Is sex-specific longevity evident in Scopoli's Shearwater *Calonectris diomedea?*

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Breeding colonies of Scopoli's Shearwater *Calonectris diomedea* are on remote, typically uninhabited islets which often are of limestone or volcanic morphology. Nests can be under dense shrub, between roots of juniper, in rabbit holes on flat ground, in crevices on slopes, or in slots of cliffs. Depending on what the island surface offers, nests can be spaced just a few metres or more than a hundred metres apart. Irrespective of the size of an entrance to a spacious cave, be its ceiling just of a foot or of a man's height, several nests may be in corners close to the cave entrance or many metres deep inside the rock. It is therefore the skill of the investigator with his tools to reach a high degree of retrap-completeness when doing a population study in a given plot for determining survival rates.

Jenouvrier *et al.* (2009) modeled survival rate at six colonies of Scopoli's Shearwater spread across 4600 km during nine consecutive years. As one of the minor results in this intensive study, mean adult survival rates differed between sexes for birds breeding in Crete whereas such a difference was not detected at the other study colonies. An explanation as to why females in Crete seem to live longer was not given because this topic was not the main theme of the publication, and this short note aims to address this. Field work at that colony off Crete had been terminated by the Cretan co-author in 2001. However, in 2009 this islet was revisited by a team of the Hellenic Ornithological Society (HOS) for another marine project. Among the 154 adult shearwaters checked within the former study plot there were 70 males and 84 females, and about half of each cohort (35 and 41 individuals respectively) wore rings from the previous field activities. Among the 13 birds who had been ringed there at least 20 years ago, there were only three males as compared to ten females. Furthermore, in this species prospectors or first-time breeders show up in the breeding colony at five years of age or even later. Hence, to obtain a guild of birds which are 20 years of age or older, it is reasonable to include all individuals which had been ringed as adults at least 15 years ago. For this guild then, there were four males compared to 22 females. This ratio in favour of females confirms the former result from Crete that mean adult survival is

greater for females. Of course, it is likely that this sex dependent difference is also present at the other colonies and that rather an artifact had been involved during sampling at the various sites. This aspect needs to be looked at in a discussion to avoid biasing by inadequate field methods. The six field workers for the data in Jenouvrier *et al.* (2009) had not intended their comparison when starting their field work, so that their capture-recapture methods differed among populations, disturbance levels differed, and their modeling efforts did not address biases which might be introduced by nest quality in relation to nest site tenacity, i.e. to progressing experience of individuals in this long-lived seabird. To incorporate the sexual survival difference into the population dynamics and achieve equilibrium of the two genders amongst the breeders, three factors seem to be involved: (a) There is a higher frequency and greater dispersal of female prospectors (Ristow 1999); (b) Males are recruited at a younger age into the breeding population than females (Ristow 1999); (c) More males than females fledge. The suggestion of an equal sex ratio among nestlings (Genovart *et al.* 2005) is unlikely to meet details. Experienced pairs return earlier, acquire the better nest crevices (i.e. less accessible for the investigator), and lay eggs earlier than inexperienced pairs. They also preferentially invest into the heavier and rarer gender. Therefore, this tendency results in more male offspring hatching in inaccessible nests earlier in the breeding season (Ristow & Wink 2004) and escape the attention of the investigator, whilst inexperienced pairs tend to breed later in more readily accessible borrows and produce more female offspring.

The next discussion topic on the potential causes and consequences of a bias in survival rates towards females is a bit speculative. External factors such as sexual differences in nutriments, wintering areas, fishery by-catch etc. are unlikely explanations. It seems more reasonable instead to look into the species' behaviour. The density of nests and their large variety of structural properties, as well as the high frequency ratio of prospectors as compared to the number of breeders (Ristow 1999) suggest that nest sites are scarce and the competition for one is fierce. It is primarily the task of the male to seize the nest burrow and defend it. Shearwaters have a forcible bill to catch their slippery food, but on the other hand their bill is a perilous weapon, too, so that in wrestling fights for burrows the competitors may get bleeding wounds; fights can result in fatalities during the early nest occupancy phase (Ristow 2010), and bones are frequently found in burrows, indicative of fights in former years. The competition between males contributes to their lower survival rate. Adult males become the rarer gender, and, thus, if they are successful to reproduce,

they do so at a younger age than females. In this context it is remarkable that experienced breeders show a tendency to invest into male progeny, despite them being the larger gender and likely to demand a greater effort for raising the nestling.

To satisfy the curiosity of the reader, a description about the life of the oldest individual is added here. One female was caught for the first time on June 16, 1978 at a nest entrance. She was re-trapped six times when breeding less than ten metres away from the first capture site in two nests during 1988-1996. When captured again July 17, 2009 she was 50 metres away prospecting at another active nest and not breeding, her age being somewhere beyond 31 years. As compared to the other presumably younger individuals who had been re-trapped in the study plot in up to ten or even fifteen different years, the re-capture frequency of this oldest female appears to be low, what suggests that she had bred in a near-by, inaccessible nest during most years.

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