

VEGETATION REGROWTH ON ISLA PINTA: A SUCCESS STORY

By: P. M. Whelan and O. Hamann

Isla Pinta—one of the most northerly Islands of the Galápagos Archipelago—appeared and disappeared out of a cloud bank on the morning of 30 October 1988. The 2-day trip from Puerto Ayora had been uneventful—no whales, no dolphins, nothing, except the continuous sound of the boat engines. We were accompanied by Andy Schmidt, Raúl Salazar, and Fionnuala Walsh (all Darwin Station personnel). The purpose of the visit was to resurvey the vegetation plots established by Tjitte de Vries in 1970 when the level of destruction of vegetation by introduced goats was at its highest. Since then joint campaigns by the National Park and Darwin Station have systematically and drastically reduced goat numbers. In theory, some improvement in the regrowth of vegetation should have been visible since the last time the plots were surveyed 6 years ago.

There are only two safe anchorages in Pinta and, while on our first night the western anchorage proved to be very calm, the distance from the vegetation plots and the dense growth of scrub made reasonable access to the plots impossible. The only signs of goats to be seen were dried-up bones. The vegetation showed no signs of grazing. The southeastern anchorage was much more exposed and the boat had to be anchored fore and aft. Embarking and disembarking were difficult, with the dinghy being pitched high up and down in the rough sea (rough enough to have one member of the team jump into the dinghy and be thrown out over the opposite side!), but the anchorage proved to be more convenient to the vegetation plots.

Even the first impressions of landing at the southeastern shore confirmed the idea that the vegetation was rapidly reestablishing itself in the absence of goat grazing. One vegetation plot near the beach, which 6 years ago contained a tall *Opuntia* cactus and little else, was now a mass of saltbush (*Cryptocarpus*) and mesquite (*Prosopis*). The cactus had fallen over.

Another vegetation plot was situated higher up the slopes of the extinct volcano that forms Isla Pinta. The lower reaches of the trail to this plot were marked

in the typical Galápagos way—stones in the forks of trees. Further along the trail, the markers were no longer present and landmarks, compass bearings, and careful search for the marker stakes eventually allowed us to locate the vegetation study plot. Here again the regrowth was considerable and no evidence of goats was seen. Many of the trees marked with tags 6 years ago had died (probably during the abnormally wet El Niño year 1982-83) but new, young trees were replacing them. These new and the surviving old trees were tagged and measured to monitor their survival and growth over the next few years.

The most arduous part of the work was the trek to the third study plot near the summit of the Island. Again the trail of stones in the forks of trees (established in the 1970s by Camilo Calapucha, field assistant at the Darwin Station) was followed and stones were replaced where they had fallen down or were missing. Eventually the trail faded and the heat, humidity, weight of equipment, the steep incline, and, most of all, the spiny *Zanthoxylum* (cat's claw) forest made the trek exhausting. From the maps, we knew the summit to be 690 m high, and regular check of the altimeter confirmed that we were painfully, but very slowly, hacking our way to the summit. Arms and clothing kept getting caught in the low cat's claw trees and branches and we agreed that the local name—"uña de gato" (cat's claw)—was very appropriate. The floor of this forest was a dense wet carpet of ferns, and using a machete to cut a path in an area such as this felt almost as wrong as doing so in a botanical garden. Ferns and orchids, species only occurring here and nowhere else in the world, all appeared to be thriving in the absence of goat grazing. On reaching the summit we found that the height according to our altimeter was 645 m (and not 690 m as on our map or 775 m as on other maps). After a 6-hour trek from beach to summit, the team had a well-earned lunch break in the cool breeze.

The study plot at the summit was startling in the amount of regrowth that had occurred in the last 6 years. A formerly bare, rocky patch with one cat's



Figure 1. Permanent Quadrat No. 3, close to the summit of Isla Pinta, approximately 630 m, as photographed by Tjitte de Vries when he established the plot in November 1970. The vegetation was severely destroyed by feral goats. *Quadrante No. 3 cerca la cumbre de Isla Pinta, aproximadamente 630 msnm fotografiado por Tjitte de Vries al establecer el cuadrante noviembre de 1970. La vegetación fue destruida por chivos.*



Figure 2. The same plot in October 1988 as photographed by O. Hamann. A rapid regeneration of vegetation has occurred since 1977, following the successful goat eradication campaign during the 1970s. Now, 18 years after the establishment of the plot, it contains a very dense vegetation, dominated by *Zanthoxylum* and *Pteridium*, as well as many fern species. In the photo from left to right are: Fionnuala Walsh, Raúl Salazar, Andy Schmidt, and in the shade of the *Zanthoxylum*, Pat Whelan. Note that the corner post in front of Salazar is the left corner post in Fig. 1. *El mismo cuadrante en octubre de 1988 fotografiado por O. Hamann. La regeneración de la vegetación ha ocurrido desde 1977, después una campaña contra los chivos desde los 1970s. Actualmente después 18 años, el cuadrante tiene vegetación densa, con *Zanthoxylum* y *Pteridium* dominantes y muchos helechos. Desde la izquierda a la derecha están: Fionnuala Walsh, Raúl Salazar, Andy Schmidt, y en la sombra del arbusto, Pat Whelan. Se nota que la estaca cerca Salazar representa el mismo en la fotografía anterior (esquina izquierda).*

claw tree had grown into an impenetrable thicket of small trees, shrubs, and ground level plants. The number of species had also considerably increased. Only photographs of its former state could show us how startling the regrowth of vegetation had actually been (Figs. 1 and 2). One new quadrat was established in the bracken fern (*Pteridium*) zone at the very summit where it adjoined the *Zanthoxylum* zone, to permit determination in the future whether this bracken zone was a permanent feature or whether it would be encroached upon or colonized by elements from the *Zanthoxylum* forest zone.

The final day's work consisted in rechecking the growth, death, and replacement of trees in another vegetation plot in the palo santo (*Bursera*) zone (125 m above sea level) on the lower southeastern slopes. Again as at other plots, it was obvious that rapid regrowth of all species was taking place in the absence of goats. Here the study was extended to include measurements of *Scalesia*, *Bursera*, and *Opuntia* cactus outside the vegetation plot so as to be able to monitor the changes in the population structure in the years ahead. Similar measurements were taken of these species at a lower elevation (45 m above sea level). It was obvious that the plant populations consisted of either very old, large trees or lots of very young trees (which had grown in the absence of goat grazing). Obviously, the trees that should have been intermediate in size had all been eliminated earlier by

goats. While doing the work, the team was closely watched by a family of Galápagos hawks, which sat in the low trees above us—almost at arm's reach.

The goat extermination campaign by the Park and Station, though expensive, has been a spectacular success with rapid vegetation regeneration and reestablishment on the west and southern slopes of Pinta (the other parts of the Island are mainly lava fields without vegetation). The team saw no visible signs of goats, but a few goats still remain (a crew member from our boat may have heard one near the western anchorage). Eradication of these few remaining individuals will be difficult and expensive, but it must be done to prevent the population from recovering the high population levels that were so deleterious for the Island. At middle elevations, we encountered several characteristic areas, where dense, forestlike vegetation was interspersed with open, grassy meadows. We considered these areas to be the prime tortoise habitat on Pinta, but sadly we did not find traces of the Pinta tortoise. It appears that Lonesome George will still be lonesome; no mate is available for this sole survivor of the Pinta tortoise population.

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THE SLOW RECOVERY OF *OPUNTIA MEGASPERMA* ON ESPAÑOLA

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The mature *Opuntia* cacti of Española have sturdy trunks that support numerous pads from lateral branches. Conspicuous as individuals, they are also conspicuously rare. The best guess as to why they are so scarce is that goats have damaged many old trees and eaten, trampled, or pushed over many of the younger ones. This was the view of Stewart (1911, 1915) who warned that the cactus was in danger of becoming extinct. For example, the density of mature cactus is much higher on the neighboring Island of Gardner which has never had goats. There is no

obvious climatic or edaphic difference between the Islands that would account for the difference in cactus density. A parallel situation exists on Floreana (goats common, cactus very rare) and its two satellite Islands, Champion and Gardner (no goats, cactus dense).

Goats were introduced to Española some time in the last century. By the time the California Academy of Sciences expedition visited the Island in 1905-06 the goats were already well established and *Opuntia* were scarce (Stewart 1911, 1915; Slevin 1931). Goats