

PROJECT COMPLETION REPORT

Title: **RESCUE AND COLLECTION OF ENDEMIC AND ENDANGERED PLANT SPECIES FOR BIODIVERSITY CONSERVATION**

Funding Institution: UK Joint Nature Conservation Committee (JNCC)

Funds provided by JNCC: £ 3,000

Contract No. C08-0180-0080

Implementing Agency: Department of Environment and Coastal Resources (DECR), Ministry of Environment and District Administration (MEDA)

Name of UKOT: Turks and Caicos Islands (TCI)

Project Duration: July 1 2010 - November 30, 2010

Executive Summary:

The DECR implemented a project on rescue and collect endemic and endangered plant species. The priority areas for collection were development sites such as housing complex, residential sites, road widening areas and disturbed areas. The goal of this project is to rescue endemic and endangered plants that are on the brink of destruction due to earth-moving associated with land developments such as construction of residential houses, business/industrial sites and hotels/resorts. Seeds of plant species that are not suitable for rescue (e.g. balling) are collected and seeds are sown in the nursery.

The rescue methods include balling, collection of wildlings and collection of seeds. Rescued plants were raised and nurtured at the Native Plant Biodiversity Conservation Nurseries in North Caicos and in Providenciales. The project has attracted volunteer groups (e.g. TC Environmental Cub and some schools).

At the end of the project, there are five (5) species endemic to TCI are growing in nurseries. One (1) TCI endemic species is protected in RBG Kew's Millennium Seed Bank but not yet in nursery propagation; one (1) species endemic to TCI and Cuba is in nursery propagation;

Eighteen species (18) and one (1) species variety endemic to the Bahamas Archipelago (including TCI) are under nursery propagation; One (1) species endemic to Bahamas Archipelago (including TCI) and south Florida is under nursery propagation and ten (10) native plant species classified as endangered by CITES and/or IUCN are under nursery propagation. Two (2) species endemic to the Caribbean Islands are also in cultivation, including one parasitic species that favours an endangered tree as its host. The project has safeguarded a total of 40 species in nursery propagation and has compiled data for propagation protocols for 39 species. Species-specific propagation methods in nursery were written and will function as propagation protocols for future efforts. Plant

Biodiversity Conservation Nurseries were quickly overwhelmed with numbers and species of endangered and endemic plants and significant standing-out room has been needed to hold plants.

Some of the plants derived from the project were planted in important sites such as the Bight Park Botanical Garden and road sides, while other plants were given to the TC National Museum Botanical and Cultural Garden in Grand Turk, where they are now labelled and publicly exhibited.

This project has rescued plant species that are listed as endangered by IUCN and CITES. The loss of biodiversity, and most importantly endemic and endangered plant species, could be prevented if proper rescue operation before land clearings and earth moving operations is done, coupled with appropriate post-rescue/collection care-practices.

Background of the Project

The TCI is home to 10 endemic plant species, including the national flower Turks & Caicos heather *Limonium bahamense*. These plants are only found in TCI. Approximately 20 further species are unique to TCI and a few other islands in the Bahamas Archipelago and nowhere else in the world, while many more are endemic to the Bahamas Archipelago including TCI, the oolitic limestone platform Florida-Bahamas-TCI-Cuba region, TCI and other nearby islands, and the Caribbean. Due to the bio-physical characteristics of the islands, and extensive development, many endemic plants and other ecologically and potentially economically important plants are imperilled. The ecological integrity and biodiversity of most of these islands and cays in the Territory are threatened by natural and anthropogenic disturbances. It is predicted that if no drastic move is made to rescue the threatened plants, the world may suffer permanent loss of precious plant species.

This project complemented the existing DECR's Plant Biodiversity Conservation Nursery that is being used by the Caicos Pine Recovery Project funded by OTEP. The rescued plants and/or newly propagated ones are raised in said nursery. The ultimate goal of this project is to build a collection of TCI and regionally endemic plants along with the appropriate data for their efficient *ex-situ* and *in-situ* conservation, propagation and management and GIS data on source populations that indicate species distribution through the islands.

Priority areas for collection of rescue plants are areas immediately proposed for site clearance and development with landowner or project management permission. Rescued plants were tagged, numbered, and accessioned in a database to record provenance, habitat and coordinates of place of collection. Collection of seeds of endemic and endangered plants focused on species which resist transplanting effort and in areas of significant populations of plants. Seed collections were limited to 20% of the total available seed at any given time. Varying techniques were used for transplanting mature rescued plants, sowing seeds and rooting cuttings; methods with best success rates will be developed into species-specific rescue and propagation protocols.

Rescue and Propagation Methods for Focus Plants

The plant species listed below were considered in experiment to determine suitability of methods in seed collection, germination, and growing-out for the focus plants.

Rescue of plants was carried out in areas slated for development. Most of the rescue operations were carried out by means of seed collections, as a number of the focus plants do not take well to transplanting. Some of these seed collections were split and portions were supplied to Royal Botanic Garden, Kew's Millennium Seed Bank for long-term conservation storage.

The table below includes common or local names and botanical names of the plants, along with the numbers of individuals rescued (estimated in some cases, where either plants are still in community pots or seeds are continually growing). Rescue methods are described for mature plant removal and seed collection as appropriate. Planting technique describes methods of potting up mature rescued plants or sowing seeds, including media used and treatment methods of planted pots. Notes are made explaining germination times, growth rates, and other methodological information, including disease risk and options for future trials that may work better. Status of plants is described in relation to the project prioritising plants that are endemic to the Turks and Caicos Island and surrounding areas, or bear an endangered status as described by either IUCN's Conservation Status or by listing on one of the appendices of CITES. In some cases, plants fit both the endemic and endangered criteria.

The table is divided roughly by plant endemic status with native endangered plants falling at the end of the table.

Common name	Botanical name	Number of individuals	Rescue method	Planting technique	Notes	Status
Turks and Caicos Islands endemic plants						
Caicos Orchid	<i>Encyclia caicensis</i>	3	Lift mature plants with root humus and phorophyte if possible	Pot up into 3 gal, pots with leaf litter, water amply.	Rescued plants bloomed shortly after potting up. <i>B N Manco started seeds in sterile agar flasks independently from project on 30 January 2010; by January 2011 plantlets about 0.5 - 1.0 cm tall with first true leaves and roots were growing robustly but not yet ready for deflasking. Details of flasking methods are included at the end of this document.</i>	TCI Endemic, CITES App II
Silvery Silverbush	<i>Argythamnia argentea</i>	7	Seed collection and planting.	Seeds planted in 4" pot on top of moistened ProMix and top-dressed with sharp rinsed beach sand; covered in plastic.	Seeds germinated in 13 days. Low germination rate (of 30+ seeds only 4 germinated). Seeds planted may have been too young.	TCI Endemic
Caroline's Pink	<i>Stenandrium carolinae</i>	1	Seed collection and planting.	Seeds planted in small tray on top of	Seeds germinated in 3-6 days. Low	TCI Endemic

				moistened ProMix and lightly top-dressed with sharp rinsed beach sand; bagged in plastic. Plants go dormant soon after first leaves are formed – do not throw away apparently dead plants without checking crown!	germination rate (of 10+ seeds, 3 germinated). Damping off is significant risk. Large grains and lightness of potting mix have been problematic so native loamy or silt soil may be a better option.	
TCI Heather	Limonium bahamense	6	Seed collection from old nursery plants.	Seeds sprinkled on ProMix and watered in.	Seeds germinate freely in 10+ days and persist for long time in soil; plant has nearly achieved a weed status in nursery. Volunteers in other plant pots are potted up together in 2's or 3's in 4" pots.	TCI Endemic
Lucayan Pear Cactus	Opuntia x lucayana	4	Cuttings (pads); seeds collected for MSB only. MSB seeds X-rayed as empty; vegetative propagation is better option.	Pads are allowed to scar for 10-14 days then planted in loose potting mix with plenty of perlite and sharp rinsed beach sand. Pads root within 10 days.	Wild plants seem to be dying off from a boring insect and bacterial or viral disease. Pads rot quickly if over watered.	TCI Endemic, CITES App II
Capillary Buttonbush	Borreria capillaris	Seeds for nursery collected	Seed collection for MSB only.			TCI Endemic

Jan 2011						
Bahamas Archipelago and Turks and Caicos Islands Endemic Plants						
Nash's Pepperwort	Marsilea nashii	2	Lifting of living clump divisions from mud into plastic bags with water.	Planted into 4" pots in ProMix and rested up to pot collar in fresh water.	Plants recover quickly from division and relocation and become tough-wiry, robust, and lush quickly in nursery. Divisions recover quickly even when roughly torn apart. Spores are produced but no visible evidence of these bringing forth new plants in nursery.	TCI and Bahamas Endemic
Nakedback Spurge	Euphorbia gymnonota	7	Seeds (mature and nearly mature) and lifting small plants	Seeds planted 2x depth of seed in ProMix and covered in plastic to keep moisture consistent germinate in 11 days with low success; seed maturity may have been a problem.	Nearly all relocated plants die – roots even on tiny seedlings are enormous and deep. All attempts to use cuttings failed; others have reported success with 4-6" cuttings in damp sand. Seeds often infested with grubs and must be completely mature to grow. Damping-off a significant problem until roots are well-established; water from bottom only.	TCI and Bahamas Endemic

					Seedlings are potted up in pots with limestone gravel in bottom, which seems to assist in drainage and root protection. Plants frequently lose lower leaves when up-potted but put on fresh growth quickly.	
Wilson's Pinweed Spurge	Euphorbia lecheoides	3	Seeds	Seeds sprinkled on sand/ ProMix mixture sprouted in 10-15 days.	Difficult to keep plants in "pampered" nursery setting – plants grow leggy and decumbent possibly from low light and heat and too much water. Plants flower within 5 months.	TCI and Bahamas Endemic
Haulbark	Thouinia discolor	4	Seeds	Seeds sprinkled on ProMix and lightly covered sprouted in 10 days with extremely high germination rate but many damped-off early.	Damping-off was a problem until plants had several leaves, at which point their growth slowed markedly. Up-potting encourages quicker growth.	TCI and Bahamas Endemic
Millspaugh's Century Plant	Agave millspaughii	21	Plantlets	Young plants collected from flowering stalks of dying plants (this species apparently does not produce	Able to withstand culture in cell tray for quite a long time; restriction of root mass slows but does not halt plant growth.	TCI and Bahamas Endemic

				fertile seed and reproduces exclusively though (plantlets) potted in a perlite/ ProMix substrate in cell trays rooted within 2 days and developed vigorous root systems quickly.		
Smooth Pear	<i>Opuntia bahamana</i>	2	Cuttings (pads)	Pads root in well-drained medium of ProMix and perlite in several weeks.	Nursery plants display floppy, weak growth possibly due to over-watering and low light. Conditions improved markedly when moved out of shade house into full sun. Ungainly in light pots and would do better in heavy ceramic planters.	TCI and Bahamas Endemic, CITES App II
Horse Pear	<i>Opuntia nashii</i>	11	Pups/ plantlets	Pup plantlets growing out of fruit root quickly in ProMix but grow slowly thereafter.	Ungainly in light pots and would do better in heavy ceramic planters. Plants may flower at small size of 25 cm tall.	TCI and Bahamas Endemic, CITES App II
Red Powderpuff	<i>Zapoteca haematomma</i>	30+	Small plant dug from new road bed. Nearly-mature seed pods collected into	Plant potted up into 3 gallon pot in ProMix and rinsed sharp beach sand mixture adapted well.	Plant blooms profusely in nursery, year-round. Apparently flowers are not self-fertile. Attempts to pollinate	TCI and Bahamas Endemic

			cloth bags and allowed to explode inside. Many seed pods empty/ infested with worms.	Seeds planted one seed's width deep in ProMix sprouted after 5 days. No scarification necessary.	by hand with flowers from other plants failed; plant may have specialised natural pollinator.	
Bahamas lovegrass	Eragrostis bahamensis	2	Seeds collected from plants with dry spikes.	Seeds sprinkled on dense potting medium sprouted intermittently with heavy rains.	Probably better to produce from divisions of clumps than seeds.	TCI and Bahamas Endemic
Wild Thyme	Euphorbia inaguensis	0	Seeds	Seeds planted in washed beach sand in 4" pot, lightly covered with sand and held in tray covered in plastic germinated in 17 days with high germination rate. All plants damped-off after forming woody stems. Next time try shallower pot and keep dryer.	Mycorrhizal associations in natural habitat may be necessary and growth of potted plants will be monitored. Leaf and stem shape in comparison to plants from which seeds were collected may also assist in determination of whether or not <i>Euphorbia inaguensis</i> and <i>E. vaginulata</i> are conspecific, as key is determined by factors that may be influenced by growth environment.	TCI and Bahamas Endemic
Cocobey	Cordia bahamensis	15+	Seeds	Seeds planted in tray on moistened	Seedlings transplant into pots well if given	TCI and Bahamas

				ProMix topped with ¼" rinsed sharp beach sand germinated in 21 days with very high germination rate.	50:50 mix of ProMix: rinsed sharp beach sand. Steady vigorous grower.	Endemic
Rong Bush	Wedelia bahamensis	6	Seeds	Seeds sown in ProMix sprout within a week but high incidence of damping-off.	Difficult to find non-predated seed; check less mature (still green) involucres for best seed. Keep shaded from rain and water from bottom of tray/ pot. Plantlets recover very well from disturbance and wilting if watered well.	TCI and Bahamas Endemic
Inagua Silver Thatch Palm	Coccothrinax inaguensis	128	Seed: berries cleaned by hand by rubbing between shade cloth pieces and rinsing.	Seeds sown in ProMix topped with 1" rinsed sharp beach sand germinated in 15 days and continued for another 20 days until nearly 100% of seeds were sprouted.	As soon as seedlings had first leaf, they were transplanted to 4" pots with ProMix/ sharp rinsed beach sand mixture to allow root growth in pot. After growing second leaf, growth slowed markedly. Damping off has been slight problem (lost 5-10 seedlings). Over-watering by too much rain continues to cause moss growth in	TCI and Bahamas Endemic

					pots. New flush of growth put on in December 2010; most seedlings had 3-4 leaves and healthy root growth.	
Frenning's Gum Elemi	Bursera frenningae	79	Seed: collected in 2008 and stored. Planted nearly 2 years later; seeds still had high germination rate.	Seeds planted in used ProMix and sand mixture sprouted in 24 days.	Growth was swift; seeds planted 10 March 2010 produced 0.4 m saplings by 1 December 2010. Green scale insect, aphids, and mealybugs have been troublesome but easily controlled with soap spray. Plants put on a swift burst of growth when up-potted. Nursery plants have never gone dormant due to constant watering, and are now as big as plants grown from seed at RBG Kew from a seed collection made two years previously (under UK glasshouse conditions); and also bigger than plants grown at the same time by B N Manco, but these plants were	TCI and Bahamas Endemic

					allowed to go dormant in dry season.	
Brasiletto	<i>Caesalpinia reticulata</i>	8	Seed: dry	Seeds nipped with knife or nail clippers and planted seed's length deep in moistened ProMix, then bagged in plastic. Seeds germinate within 4 days. Seeds seem to have low fertility rate and rot easily.	Seeds difficult to procure because many are predated by insects, and pods explode when ripe, scattering seeds.	TCI and Bahamas Endemic
Bahamas Swamp Bush	<i>Pavonia bahamensis</i>	30+	Seed: dry	Seeds planted on moistened ProMix and topped with ¼" sharp rinsed beach sand germinate nearly 100% within 14 days. Transplant to cell trays well and grow steadily.	Growth slow but steady to form sturdy small plants. Very few losses. Extremely sensitive to damage from pink hibiscus mealybug.	TCI and Bahamas Endemic
Britton's hibiscus	<i>Hibiscus brittonianus</i>	5	Seed: dry (irritant hairs on fruits, clean with protection)	Seeds planted in moistened ProMix and pressed in and lightly covered, began sprouting in about 60 days.	Slow growth, but sturdy plants.	TCI and Bahamas Endemic
Five fingers	<i>Tabebuia bahamensis</i>	1	Seed: Collected from mature fruits.	Seeds scattered on moistened ProMix in 4" pot and scratched into surface, then	Germination ratio very low but seed appeared healthy. May need shallower or deeper planting, or	TCI and Bahamas Endemic

				bagged in plastic; none germinated. Later, recycled soil yielded one very vigorous seedling which was potted by itself.	perhaps disturbance (plant often grows up wild on disturbed sites).	
Turks and Caicos Islands and Cuba Endemics						
Cuban Shamrock	<i>Oxalis eggersii</i>	15+	Harvest of mature bulbs and planting of seed produced in nursery	Seeds are scattered from explosively dehiscent capsules and colonise other plant pots. Seedlings moved to 4" pots in ProMix in 2's or 3's.	Plant has quickly attained a weedy status in nursery as most <i>Oxalis</i> species do, but seems to out-compete far more harmful weed <i>O. corniculata</i> .	TCI and Cuba endemic
Caribbean Endemic and Endemic Varieties of More Widespread Species						
Whitewood	<i>Drypetes diversifolia</i>	3	Seed: cleaned by hand with water and knife to remove fibrous fruit and pulp.	Seeds planted one seed's depth deep in cells with ProMix. Germination poor – of 40 seeds planted, only 2 grew within the first 2 months. Seeds may require longer time to germinate.	Seeds have come up gradually and irregularly. Next planting we will try light and heavy scarification and hot water treatments prior to planting.	Caribbean endemic
Inagua lycium	<i>Lycium tweedianum</i> var. <i>chrysocarpum</i>	12	Seed: cleaned by squashing fruits on newspaper and rubbing until dry.	Seeds sprinkled on moistened ProMix in 4" pot and scratched into surface, then bagged in plastic.	Seedlings appear very different from wild seedlings; more and larger leaves, likely due to favourable growing conditions.	TCI/ Bahamas endemic variety.

				Germination rate very high with many healthy seedlings after only 8 days. Damping-off and drying out proved problematic and soil moisture should be carefully controlled.	Growth form of plant is variable throughout range, and in different growing conditions. Our variety is a Bahamas/ TCI endemic but horticultural growth form may bring the taxonomy into question. Try heavier media in shallower containers next time.	
Box briar	Oplonia spinosa	20+	Seed: Collected near-ripe fruit (mature fruit explosively dehiscent and scatters tiny seeds), dried in cloth bag to save seeds.	Seeds sprinkled on moistened ProMix in 4" pot and scratched into surface, then bagged in plastic. Some seeds sprouted after 25 days and grew woody, spiny stems very quickly. Many more seeds sprouted after another 25 days (nearly every seed planted) by which time first set of seeds produced woody plants 3-5 cm high.	Fairly fast-growing once woody stem forms; spines form quickly. Tolerant of crowding at early stages.	Caribbean endemic

Purple mistletoe	Dendropemon purpureus	2	Seed: Collected moist fruits and squeezed seeds out, kept on moist paper towels and allowed them to sprout.	Used seeds' natural glue to stick to two host plants – Pithecellobium keyense and Swietenia mahagoni. Most did not take, and dried up. Two took well on Swietenia mahagoni but growth during and after haustoria formation is extremely slow!	Need to establish mature Pithecellobium keyense (preferred host in TCI) in pots to grow this species properly.	Caribbean endemic genus.
Endangered Plants Native to Turks and Caicos Islands						
Turk's Head Cactus	Melocactus intortus	150+	Seed: cleaned by squashing fruits on newspaper and rubbing until dry.	Seeds sprinkled onto pressed, moistened perlite in tray germinate nearly 100% after 6 days when covered in plastic and kept moist but protected from rain and disturbance.	Fine perlite may prove better as coarse variety sometimes loses seeds or plantlets into gaps between grains. Uncovered trays that get rain on them lost nearly all plantlets because of looseness and lightness of perlite. Susceptible to a round scale insect; application of soap spray left on for 2 hours then washed off	CITES App II

					carefully controls this problem. Overwatering due to unusually rainy dry season led to root rot in some specimens; species requires protection from excess watering.	
Woolly Nipple Cactus	Mammillaria nivosa	50+	Seed: cleaned by squashing fruits on newspaper and rubbing until dry.	Seeds sprinkled onto pressed, moistened perlite in tray germinate nearly 100% after 6 days when covered in plastic and kept moist but protected from rain and disturbance. Plantlets rot if too moist. Seeds sprinkled on ProMix/ beach sand mixture germinate more slowly and erratically but seed to produce fewer plants but of more stable, healthy quality.	Fine perlite may prove better as coarse variety sometimes loses seeds or plantlets into gaps between grains. Uncovered trays that get rain on them lost nearly all plantlets because of looseness and lightness of perlite. Covered trays sealed too tightly in plastic suffered losses due to fungus. Best method found is to hover clear plastic cover about 1 inch over trays to allow air flow but stabilise humidity and keep rain off.	CITES APP II
Tall Orchid	Encyclia altissima	30+	Lift mature plants with root	Pot up into 3 gal, pots with leaf litter,		CITES App II

			humus and photophyte if possible	water amply.		
Red Orchid	<i>Encyclia rufa</i>	1	Lift mature plants with root humus and photophyte if possible	Pot up into 3 gal, pots with leaf litter, water amply.		CITES App II
Stinking Pea Root	<i>Ateleia gummifera</i>	16	Seeds	Seeds planted in moist ProMix germinate with high success rate within 9 days. Plants grow rapidly into 2" seedlings and harden off to form tiny woody trunks within 4 months.	Until woody trunks are formed, mealybugs and woolly aphids can be troublesome. Round black scale insect infested leaves until controlled. Root growth slow.	IUCN Endangered
West Indian Mahogany	<i>Swietenia mahagoni</i>	1000+	Seeds collected, cleaned (wing removed), then refrigerated for 1-4 months.	Seeds planted densely in deep trays in used ProMix. Seeds sprouted within 12 days and were up-potted (tap roots trimmed) when they had several leaves.	High germination rate and growth success. When regularly up-potted, trees up to 0.5 m can be produced in 4 months. Plants also respond tolerably to stunting in small pots, but leaf burn can be a problem.	IUCN Endangered, CITES App II
Sacred Lignum Vitae	<i>Guaiacum sanctum</i>	300+	Seeds cleaned of arils by rubbing between screen in water	Seeds planted one seed's length deep into moist ProMix. Seeds sprouted within 21 days and	High germination rate.	IUCN Endangered, CITES App II

				formed several leaves quickly, then growth slowed.		
True Lignum Vitae	Guaiacum officinale	20+	Seeds cleaned of arils by squeezing	Seeds planted one seed's length deep into moist ProMix began sprouting within 30 days. Seedlings immediately discernable from <i>G. sanctum</i> ; always with 4 leaflets rather than 6, and more yellow-green.	Strong robust seedlings, though germination seems staggered or poor. Many seeds remained unsprouted as of late December 2010, but when an additional layer of potting media was added in January 2011, many seeds began to sprout.	IUCN Endangered, CITES App II
Satinwood	Zanthoxylum flavum	50+	Seeds, collected when fruit still closed but ripe.	Seeds planted shallowly in used ProMix and sand mixture. Sprouted within 13 days and continually thereafter. High germination rate. Freshly harvested seeds grew well. Seeds harvested in 2008 and stored fared poorly with only a few seeds sprouting.	Small plants susceptible to root damage and damping-off but grow well once established. Growth rate varies wildly. Susceptible to pests including several types of scale, mealybug, and aphids; also whitefly. Pests caused considerable stunting and malformation of leaves but treatable with soap spray. Ants encouraged pests. Within 10 months,	IUCN Endangered

					plants varied from having just sprouted to 17 cm tall.	
Dildo Cactus	Pilosocereus royenii	6	Seeds, and rescued seedlings.	Seedlings lifted with humus attached to roots, and potted gently on top of ProMix, sand, and local soil blend. Seedlings appeared as volunteers in old potting mix.	Potted plants are ungainly and fall over easily and so require tying or bracing to a post or fence. Susceptible to a round scale insect; application of soap spray left on for 2 hours then washed off carefully controls this problem.	CITES App II

Flasking techniques used for Encyclia orchids:

Prepare flasks 4-5 days prior to sowing seeds. This will give time for any unsealed or contaminated jars to grow mould or bacteria and be discarded. All of these methods work far better if there are two people to assist one another. Discuss methods and demonstrate if needed before incorporating a new trainee into assistant's position.

Materials:

1. Clean glass pint jars
2. Clean glass quart jars
3. Autoclave or large-capacity pressure-cooker
4. Aluminium foil
5. Plastic cling film
6. Scotch tape
7. Paper towels
8. Metal tongs
9. Glass plate
10. Scalpal
11. Fine forceps
12. Hemostats
13. Needle dissecting tool
14. Rubbing alcohol 70%
15. Bleach (diluted to 10% with water)
16. Antibacterial soap
17. Candle
18. Glass aquarium, set on its side with opening facing worker
19. Pre-mixed agar medium
20. Coffee filters
21. Graduated beakers (100 and 1000 ml)
22. 2-quart saucepan

Agar medium recipe:

(Makes 1 litre medium)

900 ml rainwater, pre-boiled and filtered

100 ml fresh coconut water, filtered

20 g table sugar

¼ tsp soluble orchid fertiliser

Mix above ingredients in saucepan over medium heat. Bring to the very beginning of boiling and turn off heat. Add:

13 g food-grade agar powder

Mix well until all agar is dissolved. Pour liquid either into quart jars to store for later in the refrigerator (cover tightly with cling film and scotch tape around jar neck) or pour 1-2 cm deep into bottom of washed pint jars (cover tightly with aluminium foil and press around jar neck)

Prepare flasks:

Methods:

1. Close windows and turn off fans.
2. Thoroughly clean countertop with antibacterial soap, then with bleach.
3. Wash all jars with antibacterial soap, then with bleach solution; allow to drip-dry upside-down.
4. Pour prepared liquid medium or spoon prepared solid medium into jars and cover tightly with 2 layers of aluminium foil. Press foil firmly around neck of jar.
5. Place jars into pressure cooker or autoclave and close lid (follow autoclave/ pressure cooker directions for water and heat).
6. Autoclave at 15 psi for 20 minutes.
7. Allow apparatus to cool to handling temperature and safe internal temperature for opening.
8. Open apparatus and remove jars to countertop to cool.
9. Allow jars to set for 4-5 days. Discard any with bacteria or mould growth immediately (or remove jars from room, and wash out agar elsewhere, for recycling of jars).

Sow seeds:

Green pod flasking method: Needed are mature, nearly ripe green pods (still closed but ready to open) of *Encyclia* orchids.

1. Cover mouth/ nose with mask. Close windows and turn off fans.
2. Prepare a small jar of 70% alcohol for soaking tools, and one of 10% bleach solution for cleaning. Light candle.
3. Wipe prepared flasks with paper towel soaked in bleach solution and place into aquarium.
4. Wash and scrub pods thoroughly but gently with antibacterial soap.
5. Soak for 10 minutes in 10% bleach solution.
6. Bleach inside of aquarium and glass plate.
7. Dip haemostats in alcohol, and flame. Repeat.
8. Use haemostats to retrieve a pod from bleach solution, shake off excess bleach.
9. Dip pod in alcohol and flame quickly. Repeat.
10. Dip scalpel in alcohol and flame. Repeat.
11. Rest haemostats and pod on glass plate. Slice open pod with scalpel.
12. Dip needle tool in alcohol, flame, repeat.
13. Gather orchid seed on needle tool.
14. Carefully open aluminium foil of one flask inside aquarium, tap small quantity of orchid seed in, and quickly cover jar with cling film. Tape thoroughly around jar neck with scotch tape.
15. Repeat with other jars.
16. Label jars and place in light box with fluorescent grow-lamp on 24 hours.

Protocorms will form within several weeks. By one year of age, plantlets should be about 1 cm tall and have root systems. They are not yet ready for deflasking at this stage.

Lessons Learned:

1. It is possible to rescue and/or collect planting materials from areas on the brink of destruction due to anthropogenic actions in the guise of development.
2. Plants respond to various rescue methods. Not all plants could be rescued through balling. Some plants are easier and more practical to collect seeds than balling the whole plant.
3. It is important to have a rescue program authorized by the government so that plant species that are locally or internationally important would not decimate.
4. Proper dissemination of the advantages of the rescue operation draws support from the concerned individuals and groups.
5. A species specific propagation protocol is important as some species do not respond to generalized method of propagation.
6. Rescued plants or germinated seeds require suitable area (shaded nursery) to grow where appropriate care and maintenance are provided before they are outplanted.
7. The orchids can be propagated using modified agar and flasking method.

Recommendations:

1. The rescue of endemic and endangered plant species should be continued and focus of collection remains the same – proposed and on-going development sites.
2. Rescued plant should be out-planted in selected sites such as the Botanical gardens or road side planting, as appropriate, to showcase that rescuing plants is a viable approach to maintain biological diversity, in addition to enhancing the aesthetic value of the site.
3. Awareness campaign should be conducted at various levels (schools, business/corporate groups, and government officials/policy making bodies).

Project Staff:

Technical Staff: Bryan Manco
Eric F. Salamanca

Support Staff: Judnel Blaise - North Caicos Nursery
Kenol Joseph – Providenciales Nursery
Jacques Pierre – Providenciales Nursery

DECR Administrative Staff who directly supported the project:

Wesley Clerveaux – Director
Jewel Batchasingh – Deputy Director
Marlon Hibbert – Scientific Officer
Leroy Brooks – Deputy Conservation Officer
Rhodriquez Ewing – Conservation Officer
Lormeka Williams – NEC Curator/Acting Education Officer

Volunteers: Turks and Caicos Environmental Club members

Cooperating/Assisting Organization:

UK's JNCC
Royal Botanic Garden Kew
Provo Power Company (PPC)

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