A regional and multidisciplinary approach to study and protect an endangered species: the loggerhead sea turtle (Caretta caretta)

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Migratory species travel thousands of kilometers regardless of national boundaries. Loggerhead sea turtle (Caretta caretta) has long been an iconic example of these impressive animal migrations. Yet, little is known about its spatial ecology in the Indian Ocean that hosts some of the world's largest and most endangered populations (Oman, South Africa and Mozambique). Here, we combined distinctive approaches to investigate the life cycle of the loggerhead's populations of the western Indian Ocean. As a first, a regional genetic study based on a long sequence (800bp) of the mtDNA control region was conducted. Results demonstrated that a majority (94%) of juveniles accidentally caught off Reunion Island shared haplotypes mainly from populations of the North-West Indian Ocean. Secondly, stable isotopes analyses showed that these juveniles exhibit an oceanic strategy and forage at southern latitudes, possibly along the southern subtropical convergence zone. As a third step, satellite tags were deployed in the South-West Indian Ocean on 40 juveniles. A large number of individuals (75%) migrated towards rookeries of the northern hemisphere. As a final stage, active dispersal simulations over 12 years were run to predict the spatial faith of hatchlings from the main rookeries of the Western Indian Ocean. Results showed a trans-equatorial connectivity across oceanic regions and a potential importance of persistent oceanic gyres as oceanic habitats. Results from all approaches converged towards the existence of a trans-equatorial cycle occurring at ocean basin scale for the species in the Indian Ocean. Spatial congruency therefore occurs between the western population that share common foraging areas along the southern subtropical convergence zone at some stages of their life history. Such conclusions have a strong impact on the scope of management measures required for the protection of the species. International initiatives such as the IOSEA Marine Turtle Memorandum of Understanding should be encouraged.