



Climatological effects on the breeding of terns

G.D. Quartly (1), S. Jaquemet (2), M. Le Corre (2), D. Monticelli (3,4) and J. Ramos (5)

(1) National Oceanography Centre, Southampton, UK (2) Université de la Réunion, France (3) Royal Belgian Institute of Natural Sciences, Belgium (4) Gembloux Agrochemical University, Belgium (5) University of Coimbra, Portugal (gdq@noc.soton.ac.uk / Fax: +44-23-8059-6400 / Phone: +44-23-8059-6412)

Long-term datasets of sea surface temperature and ocean colour allow us to investigate the parameters affecting the behaviour of sea birds. In particular, life history theory suggests that avian breeding should be timed to coincide with the expected availability of food. The effect of seasonal and interannual changes in environment is examined through long breeding records of sooty and roseate terns in the southern Indian Ocean, and comparison with satellite records of sea surface temperature and chlorophyll concentration (a proxy for the availability of prey). To achieve adequate spatial and temporal coverage given intermittent cloud cover, we composited SeaWiFS chlorophyll concentration data into fifth-of-a-month periods (5 or 6 days). Further temporal smoothing or averaging is required, because there are also short-term mesoscale processes that temporarily affect the local chlorophyll concentration, for example the train of anticyclonic eddies moving southward through the Mozambique Channel. The SeaWiFS satellite was used as it provides consistent data for the 8-year period of the field campaigns. Unfortunately quantitative data on higher trophic levels, whether zooplankton or small fishes are scarce and tend to be sensitive to other factors. All the colonies studied were on small islands with no permanent human inhabitants, but were rather visited on a regular basis. The colonies of sooty tern (*Sterna fuscata*) were on four islands, ranging in latitude from 4°S (Bird Island in the Seychelles) to 22°S (Europa in the Mozambique Channel), with both locations having birds laying during the winter, whilst those at Juan de Nova (17°S) laid in the summer. This was ascribed as due to differences in the seasonal availability of prey (small fishes) in re-

sponse to changes in primary productivity (phytoplankton). Finally for sooty terns on Lys in the Glorioso Islands, breeding was more often than annual, as there was no strong seasonal cycle in food to control the timing of egg-laying. However, breeding still remained colonial, i.e. all the birds in the colony bred at the same time, rather than throughout the year; this demonstrates that there are significant advantages, probably related to communication and collective fishing. Interannual variations were studied for the winter-laying roseate terns (*Sterna dougallii*) on Aride in the Seychelles. Years with greater primary productivity (satellite-derived chlorophyll records) were generally noted to tie in with a greater number of eggs being laid and hatched per breeding pair. The data of first-laying (determined from hatching dates) varied by more than a month between years, but such delays tended to match changes in the time of occurrence of the peak in chlorophyll. As laying pre-dated this peak, it indicates that birds were responding to some other environmental cue. In terms of large-scale environmental indices, no significant correlation was found with the Indian Ocean Dipole, but ENSO was seen to have an effect, with greater breeding failure during La Niña years. These observations suggest that not only do seabirds optimise their breeding according to predictors of oceanic productivity, but also that historical records of avian reproduction may contain insight into the oceanic productivity of a century or more ago