003. Climate change, human impacts, and the resilience of coral reefs. *Science* 301:929.
- Kinch J., S. Purcell, S. Uthicke and K. Friedman. 2008. Population status, fisheries and trade of sea cucumbers in the Western Central Pacific. p.7-55. *In*: Toral-Granda V., A. Lovatelli & M. Vasconcellos (Eds) *Sea cucumbers. a global review of fisheries and trade, fisheries and aquaculture*. Technical Paper 516, FAO, Rome.
- Uthicke S. and J.A.H. Benzie. 2000. Allozyme electrophoresis indicates high gene flow between populations of *Holothuria (Microthele) nobilis* (Holothuroidea : Aspidochirotrida) on the Great Barrier Reef. *Marine Biology* 137:819-825.

Uthicke S, D. Welch and J.A.H. Benzie. 2004. Slow growth and lack of recovery in overfished holothurians on the Great Barrier Reef: Evidence from DNA fingerprints and repeated large scale surveys. *Conservation Biology* 18:1395-1404.

Uthicke S., M. Byrne and C. Conand. 2010. Genetic barcoding of commercial Beche-de-mer species (Echinodermata: Holothuroidea). *Molecular Ecology Resources* 10:634-646.

Wild C., O. Hoegh-Guldberg, M.S. Naumann, M.F. Colombo-Pallotta, M. Ateweberhan, W.K. Fitt, R. Iglesias-Prieto, C. Palmer, J.C. Bythell, J.C. Ortiz, Y. Loya and R. van Woesik. 2011. Climate change impedes scleractinian corals as primary reef ecosystem engineers. *Marine and Freshwater Research* 62:205-215.