
Artificial retreats for restoration of Grand Cayman blue iguanas to the wild: a report to the British Herpetological Society (BHS)

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THE endemic Grand Cayman blue iguana, *Cyclura lewisi*, is the most endangered of the West Indian rock iguanas, having reached functional extinction in the wild by 2002. Once native in coastal and dry shrubland habitats throughout Grand Cayman, it had declined severely by 1925, as a result of the introduction of dogs, cats and rats, and the colonisation of coastal habitats by humans. By 1993 the population was estimated to have declined to around 150-200 individuals, and by 2002 that number had further plummeted to 10-25 individuals.

The Blue Iguana Recovery Programme was established as a self-contained programme of the National Trust for the Cayman Islands in 2002. It evolved from captive breeding and research efforts commenced by the Trust in 1990, forming significant international partnerships after a workshop to develop the first Species Recovery Programme for the blue iguana. This was held on Grand Cayman in 2001 with the IUCN-SSC Iguana Specialist Group.

The Queen Elizabeth II Botanic Park (QEIBP) on Grand Cayman continues to be an ideal site to pilot techniques to restore Grand Cayman blue iguanas to the wild. Although the 26 ha site is too small to sustain a genetically viable wild population in isolation, a managed, free-roaming breeding population has been established there (from captive bred stock), since 2001. Easy access throughout the QEIBP combined with the presence of the Blue Iguana Recovery Programme's two Blue Iguana Wardens provide an excellent opportunity to test techniques which can subsequently be used for large-scale population restoration in the Salina Reserve and other areas on Grand Cayman.

The use of artificial retreats for blue iguanas

was first developed in the QEIBP, arising from observations of iguanas released there and the unexpected preference they showed for retreats in artificial structures rather than natural rock holes. By 2004 a series of experimental designs led us to a "Mark 5" wood retreat for two-year-old iguanas which showed remarkable efficacy in anchoring newly released iguanas within the (unfenced) protected habitat, and also providing some protection from predators. This retreat design was used (sized for two- and three-year-old iguanas) in subsequent large scale releases in the Salina Reserve. It has become apparent over the years that natural retreats of suitable configuration for various ages of iguanas are a significant factor limiting population density both in the QEIBP and the Salina Reserve.

The purpose of the current BHS Captive Breeding Committee funded project was to design and investigate the use of retreats with both younger and older age groups, to help manage the increasing numbers of wild hatched juveniles, and to aid in retention of the Park's older breeding iguanas as they outgrow the existing Mark 5 retreats.

Hatchling Retreats

Observations on the behaviour of newly emerged *Cyclura lewisi* hatchlings (Fig. 1) are extremely sparse, as indeed are such observations for any *Cyclura* species. The first few months of life are characterised by extremely low observability, and radio tracking studies are limited in value due to possible effects of transmitter weight on escape acceleration during snake strikes.

What little information as was available at the start of this work indicated that hatchlings spend the majority of their time in trees, so it was hypothesized that they would be more likely to

adopt arboreal retreats than simulated rock holes. A simulated tree hole retreat was developed that could be strapped to tree branches using cable ties. The retreat was initially fashioned from a piece of driftwood, split lengthways and carved internally to provide a straight resting space and a turning chamber, dimensioned to an average sized hatchling. We molded the resulting 2-piece retreat in rubber, supported by a fiberglass shell, and poured the production retreats using a lightweight concrete (vermiculite, Portland cement and a minimal amount of sand).

In September 2006 twelve of these retreats were installed in trees along the QEIIBP woodland trail, and a single hatchling was released in each. The retreats, and as many wild hatched hatchlings as we were able to, were then monitored over the following 2 weeks.

The results were opposite to the known success of the Mark 5 two-year-old retreats. No hatchlings returned to their arboreal retreats after their first day in the wild, and no other wild hatchlings occupied them subsequently. All hatchlings observed spent every night resting camouflaged on exposed tree branches, anywhere between 2 and 10 m off the ground. None showed any sustained interest in tree cavities or other enclosed spaces, even during rainy conditions.

It was concluded that hatchlings did not use enclosed retreats in the way older age classes did, and so artificial retreats may have no role in maximizing population density or controlling dispersal of this age class. Preliminary observations suggested that the iguanas may move down to the ground and start occupying rock holes from approximately 5 months of age.

Yearling Retreats

In November 2006 a “Mark 6” retreat design was developed, specifically sized for yearlings (Fig. 2). It is a modified version of the standard Mark 5 design, made by curving the sleeping passage to produce a more compact unit. The master was created using a combination of clay and natural rocks, so that the exterior form would blend into the natural terrain. Again, molds were created from the master using rubber and fiberglass, and poured production units in lightweight concrete.

A series of these Mark 6 retreats were placed in the QEIIBP in January 2007. By July one of the five 2006 hatchlings still regularly seen in the Park was occupying one of these Mark 6 units, while the other four were occupying natural rock holes. It has become apparent that these smaller iguanas are able to find suitable natural rock holes more easily than larger ones, so retreats of this size have proved to be far less important.

Adult Retreats

Retreat availability for mature iguanas in the QEIIBP is undoubtedly a severe limit on population density. The few rock hole retreats in the QEIIBP which are used by adult iguanas, flood seasonally and so are periodically abandoned. Retreats in accidentally suitable man made structures (for example under enclosed steps, in cavities under shipping containers, in spaces between stacked utility poles, and under a pile of discarded doors) are used year-round and form the centres of stable territories. After deaths or territorial takeovers, new iguanas occupy and defend the same retreats just vacated by their predecessors. By 2006 the oldest of the QEIIBP’s free roaming iguanas had all outgrown the Mark 5 and other prototype retreats used for releasing two- and three-year-old iguanas and several were becoming more rarely seen as they shifted their territories outside the QEIIBP boundaries. Increasing the availability of suitably sized artificial retreats seemed likely to be effective in increasing the number of adults able to coexist within the protection of the Park.

Two alternative designs were built and tested in 2006/2007. One was a scaled-up version of the standard Mark 5 wooden retreat. Three of these were placed in the QEIIBP and were in use at the time of writing, though we now plan to relocate them to sites with better micro-environments. At this scale the Mark 5 design is visually very intrusive, which is undesirable given the role of the QEIIBP in displaying Cayman’s natural environment to the public. Burying these retreats would greatly shorten their life expectancy, since they would remain damp for long periods and soon start to rot. Therefore a “Mark 7” retreat was designed in concrete, suitable for burying in soil or loose



Figure 1. Hatchling Grand Cayman blue iguanas, *Cyclura lewisi*.

Figure 2. Yearling Grand Cayman blue iguanas, *Cyclura lewisi*.



rocks. This design used a 'tennis racket frame' configuration to minimize the surface area occupied by the retreat and to limit the volume of concrete needed. A single entry leads to a looped sleeping passage that allows the iguana to enter and exit head first (Figs. 3 and 4).

A cast test unit in the third-smallest size (size C) for this model was built in December 2006, and deployed next to an existing retreat which was in use by a roaming female. This iguana was using

a cavity in a pile of concrete building blocks, but was close to outgrowing it. She took up residence in the new retreat the first night it was available to her, showing a clear preference over the long established concrete blocks' cavity. Some weeks later she was displaced from the new retreat by the dominant male in the area, and had to return to the concrete blocks' cavity. Clearly the design was attractive enough to be worth competing for, and so can be considered a success (Fig. 5).



Figure 3. Looped sleeping passage of Mark 7 artificial refuge. ▲

Radio-tracked adult breeding Grand Cayman blue iguanas, *Cyclura lewisi*. ◀ ▲

Figure 5. Roaming *Cyclura lewisi* showing a keen interest in the artificial refuge. ◀



Figure 4. A prepared, covered and ready to use artificial refuge. ▲

A majestic adult male Grand Cayman blue iguana, *Cyclura lewisi*. ◀

Mass Production and Deployment

The final phase of this project has been to cast and deploy more of the smaller Mark7 retreats (sizes C, D and E), and to commence building molds and casting components for additional sizes of the same model. The local branch of the structural engineering company Halcrow-Yolles provided technical advice leading to selection of a high performance cementaceous grout (Sika 212 Grout) in place of concrete for casting the new larger retreats. This enabled a modified design to minimize wall thickness, and therefore reduce weight. Minimizing retreat weight is crucial for backpacking the larger retreats into remote areas.

The first mold for each size was built in-house, and cast to ensure its performance and accuracy. The mold was then passed to a local fiberglass workshop where a fiberglass "master" copy was created and used as the basis for manufacturing three to five more production molds for each retreat size. Costs at this stage surpassed the BHS grant but we were fortunate to gain additional grant funds for this work, from a local reinsurance company, Greenlight Re.

At the completion of this project, volunteers are now pouring two to three new retreats per day for ongoing deployment in the QE II Botanic Park (both for the wild population and for captive breeding pens where upgraded retreats were also needed); and also into the Salina Reserve where iguanas released as three-year-olds in 2004 are facing the same limitations as we had observed in the QE II Botanic Park.

As expected, the thin-walled final production model required covering with rocks or other naturally available thermal insulation to prevent overheating inside. This also disguises the retreats which is desirable anyway, for reasons relating to tourism and aesthetics. With that requirement met,

the retreats deployed in the Park are being taken up readily by free roaming iguanas, and the Salina deployments are expected to perform equally well.

Direct measurement of the effect this retreat deployment will have on the overall long-term carrying capacity of the two sites will now require several years of monitoring. Early indications are very positive, and this work positions us very well for the anticipated first iguana releases into a new protected area on Grand Cayman, in 2010.

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