



# DEPARTMENT OF ENVIRONMENT

CAYMAN ISLANDS GOVERNMENT

## Report

### **Experimental culls on invasive Green Iguanas, 2016**

#### **Executive Summary:**

Surveys show that Grand Cayman's invasive Green Iguana population is doubling every 1.5 years, threatening a catastrophic impact on the natural environment and socially unacceptable problems for agriculture, infrastructure and residential areas.

Experimental culls in June 2016 resulted in the removal of 18,838 Green Iguanas, mainly from western Grand Cayman. Bounty hunter groups and skilled hunters under contract both averaged approximately 100 iguanas culled per day.

Use of the DoE compound for receiving and counting dead iguanas is not viable as a long term arrangement. Bounty hunting proved to be problematic in practice, and for future work the contract approach is recommended.

The scale of the Green Iguana control challenge exceeds DoE's current capacity, and requires Government to consider options to resource this major undertaking.

## **Rationale:**

On 24<sup>th</sup> February, 2016 the National Conservation Council (NCC) accepted a proposal from its Invasive Species Committee to conduct experimental Green Iguana culls on Grand Cayman, and delegated the implementation of this proposal to the Department of Environment (DoE).

The reasons behind this proposal were as follows:

1. Population surveys by DoE of the Green Iguana population indicate that a major population explosion of this invasive species was underway, rising from about 200,000 in 2014 to 300,000 in 2015, doubling every 1.5 years.
2. Impacts to domestic environments, commercial landscaping, agriculture, utility infrastructure, and natural environments are so severe that current Green Iguana population levels, let alone the ongoing increase, is unacceptable to society.
3. Almost no locally relevant information or experience was available to assess what an effective control program would cost, or how it should be designed to be most cost-effective and manageable. Gathering this information and experience required trying out different approaches in practice.

Funding granted from the Environmental Protection Fund to the NCC was available for this work in the 2015-16 financial year.

## **The Experiments:**

Two culling experiments were conducted by DoE in June, 2016. One involved skilled hunters under contract to clear specific areas. The second experiment tested a limited “bounty” approach.

### Skilled hunters under contract:

The first experiment focused on three specific areas in western Grand Cayman, where Green Iguana population densities are very high: The Shores subdivision, the SafeHaven Golf Course, and the Britannia Golf Course.

Three experienced iguana hunters, who were licensed firearms users with suitable air rifles, were contracted by DoE. Each hunter was contracted to work on one of the three areas. The contracts were structured with a strong performance bonus incentive to bring the Green Iguana populations in these areas down by at least 90% in two weeks.

All iguanas culled in these areas were brought to DoE for counting, and to obtain biological data relevant to forward planning.

The three areas were surveyed by DoE staff before and after the culls, to record the actual change in Green Iguana population density and so to measure the success of the culls.

### Restricted Bounty:

A public meeting was held by DoE in December 2015, to which all resident persons who had experience in, or interest in culling Green Iguanas, were invited. All attendees at that meeting were later invited to participate in the restricted bounty experiment. From that pool of interested and motivated people, 18 individuals came forward to be registered as cullers for a one-week experiment that followed the skilled hunter trial. The primary focus area was from Grand Harbour to Barkers, including George Town, the Seven Mile Beach and West Bay.

Registered cullers agreed to observe conditions relating to humane killing of iguanas, and to bring freshly culled iguanas at set times to DoE for counting. Registered cullers were free to involve other people under their registration, making independent financial arrangements, provided all persons operating under the registered cullers observed the same conditions.

Counted iguanas from registered cullers were tallied for a final payment to each registered culler of \$5 per iguana.

### **Findings:**

#### Effectiveness:

Skilled hunters under contract were successful in two of the three areas. In both golf course properties, Green Iguana populations were brought well past a 90% reduction in two weeks. However, as soon as the cull ended, Green Iguanas very rapidly re-invaded from adjacent land.

In the Shores subdivision, skilled hunting was less effective, at least in part because a large proportion of the target iguanas were relatively inaccessible and hard to detect due to mangrove habitat and canals.

In two weeks, the three skilled hunters removed a total of 4,370 Green Iguanas from these three sites, killing an average of 100 iguanas per day and achieving overall a 93% reduction of the population in all three sites at the start of the cull.

Bounty hunters were also effective, removing 14,468 Green Iguanas mainly from western Grand Cayman, in one week. Registered cullers (in groups including their associates) each culled an average of 109 Green Iguanas per day.

Costs:

Direct payments to hunters / cullers were as follows:

Method	Total Iguanas Culled	Total Payment	Average cost per Iguana
Skilled Hunters	4,370	\$ 25,000	\$ 5.72
Bounty Hunters	14,468	\$ 72,045	\$ 5.00

However, there was considerable variation between skilled hunters: the most cost-effective skilled hunter culled 3,024 iguanas for \$10,000 which is equivalent to \$3.31 per iguana.

In addition to payments to hunters, the main cost to DoE was an immense demand on staff time, preceding and during the culling experiments.

For example, at least 349 staff person-hours were expended in counting the 14,468 iguanas from the restricted bounty experiment alone. Costs during the restricted bounty experiment also included rental of a disposal skip, and protective clothing for staff handling iguana carcasses. Factoring in these indirect costs, the real cost to the Cayman Islands Government during the restricted bounty experiment was equivalent to \$5.91 per iguana.

The full expenditure record for the trial culls is presented at the end of this document.

Operational limitations and concerns:

In the course of these two experimental culls, a number of operational limitations and concerns became apparent. These are important considerations in planning future operational Green Iguana control measures.

1. The demand on DoE staff time required by the experiments was unsustainable, as this diverted many staff from a wide range of primary duties for an extended period. The Department cannot continue on this basis, and certainly cannot envisage operating a larger scale operation of that kind with existing resources.
2. The cost of the operation in financial terms was higher than DoE staff and management feels is ideal.

3. Offensive odour and contamination of the counting and disposal area created an unpleasant working environment, and stimulated complaints from neighbouring buildings and workers.
4. During the limited bounty experiment, conditions imposed on the hunters were not effectively communicated to their subordinate team(s). As a result inhumane treatment of iguanas occurred, and a growing number of unaffiliated persons sought to get involved. By the end of the week, this led to some disorderly and even aggressive interactions with DoE's counting staff.
5. Scaling up the operation to the level required to reverse the Green Iguana population growth will require an approach which reduces DoE overheads, and keeps down the per-iguana cost. DoE estimates a cull of 177,500 adult and sub-adult iguanas per year will be necessary to initiate a decline in the Green Iguana population if we begin the operational cull in 2017. This implies an operation almost ten times larger than the recent experimental culls.
6. In the first year of a sufficiently resourced cull, a biomass of the order of 200 tons of iguana carcasses per year will be generated and will have to be disposed of. During the June 2016 experiments it already became clear that incinerator capacity at the George Town landfill would be nowhere near sufficient to handle this kind of mass, in event it is brought back into service. While it is possible that some fraction of the cull may be taken for human consumption, we must expect that the vast majority will have to be received by and disposed of at the landfill facility. Arrangements may need to be developed with the Department of Environmental Health.

## **Future Strategy Alternatives:**

### Bounty Hunting:

By its nature, bounty hunting requires an independent agency to count culled Green Iguanas in order to calculate and justify payments to hunters. At operationally useful scales, this requirement creates a major overhead which DoE cannot meet with existing staff resources.

Other issues with management of humane treatment of iguanas, difficulties in paying government funds to unregistered members of the public, handling of old, decomposing carcasses etc, all combine to make this a severely problematic option.

### "Honeypot" Hunting:

The observed pattern of rapid immigration to recently culled sites such as golf courses (which support high densities of Green Iguanas), suggests that sustained culling in such areas could

progressively draw in and kill iguanas from surrounding lands. Such immigration can be extremely rapid: for example after the skilled hunter cull successes were verified by surveys, immigration of iguanas from surrounding areas resulted in an 82% rebound in these three cull sites, in only two weeks.

A network of appropriately spaced honeypot areas could effectively clear iguanas from a much larger area. The optimal spacing of honeypot areas would initially have to be determined on the ground, by survey work, and may vary depending on land use in and around the culling zones.

If honeypot culling was conducted as a sequence of culling contracts in the specified area, repeated at appropriate intervals, the honeypot area would act as a population trap, drawing in and removing iguanas from surrounding areas, for as long as the effort continued. This approach could be implemented without the overhead burden of counting culled iguanas, by issuing repeating contracts with performance incentives based on before-and-after population surveys. This is the payment structure we used successfully in the skilled hunter experiment, and it should work equally well without any requirement to receive and count the culled iguanas.

#### Progressive Area Clearance:

By beginning an area-by-area cull from one end of the island and proceeding systematically forward, an area cull operation can avoid being undermined by reinvasion. As with honeypot culling, this approach also can be implemented without the overhead burden of counting culled iguanas, by issuing contracts with performance incentives based on before-and-after population surveys.

#### Before-and-after surveys to measure culling contract fulfillments:

In the course of population surveys in 2014 and 2015, and additional surveys focused on the cull areas in the experiments, we have found our survey techniques to be consistently accurate and reliable, provided that observers are well trained. We can therefore be confident in using these surveys to assess contract performance and estimate the numbers of iguanas being culled.

Before-and after surveys would remain a DoE overhead, but these require a lower staff commitment than daily counting of culled iguanas.

## Expenditure 2015-2016

The following expenditure was made by DoE up to 30<sup>th</sup> June 2016, from EPF funds authorized through the National Conservation Council, for the experimental green iguana culls reported above.

GL Date	Vendor Name	Line Description	Debit
15-Dec-15	Cayman Airways	GWYQEP - M. Vallee - Green Iguana Meeting - PO # 3211	127.05
18-Dec-15	Tortuga Rum Co	Refreshments - Green Iguana Meeting - Dec 10th - PO # 3213	53.58
18-Dec-15	Foster's Food Fair	Refreshments - Green Iguana Meeting - Dec 10th - PO # 3212	60.11
02-Jun-16	DoE petty cash	Scale Weight Etc. - Iguana Culling	51.25
08-Jun-16	AL Thompson's Home Depot	Hand Sanitizer-dusk masks- litter trays - Green Iguana Project - PO # 3723	39.95
08-Jun-16	Cost U Less	Sponges-Gloves-Bleach-Clipboards-Receipt Book - Green Iguana Project - PO # 3722	51.12
08-Jun-16	Kirk Home Centre	Safety Goggles & Coveralls - Green Iguana Project - PO # 3721	29.42
08-Jun-16	Roper Enterprises Ltd	Rubber Apron - Green Iguana Project - PO # 3720	26.95
08-Jun-16	Uncle Bill's Home Improvement Centre	Rain Suit- Green Iguana Project - PO # 3719	30.50
10-Jun-16	Cost U Less	Sponges-Gloves-Bleach-Clipboards-Receipt Book - Green Iguana Project	20.99
16-Jun-16	AL Thompson's Home Depot	3 x storage totes & rubber boots - Iguana Project - PO # 3730	131.00
21-Jun-16	Cost U Less	Tents x 2 - Green Iguana Project - PO # 3759	399.98
23-Jun-16	Kirk Home Centre	Coveralls - Iguana Project - PO # 3752	82.40
23-Jun-16	Cost U Less	Rubber Gloves - Iguana Project - PO # 3745	50.00
23-Jun-16	AL Thompson's Home Depot	Wheel Barrow - Iguana Project - PO # 3751	135.00
26-May-16	Burke, Troy	Project Mobilisation - Green Iguana Culling	3,000.00
26-May-16	McLean's Culling Services	Project Mobilisation - Green Iguana Culling	3,000.00
26-May-16	R & B Garden & maintenance services	Project Mobilisation - Green Iguana Culling	3,000.00
20-Jun-16	Burke, Troy	Green Iguana Culling - June 2016	2,000.00
20-Jun-16	Ebanks, Clell Brad	Green Iguana Culling - June 2016	2,000.00
20-Jun-16	McLean's Culling	Green Iguana Culling - June 2016	2,000.00

	Services		
23-Jun-16	Professional Waste Management	Delivery & removal of container Jun 20th - 27th 2016 - Iguana Project - PO # 3753	925.00
01-Apr-16	Rivera-Milan, Frank F	Iguana surveys and data analysis Nov-Dec 2015	7,070.00
04-Apr-16	Rivera-Milan, Frank F	Iguana Surveys and report, Feb & March, 2016	2,680.00
04-Apr-16	Royal Bank of Canada	Bank wire charges	35.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	2,930.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	8,395.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	6,280.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	100.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	735.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	970.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	1,145.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	1,275.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	1,345.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	2,440.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	11,640.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	3,015.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	3,095.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	3,240.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	3,280.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	3,420.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	4,060.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	4,195.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	4,285.00
30-Jun-16	Ebanks, Clell Brad	Iguana Culling Performance Incentive	5,000.00



30-Jun-16	McLean's Culling Services	Iguana Culling Performance Incentive	5,000.00
30-Jun-16	Registered Bounty Hunter	June '16 Iguana Culling Pilot Programme	6,200.00
<b>TOTAL</b>			<b>109,044.30</b>