The Revegetation of the McClean Monument

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The McClean Monument is the name given by the Botany Group of the Trinidad and Tobago Field Naturalists' Club to the quarry on the Lady Young Road from which material was taken for widening the Churchill-Roosevelt Highway in the years 1976-1979. When the proposal was first put forward for the site to be used as a quarry, there was great public opposition to it, and after months of debate and controversy, permission for the excavation was given by the then Minister of Works, Mr. Hector McClean, hence the name.

Excavation began in May 1976 and was completed in February 1979. Much of the story of those years is told in the Trinidad Naturalist Magazine (Anonymous 1976a, 1976b). The Minister had stated that "benching" would prevent landslips and encourage the natural vegetation to grow back, but the company (Seereeram Brothers Ltd) had also undertaken to replant the area after the excavation was complete. In fact, replanting was never attempted and the revegetation process was left to "Mother Nature".

The Botany Group seized the opportunity of studying the recovery, and this article records the changes we have noticed in the past 16 years.

At the end of excavation the site consisted of seven terraces getting progressively smaller from bottom to top, and completely bare of vegetation. The rock bed is "micaceous phyllite, a loose, crumbly, material which when wet displays a great tendency to slip" (Anon. 1976a). In the early days of the controversy "the tendency to slip" was perhaps the major concern, and during the excavation minor slips did occur. Even later, after the departure of the excavators, there had been minor slips as is clearly evident in the photograph taken in 1984 (Hilton 1984). It showed that run-off from the terraces did not always follow the planned course. Each terrace is sloped downward towards the base of the next higher terrace and from east to west so that water should run off at the western side of the base of each terrace, except the first, which slopes towards the east. However, it is clear that in some places water has rushed over the edge of one terrace and on to the one below.

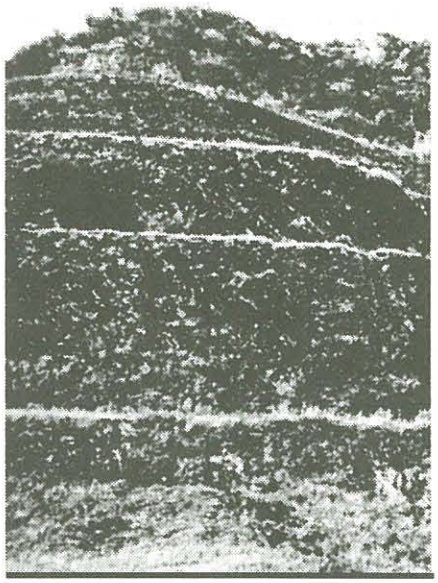

Fig. 1.
The McClean's Monument in January 1995. Note large trees have appeared on terraces 3 and 5 and thaty terrace 7 is now almost completely obscured by vegetation.

The interest now lies in the process of revegetation. The Botany Group has visited the site periodically, collecting specimens of the flora and taking photographs. We have concentrated on the first four terraces, numbered from bottom to top. In the following account the names of all species are those given in the Flora of Trinidad and Tobago (Williams et al. 1928-).

The Observations

January 1984. The site as it was when we first visited it in January 1984 is shown in Hilton (1984). The list of plants we collected is given in Table 1. It will be noticed that there are eight tree species and six shrub species among the 34 species. After less than five years no individual had grown very large nor was any of these 14 species very numerous. It was a little surprising that bois canot (*Cecropia peltata*) was not more prominent and surprising too that there was no jereton (*Didymopanax morototoni*) Both of these trees are usually early colonisers of disturbed land, but with no soil, only rock, the conditions for the growth of trees were extremely unfavourable. Other tree species that were common nearby (bloodwood, *Croton gossypiifolius*; saltfishwood, *Machaerium robinifolium*; balsa, *Ochroma pyramidale*) had begun to invade, but in small numbers only.

The species in Table 1. must not be taken as a complete list; there are no sedges and only four grasses. Members of these groups are hard to identify without flowers and we collected only what was in flower. Most of the herbs are common weeds such as *Bidens pilosa, Mimosa pudica* and *Sida urens.* On this first visit we saw two or three ground orchids but did not collect them. We preferred to enjoy their beauty and leave them in place until our next visit.

September 1991. On our visit of 10th September we noticed a big change from the seven years before. Some fairly large trees were evident and the ground cover was thicker (Fig.1). Although we did not attempt to make an exhaustive collection, and again collected only what was in flower, we found 19 species that were not in the first collection (Table 2). Many species of the first collection were still there - perhaps all of them - but the possibility of extinctions as the vegetation changes remains a topic to study later.

When Table 1 is compared with Table 2 it can be seen that the later collection contained representatives of seven new families, including the orchids that we had left uncollected at the first visit and the sedges. Of the new species, thirteen were herbs, three were shrubs (*Aeschenomene americana, Duggena hirsuta, Baccharis trinervis*) and three were trees (savonette, *Lonchocarpus punctatus;* white fiddlewood, *Citharexylum fruticosum; Pollalesta condensata*). To us the new species represented a real increase in the diversity of the population and a sign that the vegetation was slowly returning to its original composition.

From a conservation aspect, the most interesting plants were the larger trees. These all proved to be either *Lonchocarpus punctata* or *Machaerium robinifolium*, the two most abundant species of Beard's Deciduous Seasonal Forest, the typical forest of the north-west peninsula and the Boca islands (Beard 1946).

February 1993. On this visit (7th February) we found five new species, wild hops (*Flemingia strobilifera*), mango (*Mangifera indica*), an unidentified fig that may have been *Ficus nymphaeifolia*, an identified member of the Meliaceæ and an unidentified legume. *Flemingia* was something of a surprise. It is an introduced plant that has become naturalised, but it has no obvious means of dispersal and we wondered how it could have got to this site so quickly. The mango we assumed had been brought by man; the others we assumed had come from the surrounding vegetation.

On this visit we collected some fruit from the savonette trees. Over fifty of the fruit were later found to be damaged by seed predators (Bruchid beetles?) and only three seeds germinated. From these we grew seedlings for planting on our next visit.

October 1993 By now the seedlings were big enough to be planted and we returned on the 17th to plant them on terrace 4 in spots where they were likely to receive water running over from terrace 5. All were labelled with yellow tags that would make them easy to recognise. We did not collect any plants on this trip or any savonette seeds since the savonette trees were not fruiting.

June 1994 . On our visit of the 26th we photographed the site again but were prevented from carrying out a census of the trees by a pair of aggressive young men who claimed they were bee-keepers and did not want us to disturbe their hives on terrace 4. We did not know what to make of this but decided to retire and return another time to take the census after we had our photographs processed.

October 1994. On our visit of the 16th we met two older members of the bee-keeping group and had a long and friendly conversation with them. Their information answered some of the questions prompted by previous visits. Apparently, they had planted some trees to provide nectar and pollen for their bees, and these included the mango we had found in February 1993 and four mahogany trees, one of which was our unidentified member of the Meliaceæ . They had not planted any guavas, so the numerous saplings we had seen as far back as the first visit had come in naturally. They had also planted one savonette tree to provide shade at a "base camp" on terrace 1. This was by now quite conspicuous and can be seen in the bottom left hand corner of Fig.2. According to them, their bees do not visit the flowers of this species because their probosces are not long enough to reach the nectar, and true enough, the only bee we saw visit the flowers was a much larger native bee. Savonette was flowering freely at the time, but there were as yet no ripe fruit.

The bee-keepers had seen one of our labeled savonette saplings and carefully avoided damaging it. It now measured 75 cm, at least 45-50 cm taller than when it was planted but there was no trace of the other two seedlings planted at the same time.

The unidentified legume of our visit in February 1993 was collected and later identified at the National Herbarium as *Coursetia arborea*.. This species looks a lot like saltfishwood but has slightly larger leaflets and no spines. On the more open part of the terraces they were few in number and none was as tall as the largest savonette, but at the eastern end they were much more numerous and much taller, even taller than the savonettes on the open terraces.

One other new species was added on this visit: *Casearia spinescens* (Flacourteaceae), of which there was one shrub.

November 1994. Before our visit on the 13th, from photographs taken on previous visits, we had prepared a drawing of the terraces 2-4 that showed all the trees and major clumps of vegetation (Fig. 3). On this visit we sought out all the small trees in these clumps and located them in the drawing so that their growth could be followed in the years ahead.

Discussion

In any revegetation project speed is important. The longer the process takes the greater will be the loss of nutrients and the greater the erosion. Presumably, these considerations have guided foresters in choosing *Pinus caribbea* as the species for replanting denuded

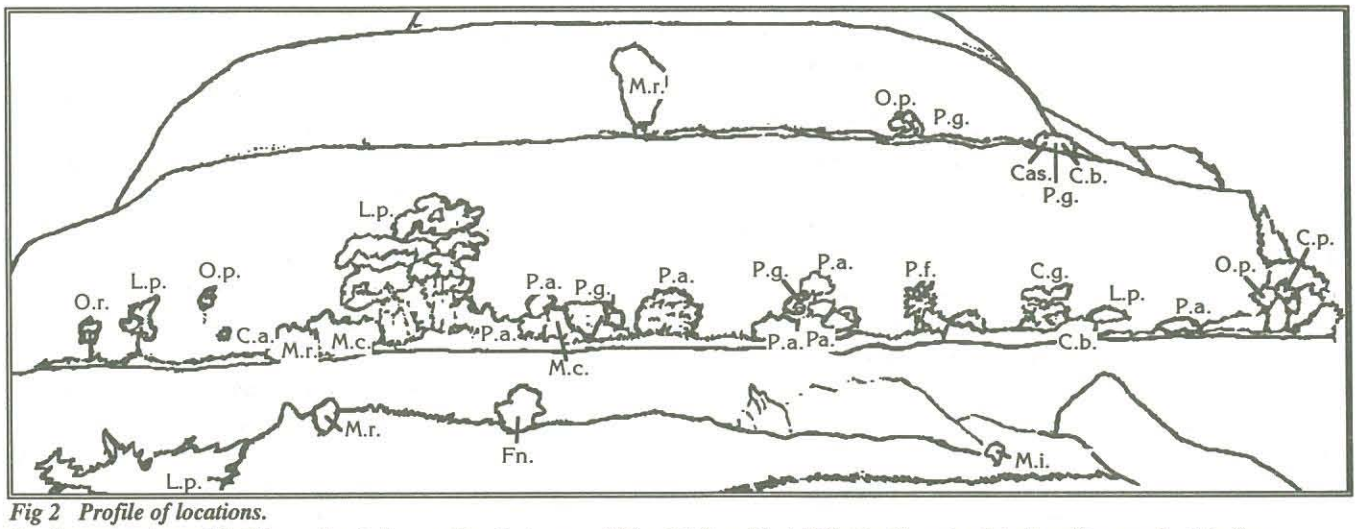

Fig 2 Profile of locations.

Ca.- Coursetia arborea, C.f. - Citharexylium fruticosum, C.g.- Croton gossypiifolius, C.l. Coccoloba latifolia, C.p. Cecropia peltata, F.n. - Ficus nymphaeifolia, L.p.- Lonchocarpus punctatus, M.c.- Muntingia calibura, M.i. - Mangifera indica, M.r. Machaerium robinifolium, O.p. Ochroma pyramidale, P.a.- Piper aduncan, P.s. Psidium

areas. It grows quickly, and the propagation method has been worked out and adapted to mass production. In our view, though, there are disadvantages in *Pinus* viz. it alters the look of the vegetation, it is a foreign species with unknown long-term effects on the native flora and the value of the timber may in time divert a project from one of conservation to one of sustained use, with the possibility of over-use, erosion and a return to the same situation that its planting was designed to cure. We much prefer the use of native species, and our study of the revegetation of this quarry has turned up three native species with potential for widespread use: *Lonchocarpus punctatus, Machaerium robinifolium* and *Coursetia arborea*.

These three species have grown much better than those we think of as typical colonizers such as *Croton gossypiifolius, Cecropia peltata* and *Ochroma pyramidale*, and they have done it on native rock. Even *Coursetia,* which so far has not done as well as the other two, may have done less well simply because it arrived later and has had less time in which to grow. Its seeds seem to be dispersed simply by the force of the bursting seed-pod and this is probably less efficient than the wind dispersal of the light, flattened pods of *Machaerium* and *Lonchocarpus.* This suggestion is supported by the observation that at the eastern end of the "monument' where seeds may have arrived early from mature plants on the nearby undisturbed slopes, the *Coursetia* trees are much larger than those towards the middle

All three species belong to the Papilionoidea sub-family of the Leguminosæ and have grown well presumably because of their root nodules which would have allowed them to fix atmospheric nitrogen and increase the fertility of the regenerating soil.

We envision no difficulty in mass-producing any of these species; their seeds sprout easily after only a few days and the seedlings grow quickly. Although, like many legumes, they are probably susceptible to predation by Bruchidæ, there should be no difficulty in collecting sufficient seed if the beetle population can be controlled or if seed can be collected before beetle populations build up to troublesome levels.

Savonette is better adapted to the drier parts of Trinidad and may not fare as well in wetter conditions. This may restrict its use somewhat, but in a situation where there is no competition from other species because the area is denuded, it may grow sufficiently well to be useful. The other two species grow in central Trinidad as well as the Northern Range, on both sandy and clay soils and

Table 1. Plants found on the first three terraces in January 1984
H=herb, SS=sub-shrub, S= shrub, T=tree, V=vine

Family	Species	Habit
Polypodiaceae (ferns)	*Petrogramma colomelanos*	*h*
	Pteris vittata	*h*
	Nephrolepis multiflora	*h*
Malvaceae	*Sida urens*	*ss*
Bombacaceae	*Ochroma pyramidale*	*t*
Eleocarpaceae (Tiliaceae)	*Muntingia calibura*	*t*
Leguminosae	*Centrosema pubescens*	*v*
	Alysicarpus vaginalis	*h*
	*Stylosanthis hamata**	*h*
	Desmodium canum (supinum)	*h*
	Mimosa pudica	*h*
	Machaerium robinifolium	*t*
Myrtaceae	*Psidium guyava*	*t*
Melastomataceae (Melastomaceae)	*Tibouchina longifolia*	*ss*
Asteraceae (Compositae)	*Calea solidaginea*	*s*
	Erigeron canadensis	*h*
	emilia fosbeergii (coccinea)	*h*
	Bidens pilosa	*h*
	Pluchea canadensis (odorata)	*s*
	Chromolaena (Eupatorium) odorata	*s*
Gentianaceae	*Enicostema verticillatum*	*h*
Boraginaceae	*Cordia curassavica*	*s*
verbenaceae	*Lantana camara*	*s*
	Stachytarpheta jamaicensis	*h*
Lamiaceae (Labiate)	*Hyptis pectinata*	*h*
Polygonaceae	*Coccoloba latifolia*	*t*
Piperaceae	*Piper aduncan*	*s*
Euphorbiaceae	*Croton gossypiifolius*	*t*
Moraceae	*Cecropia peltata*	*t*
	Chlorophora tinctoria	*t*
Poaceae (Graminiae)	*Andropogon bicornis**	*h*
	*Panicum maximum**	*h*
	*Pennisetum setorum**	*h*
	*Rhynchelytrum repens**	*h*

in higher rainfall than at Lady Young, and may grow well enough to be useful everywhere. In any event, we do not advocate their immediate use in replanting projects. What we do advocate is that they should be tried in experimental plots where they may be compared with species now favoured by the Forestry Division. In our own small way we intend to pursue such trials.

Table 2. - Plants collected on the first three terraces in 15 September 1991. H=herb, S= shrub, T=tree, V=vine, P=parasite

Family	Species	Habit
Polypodiaceae (ferns)	*Nephrolepis revularis**	*h*
	Pteris vittata	*h*
Eleocarpaceae (Tiliaceae)	*Mintingia calibura*	*t*
Fabaceae (Leguminosae)	*Aeschynomene americana**	*s*
	Alysicarpus vaginalis	*h*
	*Stylosanthis hamata**	*h*
	Desmodium canum (supinum)	*h*
	*Lonchocarpus punctatus**	*t*
	Stylosanthes hamata	
	Machaerium robinifolium	*t*
Myrtaceae	*Psidium guyava*	*t*
Rubiaceae	*Spermacoce assurgens (Borreria laevis)**	*h*
	Spermacoce (Borreria) verticillata	*h*
	Gonzalagunia hirsuta	*s*
Asteraceae (Compositae)	*Baccharis trinervis**	*s*
	*Pollalesta (Oliganthes) condensata**	*t*
	Emilia fosbeergii (coccinea)	*h*
	Bidens pilosa	*h*
	Pluchea canadensis (odorata)	*s*
	*Tridex procumbens**	*h*
Apocynaceae	*Mesechites trifida**	*v*
Gentianaceae	*Enicostema verticillatum*	*h*
Boraginaceae	*Cordia curassavica*	*s*
Scrophulariaceae	*Achetaria guianensis**	*h*
	*Buchnera floridana (elongata)**	*h*
Verbenaceae	*Lantana trifolia*	*h*
	Stachytarpheta jamaicensis	*h*
	*Citharexylum fruticosum**	*t*
Piperaceae	*Piper aduncan*	*s*
Lorantaceae	*Phthirusa adunca**	*p*
Euphorbiaceae	*Euphorbia hyssopifolia**	*h*
Orchidacae	*Habenaria monorrhiza**	*h*
	*Oeceoclades (Eulophidium) maculata**	*h*
Iridaceae	*Cipura paludosa**	*h*
Cyperaceae	*Fimbristylis cymosa**	*h*
Poaceae (Graminiae)	*Andropogon bicornis*	*h*
	Panicum maximum	*h*
	Pennisetum setorum	*h*
	Rhynchelytrum repens	*h*

** Not recorded in table 1*

We can expect further changes at the "monument" and we intend to keep on investigating them both in the hope of discovering other useful species for revegetation projects and also because of interest in the purely scientific aspects of succession. One possible change (God forbid) is a resumption of quarrying at the site. This would bring an abrupt end to our activities. A more attenuated end will come with our advancing age. In the latter case we hope that other members of the Club will take over where we leave off.

Acknowledgements

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