

Release of Arnold's giant tortoises *Dipsochelys arnoldi* on Silhouette island, Seychelles



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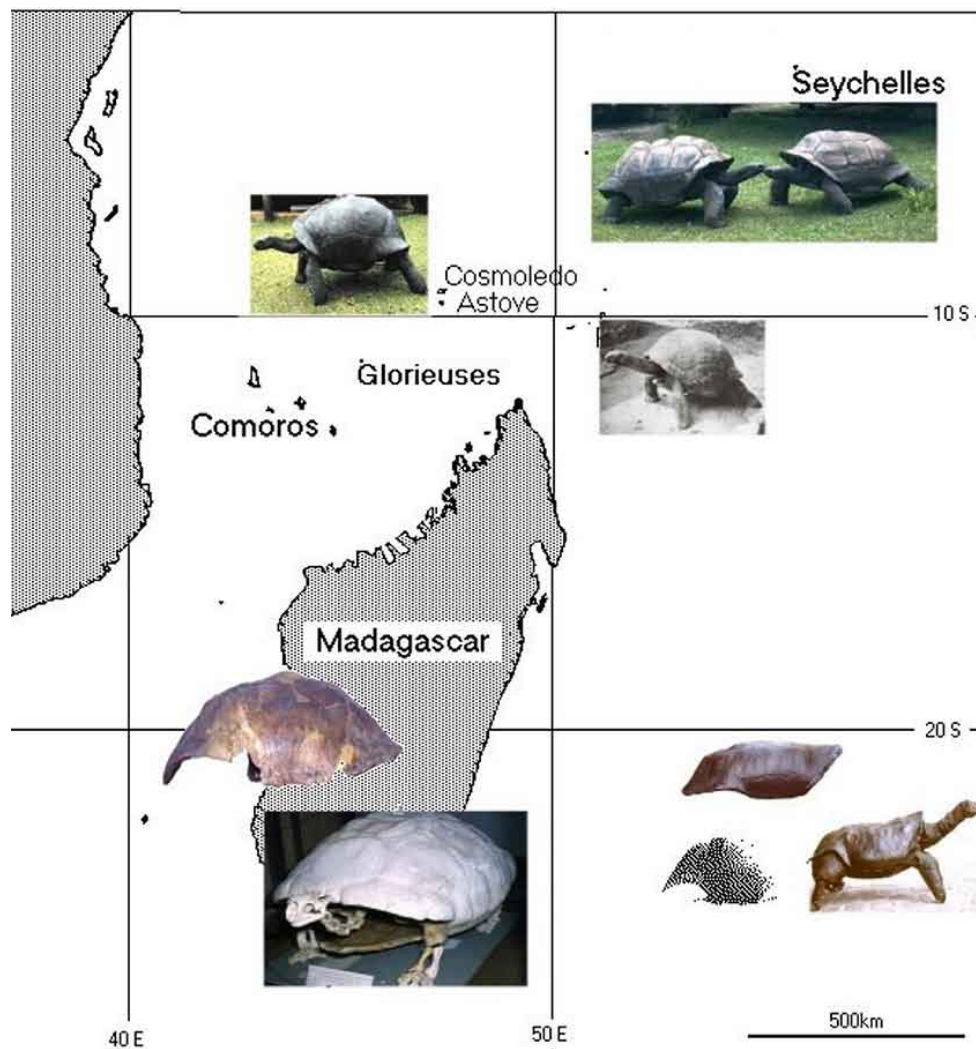
Summary

On 7th December 2007 five adult Arnold's giant tortoises *Dipsochelys arnoldi* were released at Grande Barbe, Silhouette Island, Seychelles. These represent the first Seychelles granitic island tortoises to be released into the wild and this is the first stage in establishing the endemic species in their original range.

Background

Prior to human colonisation of the Western Indian Ocean giant tortoises occurred on almost all islands in the region. Shortly after colonisation most of these populations were driven to extinction by over-exploitation. The Seychelles islands supported at least 4 distinct taxa belonging to the genus *Dipsochelys* (historically included in *Geochelone* and sometimes also referred to as *Aldabrachelys*) (Fig. 1). Two of these were found in the granitic islands, one restricted to the southern atolls (including Aldabra) and one of unknown origin within Seychelles. The southern atoll species, the Aldabra giant tortoise *D. dussumieri* (sometimes referred to as *D. elephantina* or *A. gigantea*), survives with some 100,000 wild individuals on Aldabra atoll and several thousand in captivity throughout the world. The granitic island species were considered extinct but small numbers survived in captivity. The Seychelles giant tortoise *D. hololissa* is known from historical records and specimens originating from the granitic islands. Its population currently comprises a small number of isolated males in non-breeding captive groups and 6 adults and 14 juveniles in the Seychelles Giant Tortoise Conservation Project (Nature Protection Trust of Seychelles). Arnold's giant tortoise *D. arnoldi* is known from a small number of museum specimens of uncertain origin and subfossil remains from the granitic islands. A small number of males have been identified in zoos outside of Seychelles and in private ownership in Seychelles. The only females are in the Seychelles Giant Tortoise Conservation Project which has bred 140 juveniles (Fig. 2).

Fig. 1. Map of the Western Indian Ocean showing the original distribution of giant tortoise species



The Seychelles Giant Tortoise Conservation Project was established with the aim of preventing the extinction of the Seychelles giant tortoises through captive breeding and ultimately re-establishment of both species in the wild. Silhouette island was selected as the main focus of reintroduction as it provides a large area for population establishment, diverse habitats and a healthy ecosystem, most of which is secure from inappropriate development. Population modelling (using the Aldabra tortoise as an analogue) indicates that the island could support a population of some 50,000 tortoises. Prospects for re-establishment of wild tortoise populations are summarised in Fig. 3.

Fig. 2. Population growth in the captive herds of *D. hololissa* and *D. arnoldi* in the Seychelles Giant Tortoise Conservation Project.

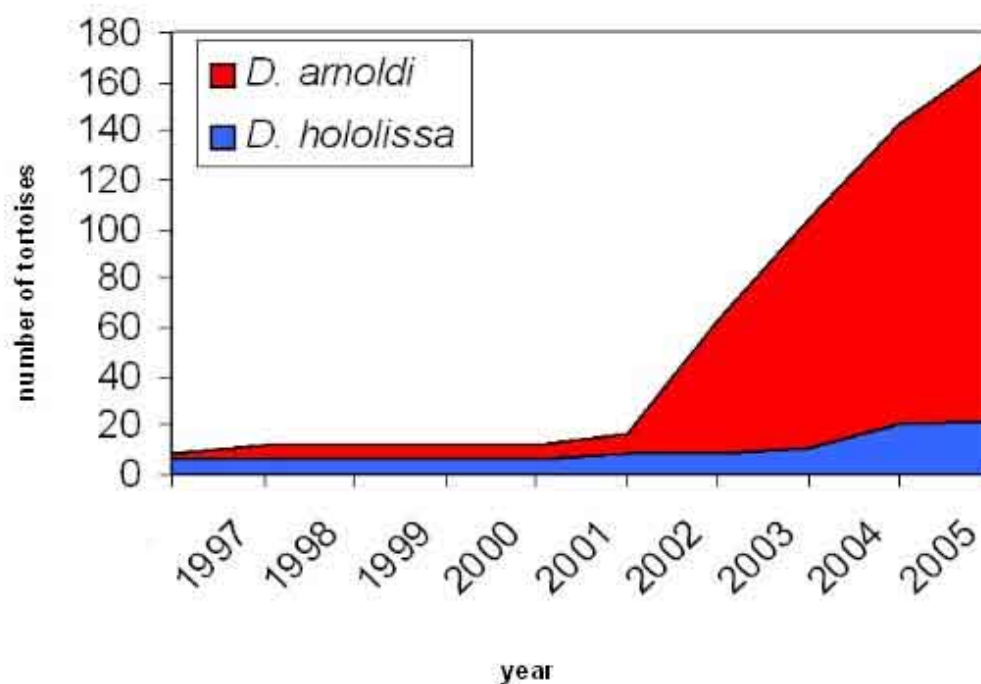
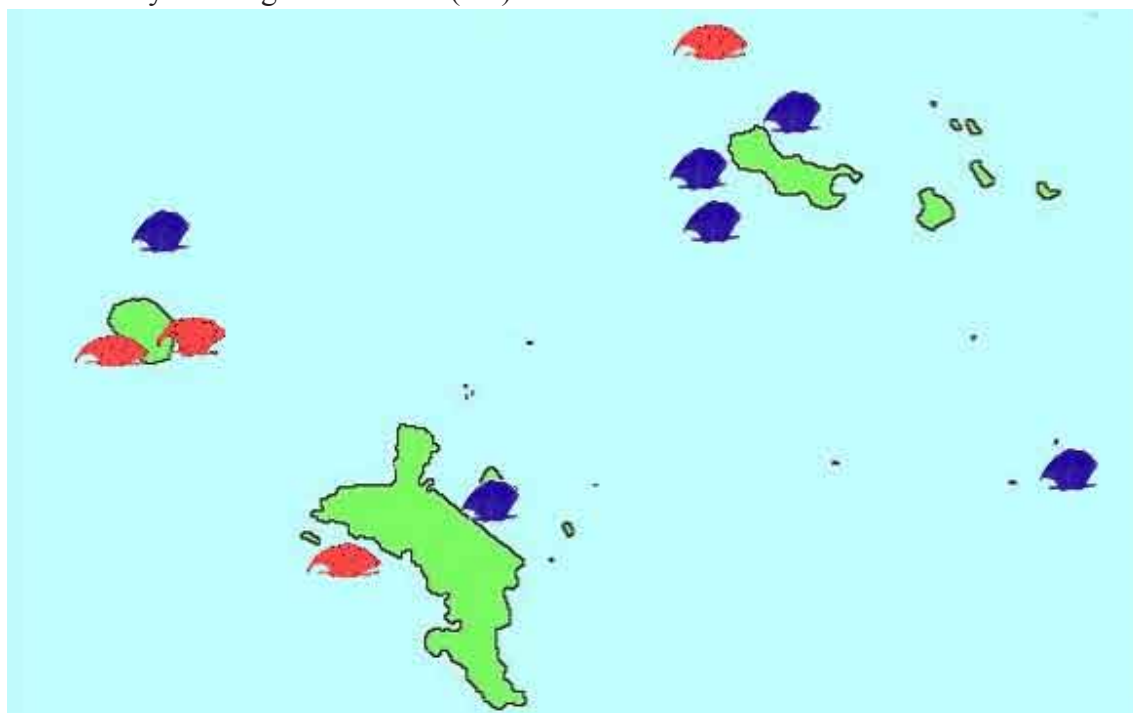


Fig. 3. Population Existing populations of introduced Aldabra tortoises (blue) and potential release sites for Seychelles giant tortoises (red)



Identity of released tortoises

The five tortoises released at Grande Barbe are all identified as *Dipsochelys arnoldi*. This identification is based primarily on morphological characters (Fig. 4). Published molecular identifications are unclear with several different indications provided by different data sources as outlined below.

Mitochondrial control region, RAG2, tRNA-Glu and 12S ribosomal RNA - all invariant

Alpha D-globin - known only from one individual (*D. cf. dussumieri*)

16S ribosomal RNA - a common haplotype is shared by *D. hololissa* and *D. dussumieri*; *D. arnoldi* differs at one point. All released individuals possess the *D. arnoldi* haplotype.

Cytochrome b - low variation in living *Dipsochelys*; most *D. arnoldi* possess the common *Dipsochelys* haplotype, shared with other living species but two unique *D. arnoldi* haplotypes have been identified. All released individuals possess the common haplotype; the unique haplotypes are found in two captive males. As all sampled female *Dipsochelys* possess the common haplotype no cytochrome b variation will be passed on to future generations.

Cmos - a common haplotype is shared by *D. arnoldi* and *D. dussumieri*; *D. hololissa* differs at one point. All released individuals possess the common haplotype.

Nuclear DNA - microsatellite markers provide only limited separation of living taxa and populations. *D. arnoldi* is the most divergent form, although even in this taxon there are only two unique alleles. There is some indication of selection operating in some microsatellites, distorting the pattern of inheritance. At least one of the unique alleles is represented in the released group. Heterozygosity is low in *D. arnoldi*, with the released individuals having 42-63% of loci heterozygous (overall 52.5%).

The released tortoises comprise three adult males ('Stan', 'Hector' and 'Adrian') and two adult females ('Clio' and 'Alida'). These are all typical of the species for morphological features (with 'Hector' showing extreme characteristics) and genetically representative. 'Stan' and 'Clio' are the largest male and female *D. arnoldi* on record.

Fig. 4. Principal components of variation in *Dipsochelys* adults. Released adults highlighted in red

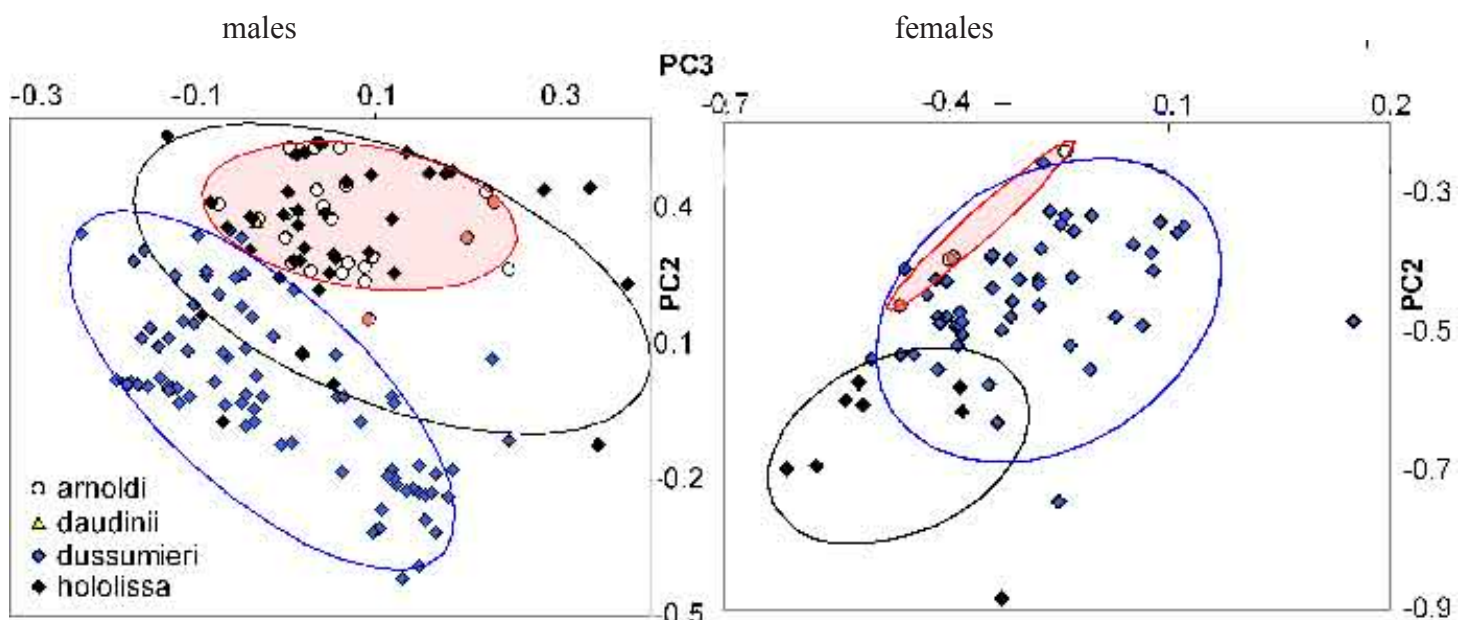


Fig. 5. Released tortoises

Clio (female)



Alida (female)



Hector (male)



Stan (male)



Adrian (male)



Release

The site selected for release was Grande Barbe, Silhouette Island. This area is the largest semi-natural lowland marsh and woodland area. It supports a wide range of habitats including abundant vegetation eaten by the tortoises and a freshwater marsh and river. The area is accessible by sea only for a few weeks of the year and then only to small boats due to strong currents and a fringing reef. Inland it is bordered by the river. These features mean that tortoises released in area are secure from theft and are unlikely to disperse away from the release site.

Fig. 6. Grande Barbe



The release was planned for 7th December 2006 to coincide with a visit to Silhouette by a group of supporters of the project. The adult tortoises were collected from their enclosure at La Passe at 8 a.m. and transported to the island's small boat. The tortoises were lifted into a trailer and into the boat by hand, which was achieved with a minimum of stress despite their great weight.

All five tortoises were transported in one boat round the island to Grande Barbe. During the journey the tortoises moved about the bottom of the boat, changing position and finding areas of shade. From time to time water was splashed on them to minimise over-heating.

Fig. 7. Transport of tortoises to Grande Barbe



At 9 a.m. the tortoises were unloaded at Grande Barbe. Each tortoise was lowered into the water at the shore and floated the last 2m to the beach. They then made their own way up the beach but required lifting onto the beach crest due to a 50cm high shelf at the top of the beach. The tortoises did not show any distress during their few seconds in the water but did find walking up the beach difficult due to the very soft sand; none of these individuals had encountered any of these conditions before.

Fig. 8. Arrival at Grande Barbe



The tortoises were all released in a small area of coconut wood at one corner of the plateau. Two individuals were on the edge of the wood and an open area of grassland, two were on the beach crest fringe and one moved immediately into the centre of the wood. This latter individual (Stan) was the largest tortoise and had been most exposed to the sun on the crossing, he was not observed eating on the day of release and may have been over-heated. The other four tortoises were all observed feeding within minutes of landing.

The following day all five tortoises were relocated in the same area. None had moved significant distances with the exception of Adrian who was feeding in the grassland. After one week further dispersal had occurred. Most feeding was observed on the coastal creepers that form their favoured diet in captivity (especially *Vigna marina*) although feeding on *Scaevola sericea* was observed within 15 minutes of release. This plant species is not normally eaten in captivity and this observation may represent abnormal behaviour due to the stress of movement. Future observations of feeding will determine the significance of the observation. One individual was also seen to have been consuming fallen breadfruit (*Artocarpus altilis*) in the old settlement (not a natural food source but the most preferred food when available). Other plants consumed included *Stachytarphetta urticaefolia*, *Ipomoea pes-caprae* and *Digitaria horizontalis*.

Fig. 9. Hector's first few minutes at Grande Barbe



Movement, light and temperature sensors were attached to four of the tortoises, however problems with the adhesive used meant that only one sensor remained affixed. Two detached sensors have been relocated and will be re-attached.

Fig. 10. Adjusting to life at Grande Barbe

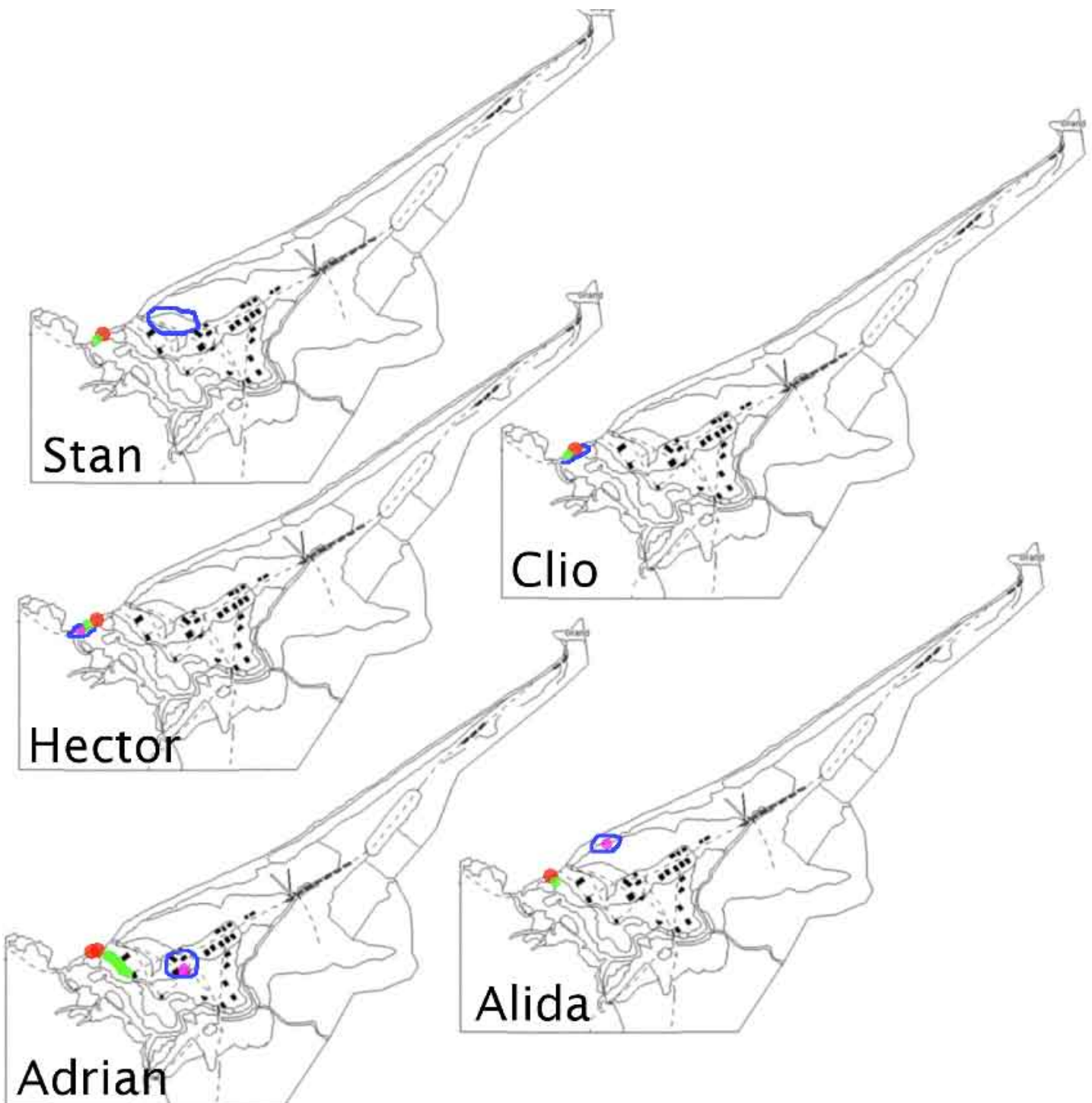


Prospects

It is expected that the released tortoises will adapt well to the conditions at Grande Barbe. There is abundant food, water and a good range of conditions. In the future they will be joined by juveniles to establish a viable population. The juveniles are currently being reared in captivity and will be released when they are considered large enough to be secure from potential predators and easily tracked. This is estimated to be when they reach 15kg (approximately 5-6 years of age).

Grande Barbe is the site for a planned small, environmentally friendly hotel development. This will be constructed using the footprint of the existing ruined building and with raised tented accommodation in the woodland. This will create a minimum of disturbance for the released adult tortoises. Juveniles will be kept away from the development areas until construction is complete (either by postponing their release or by release into an enclosed area).

Fig. 11. Movement of tortoises between 7-19th December 2006. Red - release point; green - position 24 hours later; pink - position 1 week later; blue - area occupied by 19th December.



The ultimate aim of the project is to establish a wild breeding population of *Dipsochelys arnoldi* at Grande Barbe. The release of 50-100 tortoises should be sufficient to achieve this aim. In the long term it is estimated that the site could support 500 tortoises, with further expansion into surrounding habitat. Models based on the Aldabra tortoises suggest a maximum population density of 35/hectare but a model in development using plant productivity and tortoise consumption rates predicts a higher density.

The presence of tortoises in the area is expected to have a significant effect on the vegetation of the site. These effects are being modelled but cannot be fully predicted as this is an entirely new event in the history of the islands. Previous releases of tortoises have used the Aldabra tortoise which is adapted to a dry grassland and scrub environment, not a highly productive rainforest and marsh system. They have also not included any habitat monitoring or modelling, so the impacts of the released tortoises on Fregate, Curieuse or North islands are entirely unknown. At Grande Barbe it is expected that the tortoises will reduce the dominance of creepers and weed species in the grassland, maintain open pools in the marsh and create a more open woodland.

Further releases of *D. arnoldi* on other islands are being planned or considered (Aride and Conception islands in conjunction with Islands Conservation Society). It is also planned that *D. hololissa* will be established at Anse Lascars on Silhouette when sufficient juveniles have been reared.

Acknowledgements

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