

Reef health influences self-recruitment in a meta-population of Skunk Clownfish (*Amphiprion akallopisos*) in the Indian Ocean connected through larval dispersal

Huyghe Filip and Kochzius Marc

Marine Biology - Ecology and Biodiversity - Vrije Universiteit Brussel, Pleinlaan 2, 1050 Brussel
E-mail: filip.huyghe@vub.be

Knowledge of ecological connectivity, i.e. self-recruitment (SR) and larval dispersal among reefs, is critical for MPA design. Empirical estimates have demonstrated a striking variety in levels of SR worldwide, as well as temporal and seasonal variety. As drivers for this variety larval behaviour, the influence of reef health on larval sensory capacity to localise reef habitat, oceanographic patterns, and the stochastic nature of larval survival have been suggested. We study the influence of reef health on SR and larval dispersal among populations of Skunk Clownfish (*Amphiprion akallopisos*) around the Island of Unguja, Tanzania, as well as inter-annual and inter-seasonal variety in function of a seasonal change in wind direction and consequently sea surface current in the Zanzibar Channel.

Furthermore, we describe the dispersal kernel, measure the mean dispersal distance of larvae, and assess meta-population resilience and adult replacement time. Tissue samples of 3,225 individuals, 1,777 adults and 1,448 juveniles, was collected on 14 reefs during two years and genotyped for parentage analysis using 13 microsatellite markers. Overall SR was 21.7 %, and was highest in the healthiest reef (34.5 %) but similar in the remaining reefs. The three healthiest reefs contributed the most to the larval pool. In total, 91.2 % of the juveniles were assigned to parents within the dataset. All reefs around Unguja seemed to be well connected through larval dispersal. We did not detect any inter-annual variation or influence of changing oceanographic conditions on SR or larval dispersal. Mean dispersal distance per larva was 15.63 km. Replacement time for the meta-population around Unguja was 1.35 years per adult, but was much higher for each individual reef when only SR was taken into account.

We conclude that reef health increases SR but only when the reef is almost in pristine state. The meta-population of Skunk Clownfish around Unguja is largely self-recruiting and self-persistent. Individual reefs, however, rely on larval dispersal from other reefs for population persistence. We therefore recommend the protection of a second reef (Bawe) as a MPA in addition to the current MPA (Chumbe reef) to improve resilience of the meta-population.

Keywords: larval dispersal; connectivity; self-recruitment; Western Indian Ocean; Marine Protected Area