SAVING THE GIANT TORTOISES OF THE GALAPAGOS FROM EXTINCTION

(This paper was read by the Secretary-General of the Charles Darwin Foundation at the Second International Conference on the Breeding of Endangered Species in Captivity, held at the London Zoo, 6-8 July 1976, under the auspices of the Fauna Preservation Society and the Zoological Society of London.)

The problem of saving the surviving subspecies of giant tortoises in the Galapagos archipelago varies greatly from one island to another and on the largest, Albemarle (or Isabela) it varies from volcano to volcano. Not only are there different subspecies, but there are also different dangers. Since the establishment of the Charles Darwin Research Station and the National Park Service, man has ceased to be a major threat and there is relatively little poaching today. But the alien animals introduced by man are a continuing menace to the tortoises — and for that matter to much of the native flora and fauna. On some islands the trouble is the black rats, on others feral pigs, goats, dogs, cats and even donkeys. Most islands are afflicted with more than one of these pests. Of the larger islands, only Narborough is entirely free; but apparently it is also free from tortoises, as only one specimen has ever been recorded there and that was collected in 1906. It was appropriately named Geochelone elephantopus phantasticus and Eric Shipton, who has vainly hunted for both, rates the chances of finding phantasticus lower than those for the Yeti.

When the Darwin Station began operations in the 1960s, it looked as though ten of the original fourteen or fifteen sub-species still existed but it was doubtful whether any one of them could survive without active intervention. Since then, three main types of protection have been afforded.

First, where there are still viable breeding populations, protection can in some cases be given on the spot — for instance, by building walls round the nests to keep the dogs or pigs from digging them out, or by reducing the numbers of these predators by hunting. However no satisfactory methods of controlling dogs, cats and rats have yet been discovered in spite of continued experimentation and hunting goats or pigs is a slow and expensive exercise. In the 1960s only three subspecies, each on one of the five major volcanoes of Albemarle, seemed to be self-replacing, let alone recovering their former vast numbers.

Secondly, where there is still an adequate population of adults but few or no young survive (as in the case of the subspecies on Duncan [Pinzon] Island, where the black rats have destroyed virtually every hatchling for over half a century) the solution is to transfer the eggs to hatcheries at the Station and rear the young until they are big enough to stand up to the rats. This method of removing the eggs to the hatchery was adopted for five other subspecies because, although some of their young survived, they were not numerous enough to ensure natural replacement. Only on Santa Cruz Island (where the chief offenders were feral pigs) has predator control been sufficiently successful so far to justify suspending the breeding programme and devoting the resources thus freed to other subspecies in greater danger. By April 1976 the following numbers were being raised at the Station from
Inside The Tortoise Rearing House at The Charles Darwin Research Station
eggs laid in the wild, or had already been returned to their native islands.

<table>
<thead>
<tr>
<th>Subspecies from</th>
<th>Total raised</th>
<th>Total repatriated</th>
<th>Year Programme Began</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chatham (San Cristobal)</td>
<td>50</td>
<td>-</td>
<td>1971/72</td>
</tr>
<tr>
<td>James (San Salvador)</td>
<td>179</td>
<td>67</td>
<td>1970/71</td>
</tr>
<tr>
<td>Duncan (Pinzon)</td>
<td>231</td>
<td>158</td>
<td>1965/66</td>
</tr>
<tr>
<td>Albemarle (Isabela) San Pedro</td>
<td>31</td>
<td>-</td>
<td>1971/72</td>
</tr>
<tr>
<td>&quot; Las Tablas</td>
<td>75</td>
<td>-</td>
<td>1970/71</td>
</tr>
</tbody>
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In the case of the Duncan subspecies, this has already meant more than a doubling of the total population. By 1975-76 seven annual classes, totalling 158 young, had been returned to their native island where they were visited, weighed and examined every three months. They have had little difficulty in adapting and the first group of 20 (1965/66 class) increased in 4 years (1970-74) from an average weight of 3.3 kg. to 19.5 kg. At five years old they seem in no danger from the rats. There was some anxiety whether the first batch of 25 James tortoises could stand up equally well to the feral pigs when they were repatriated in 1975, but the fact that a further 42 have been returned this year shows that confidence is growing. Nevertheless the National Park Service killed 2,000 pigs there in 1975 to improve the odds and the campaign is continuing.

A purist might argue that this was not genuine breeding in captivity as the mating actually took place in the wild. However, there is now a third category to which even this objection could not apply. When the Darwin Station first explored Hood (Espanola) Island, it looked as though there was no hope for the local subspecies. Hood is a fairly large and very arid island. Its vegetation had been devastated by huge herds of goats and erosion had set in. Somewhere on its rugged 58 Km² surface perhaps fifteen tortoises wandered in search of such food as the goats had left. Apparently they never met for mating: at least there was no evidence of any tortoise having been born in this century. As a last resort, whenever a tortoise was found it was transferred to the Darwin Station and put into a pen. In due course one male and twelve females were collected and, after initial setbacks, successful breeding began in 1970-71. One big problem that had to be overcome was the construction of satisfactory artificial nesting sites.

The natural anxiety over insufficient genetic variability was recently relieved to some extent when a second male was found. It may be worth mentioning that the new male performed poorly as long as he was in the same pen as the first and dominant male; but since he has been provided with a separate pen and his own group of females he is giving every satisfaction. By April 1976, 88 young had been produced, thus increasing the known population from 14 to 102.

While the young Hood tortoises were growing up the National Park Service was engaged in an intensive campaign of hunting the goats on the island. As a result, there has been a notable recovery of the vegetation. In 1975 17 youngsters of the 1970-71 class were released on their native, or more correctly, their ancestral island. Checks show that they are thriving, while continued hunting pressure has reduced the goat population still further.
Geochelone elephantopus abingdoni - The only known survivor

photo: Jan MacFarland
Fortunately, goats are the only pest on Hood as there are no introduced predators. A further five youngsters have been released so far this year.

Dr. Craig MacFarland, who has worked for years on the Galapagos tortoises, is now satisfied that all the ten subspecies known to exist when the Foundation was set up can be saved for posterity, provided the captive breeding and pest control programmes are continued. But undoubted success in the past is no guide to the latest problem. The Abingdon (Pinta) tortoise, once declared extinct, has turned up again— but it is represented only by a single male. A female may still be found on the island, but repeated, arduous searches have so far disappointed. If there is no mate on Abingdon, then it is merely a question of time before the false rumour of *G. e. abingdoni*’s extinction does become true.

Unless a female can be found in a zoo! This seems possible as there are about 300 Galapagos tortoises scattered in various zoos and therefore a distinct chance that at least one is a female *abingdoni*. The trouble is that most zoos do not know what subspecies (if that is what they are) they are holding. Projects are under discussion for a morphological analysis utilising multivariate statistical techniques as a means of finally working out the taxonomy and evolutionary relationships of the taxa and then applying this to the problem of identifying zoo specimens; and to use electrophoresis to solve tortoise systematics by examining a variety of protein systems in the blood sera and certain tissues.

However, MacFarland insists that the identification problem is less difficult than with most subspecies as, in his view, adult males or females of *abingdoni* could only be confused with *becki*, the somewhat similar saddle-backed subspecies from Wolf, the most northerly of the Albemarle volcanoes. He believes that, with the aid of accurate measurements and photographs, it should be possible to identify any *abingdoni*, even if it lacks an authentic birth certificate. This Conference could well serve as a matrimonial agency.

Meanwhile “Lonesome George”, as the American press has named him, has been given feminine company of the most closely related subspecies so that sex-starvation should not result in the atrophy of what is potentially his most important asset. If no female *abingdoni* can be found either on the Galapagos or in one of the world’s zoos, then, any offspring of his present but, we hope, temporary union could be back-crossed to produce through succeeding generations the closest feasible approximation to a pure breed. However, just as nobody knows how long a Galapagos tortoise lives, nobody knows at what age it begins to reproduce. Figures of 30-50 years are suggested which makes the time factor involved seem almost astronomical. Let us hope that the zoos can help with the rescue of *abingdoni* from the menace of extinction. For that matter, any contribution the zoos might make to the genetic stock of *hoodensis* would be valuable, but this is not of the same critical importance as finding female and indeed more male *abingdoni*.

The question arises, should breeding herds be formed outside the Galapagos as an insurance against a major disaster, such as the introduction of some virulent disease. In these uncertain times, any additional insurance is valuable; but given the restricted resources available and the fact that nothing of this nature has happened in the last 400 years, it would not seem to merit a particularly high priority. The Darwin Station has been more successful than the zoos in its breeding efforts. Fertility and hatching rates are high and only 10-15% of
hatchlings die, mostly in their first year. This may be partly due to the fact that the Station has deliberately concentrated on breeding each subspecies pure — as has the Honolulu Zoo, which has also had very considerable success — whereas most zoos have tended to cross subspecies. The San Diego Zoological Society, which has shown such interest in Galapagos tortoises and has given such vital support to the Darwin Station, has had much lower fertility and hatching rates from its breeding colony.

The Station's very limited experience suggests that the subspecies, or at least some of them, are not very compatible genetically. The eggs of the only mixed breeding herd the Station ever maintained were mostly infertile and about a third of the young that did hatch were albinos and short-lived. Zoo populations of mixed "subspecies" yield fertility rates of 5-10% in the eggs, compared with 80-90% in the wild and in the pure captive stocks at the Darwin Station. In fact, doubts have arisen whether "race," "subspecies" or "species" is the correct word to use. But quite apart from this issue of mixed breeding, the Station has obvious advantages such as natural climatic conditions, habitat, food species and nesting soils. Costs are low and results are high. Eggs for most endangered races (or whatever they are) can be brought in large numbers from the wild with relatively little effort and this avoids the problem of inbreeding for six of the eight endangered races. Restocking the various islands is also a simple operation.

Nothing here should be construed as discouraging zoos from organising breeding herds, particularly if, by selection or exchange, they could form racially pure groups. Indeed, with fewer and fewer tortoises leaving Ecuador, thanks to protective legislation and the patrolling of the National Park Service, such breeding seems the only way in which zoos can re-stock. The only contention is that breeding the endangered varieties of tortoises in their native Galapagos has been surprisingly successful and seems both the most effective and the most economical way of saving them for posterity.

Finally, a very few words about the running of the tortoise programme. Since the National Park Service was organised, it has increasingly taken over the administration of conservation from the Darwin Station but the latter continues to give support and advice. Much of the research has been and is still being done by visiting scientists using the Station as a base. For instance, it was as a visiting scientist that Dr. MacFarland, the present Station Director, did his most important work on the tortoises.

G. T. CORLEY SMITH

REFERENCES


Since this paper was written it has been learned that the San Diego Zoological Society, with its habitual generosity, has offered to return a male Hood tortoise (*G.e. hoodensis*) to its native Galapagos, where it will increase substantially the genetic variability of the breeding herd at the Darwin Station and thus improve still further the survival prospects of this race, once considered doomed to extinction.

No mate for the lonely male *G.e. abingdoni* has yet been discovered either on Pinta Island or in a zoo, but the following “WANTED” notice has been issued by the World Wildlife Fund.

“Dr. Craig MacFarland, Director of the Charles Darwin Research Station in the Galapagos Islands, is searching for a female Galapagos tortoise, Pinta Island subspecies, to be paired with the only known male tortoise of this subspecies, which was discovered in 1971. Should any zoological park or other wildlife collection possess a Galapagos tortoise, subspecies unknown, Dr. MacFarland recommends that photos be taken (black and white) with a ruled two meter gauge near the animal. The photos should be taken from the following angles:

- from straight in front
- from the side, straight on
- from the rear, straight on
- from directly above the shell
- from the side-front

Photos should be sent to: Dr. Tom Fritts, Curator of Reptiles, San Diego Natural History Museum, P.O. Box 1390, San Diego, CA 92112. Dr Fritts is working on the identification of species through a complicated statistical analysis of the shell characteristics.”