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Sporadic nesting reveals long distance colonisation in the philopatric loggerhead sea turtle (*Caretta caretta*)

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Carlos Carreras[1,2], Marta Pascual[1], Jesús Tomás[3], Adolfo Marco[4], Sandra Hochsheid[5], Juan José Castillo[6], Patricia Gozalbes[3], Mariluz Parga[7,8], Susanna Piovano[9,10] & Luis Cardona[11]

The colonisation of new suitable habitats is crucial for species survival at evolutionary scale under changing environmental conditions. However, colonisation potential may be limited by philopatry that facilitates exploiting successful habitats across generations. We examine the mechanisms of long distance dispersal of the philopatric loggerhead sea turtle (*Caretta caretta*) by analysing 40 sporadic nesting events in the western Mediterranean. The analysis of a fragment of the mitochondrial DNA and 7 microsatellites of 121 samples from 18 of these nesting events revealed that these nests were colonising events associated with juveniles from distant populations feeding in nearby foraging grounds. Considering the temperature-dependent sex determination of the species, we simulated the effect of the incubation temperature and propagule pressure on a potential colonisation scenario. Our results indicated that colonisation will succeed if warm temperature conditions, already existing in some of the beaches in the area, extend to the whole western Mediterranean. We hypothesize that the sporadic nesting events in developmental foraging grounds may be a mechanism to overcome philopatry limitations thus increasing the dispersal capabilities of the species and the adaptability to changing environments. Sporadic nesting in the western Mediterranean can be viewed as potential new populations in a scenario of rising temperatures.

Philopatry, or natal homing, has been defined as the return of the individuals to the natal location, usually to reproduce[1,2] and thus exploit areas successfully used in past generations[3]. This strategy would proliferate in a species due to the 'multiplier effect', in which individuals with the 'philopatric' genotype increase in numbers in very successful reproductive areas in comparison to other behavioural genotypes[4]. Many advantages have been proposed as evolutionary drivers for this behaviour, including a higher probability of finding multiple mates for reproduction[5], the use of optimal areas for raising the offspring[3], an increase of the local adaptability[6], or greater global genetic diversity[7]. However in some situations this strategy has also limitations that would favour an opposed 'dispersal' strategy, in which the individuals search for new areas[8]. Philopatry would limit the recovery of areas on the verge of extinction, increase kin competition[9], favour habitat-dependent mortality[10], or prevent the dispersal of the species[8].

[1]Department of Genetics, Microbiology and Statistics and IRBio, University of Barcelona, Av.Diagonal 643, E-08028, Barcelona, Spain. [2]Centre for Ecology and Conservation, University of Exeter, Cornwall Campus, Penryn, TR10 9EZ, UK. [3]Cavanilles Institute of Biodiversity and Evolutionary Biology, University of Valencia, Apdo. 22085, E-46071, Valencia, Spain. [4]Estación Biológica de Doñana, CSIC, c/ Américo Vespucio s/n, E-41092, Sevilla, Spain. [5]Marine Turtle Research Centre, Department RIMAR, Stazione Zoologica Anton Dohrn, Via Nuova Macello, 80055, Portici, Italy. [6]CREMA (Centro de Recuperación de Especies Marinas Amenazadas), Aula del Mar de Málaga-Consejería de Medio Ambiente de la Junta de Andalucía, c/Pacífico 80, E-29004, Málaga, Spain. [7]Submon Marine Conservation, Rabassa 49, E-08024, Barcelona, Spain. [8]Marine Animal Rescue Center (CRAM), Passeig de la Platja 28-30, E-08820, El Prat de Llobregat, Spain. [9]Dipartimento di Biologia Animale e dell'Uomo, University of Torino, Via Accademia Albertina 13, 10123, Turin, Italy. [10]School of Marine Studies, The University of the South Pacific, Laucala Campus, Prive Mail Bag, Suva, Fiji. [11]Department of Evolutionary Biology, Ecology and Environmental Sciences and IRBIo, University of Barcelona, Avda. Diagonal 643, E-08028, Barcelona, Spain. Correspondence and requests for materials should be addressed to C.C. (email: carreras@ub.edu)