

Genetic diversity and connectivity of the reef-building coral *Seriatopora hystrix* along the East coast of Africa

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Following the global trend, coral reefs in East Africa are declining rapidly due to the effect of direct and indirect anthropogenic stressors, such as pollution, destructive fishing practices, ocean acidification, and climate change. These ecosystems are of critical importance for the more than 39 million people living at the coasts of Kenya, Tanzania, and Mozambique. Coral reefs are the most biodiverse marine ecosystems worldwide providing several goods and services to human populations that include coastal stability, food, tourism and recreation, and cultural heritage. Therefore, conservation action that effectively protects these ecosystems is urgently needed.

This study aims to provide insightful information about the genetic diversity and population structure of the reef-building coral *Seriatopora hystrix* along the East African coast in relation with its particular life history traits. Herein, we utilise nine polymorphic microsatellite loci to assess the genetic variation in ten populations of *S. hystrix* (Fig. 1A). Analyses of genetic diversity distribution support the relation between biogeographical patterns of coral species distribution and genetic diversity of *S. hystrix*. Moreover, populations of *S. hystrix* were well structured ($F_{ST} = 0.23$; $R_{ST} = 0.41$) and strong differentiations were found over shorter distances, with no isolation-by-distance.

Inbreeding associated with sexual reproduction rather than selfing seemed to explain better the deficits of heterozygotes found in some populations. Two genetic breaks were identified around latitude 4° S and 14° S, which corresponded with the most extreme populations and also coincide with dispersal barriers imposed by the oceanic currents (Fig. 1B). This study did not detect traces of recent bottleneck events, or admixture. Additionally, estimates of contemporary migration support that long distance gene flow can occur, yet still the long life span of scleractinian corals might blur the differences between contemporary and ancestral events. In conclusion, this study found that *S. hystrix* in East Africa exhibits characteristics of a metapopulation where migration takes place mostly from south to north throughout the East African Coastal Current (EACC, Fig. 1C). Therefore, combined efforts for environmental conservation and building capacity of locals should be reinforced in the Northern Mozambique Channel, which might act as seeding source for northern reefs enhancing the resilience of coral reefs after catastrophic events.

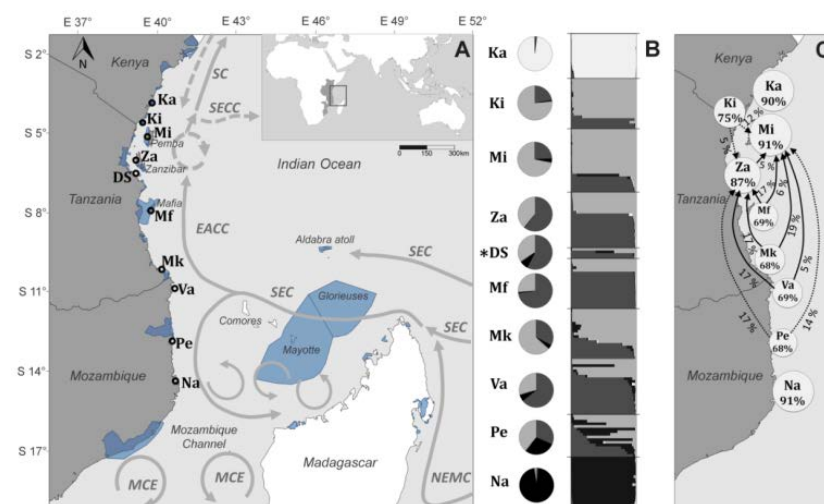


Fig. 1. A. Map of the East African coast with sample sites of *Seriatopora hystrix*. The principal ocean currents in this area are depicted with grey arrows: Northeast Madagascar Current (NEMC), South Equatorial Current (SEC), East African Coastal Current (EACC), Somali Current (SC), South Equatorial Countercurrent (SECC), and Mozambique Channel Eddies (MCE); dotted arrows represent seasonal currents during the Northeast monsoon (Esenkov & Olson, 2002; Schouten et al., 2003; and Mahongo & Shanghude, 2014). Blue shaded areas represent marine protected areas (<http://www.mpatlas.org/>).

Fig. 1. B. Pie charts show the distribution of the four genetic clusters ($K = 4$) at each sampled site as suggested in the Bayesian clustering implemented in the software STRUCTURE. The histogram displays the individual's estimated membership fraction in each of the clusters (each bar represents an individual). * Given the small sample size, DS was only used in the STRUCTURE analysis.

Fig. 1. C. Migration rates estimated with BAYESASS. Black arrows represent the direction of the contemporary migration event. The non-migration rates are indicated inside the circles and migration rates besides the directional black arrow. Inconsistent migration rates are indicated with dotted arrows.

References

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