

EFFECTS OF THE 1982/83 EL NIÑO ON GALAPAGOS FUR SEALS AND SEA LIONS

by

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The catastrophic 1982/83 El Niño (EN) has left its mark on almost all forms of life on the Galapagos, be it terrestrial or marine. While the event was (almost) paradise for some species of terrestrial animals and plants (Grant and Grant 1984) it proved a serious disaster to marine forms (Laurie 1984, Schreiber and Schreiber 1984). Fur seals and sea lions were hard hit (Limberger et al. 1983) by the dramatic decrease of numbers and the accessibility and quality of their food resources (Barber and Chavez 1983, Santander and Zuzunaga 1984).

The effects are best documented for the Galapagos fur seal (Trillmich and Limberger in press). In late 1982 mothers stayed at sea seeking food for ever-increasing periods and returned to their young only so sporadically that pups and, later on, yearlings and 2-year olds lost weight and eventually died. Apparently mothers found it more and more difficult to find enough food for themselves, let alone for their young, and had to spend very long times at sea to support themselves. We know from dive records (Kooyman and Trillmich in press) and scat analysis that fur seals hunt mostly in the upper 40 metres of the ocean, where they take advantage of the vertical migration of organisms from the deep scattering layer (e.g. lantern fish, small cephalopods) which come close to the surface during the night. Under EN conditions the upper layer of the ocean warmed so much that presumably many of these cold water organisms did not rise so close to the surface. Measurements on Peruvian fishes showed that the nutritive value of the surviving fish decreased by 30-40% (Santander and Zuzunaga 1984). The dependent young fur seals (yearlings and 2-year olds), which are much smaller than their mothers and therefore less efficient divers, were unable to get enough food for themselves by their own foraging. With neither sufficient maternal milk nor enough independent foraging success they died during the latter half of EN.

Even the larger, and mostly weaned, 3-year olds were unable to find enough food for themselves and died to almost 100%. Of the adult females about 30% died and the same proportion of subadult males seems to have succumbed to this climatic disaster. Hardest hit of all age and sex groups were the males which were territorial in the 1982 breeding season (Aug.-Nov.). Of these animals we could not find a single one when we returned in August 1983. Males normally lose about 25% of their body weight as they fast while defending their territory and apparently they were unable to recover from this weight loss under EN conditions.

The EN ended in July 1983. During the immediately following reproductive season from Aug. to Nov. 1983, very few of the surviving females gave birth. Only about 10% of them had carried their foetus to full term under the previous food stress, and even those gave birth to unusually light pups. With the loss of all the very large territorial males from 1982, somewhat smaller males found themselves with huge territories and extremely numerous females which they were unable to defend against small, 4-7 year old, intruding males. Essentially the territorial system broke down and was replaced by one of space-related dominance. The largest surviving males established themselves on areas about 4-5 times the size of a normal territory and chased smaller males away from estrus females when they encountered them, instead of preventing them from intruding altogether.

When I returned in 1984 the situation looked much better for the fur seals. 1984 was an unusually cold year and this apparently provided the fur seals with plenty of food. Females were almost 20% heavier than in previous years, the few pups born in 1983 had grown to large yearlings, about the size of a 2-year old in former years, and the smaller males had grown tremendously during the intervening period. Thus more males held territories in the 1984 breeding season. The most obvious feature of the last season was, however, that despite the reduction in female numbers the colony was full of pups. How did this happen? In normal years only half of the female population produces pups, because females nurse their young for approximately two years. During EN all females had lost their young and were therefore synchronously beginning to reproduce again when they had recovered from the effects of food stress during EN. The age structure of the fur seal population has thus become a very rugged curve: the 1980-1982 classes are entirely missing, the 1983 class is very small and the 1984 class, if not killed by another EN event, will become a steep peak. On the other end of the age distribution, old males are entirely missing.



Galapagos Sea Lions
 Photo: Fritz Pölking

We know much less about the effect of EN on the Galapagos sea lions but what little has been documented indicates that they were hit similarly although perhaps less violently: all pups born in 1982 died and pup production in 1983 was about one third of the usual, while in 1984 pups abounded everywhere. The effect of EN on the adults is unknown, but I would expect that older, physically less fit animals and perhaps quite a few territorial males died as well.

It is clear from these observations that recurrent strong EN events must greatly influence the population dynamics of these species by (1) changing the age structure and (2) strongly reducing the average carrying capacity of the environment. It may be that ENs contribute in this way to maintain the population densities of Galapagos fur seals and sea lions at much lower levels than those of more temperate or sub-polar fur seal and sea lion species.

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