Biodiversity survey of the herpetofauna of El Paraiso Valley and Cusuco National Park, Honduras; a pilot study

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INTRODUCTION

One of the major factors affecting populations is habitat disruption (Sousa 1984). The response of herpetofauna to habitat disruption has received disproportionate attention in the literature when compared to mammals and birds (Carter, MSc thesis, unpublished).

There is a general decline in amphibian populations worldwide (DAPTF, Open University, http://www.open.ac.uk/daptf) and a significant part of the herpetofauna research has focused on this trend (e.g. Carey 1993; Alford & Richards 1999; Pounds et al 1999; Halliday 2001). According to DAPTF, prior to the last 25 years the primary cause of this decline had been anthropogenic habitat disturbance, but from the late eighties there have been reports of declining populations from within protected habitats, such as national parks and nature reserves.

Reptile population responses to habitat disturbance are, however, perhaps the least understood of all the vertebrate classes (Walker et al. 1996). Nevertheless, they too are experiencing declining populations mainly as a consequence of habitat alteration and destruction (Wilson & McCranie 2003).

Several members of the herpetofauna of Honduras have experienced population declines despite there being a system of national parks and reserves in place. Wilson and McCranie (2003) reported that these declines are being kindled by habitat disturbance as a consequence of unchecked demographic growth. But this in unlikely to be the only explanation for population declines in those areas insignificantly influenced by direct human activity. It has been suggested by DAPTF that there may be global factors that are having a negative affect on amphibians and this may also apply to reptiles. Possible factors include increased UV radiation, widespread pollution and disease.

To effectively monitor the herpetofauna of this region, and investigate the factors most influential in bringing about the current population declines, it is first necessary to complete a survey of the biodiversity. The survey should allow us to identify reliable indicator species capable of measuring the health of the habitats being studied relative to the herpetofauna.

This pilot study was carried out in the summer of 2003 and had three main objectives: to assess the appropriateness of the Cusuco National Park and the El Paraiso Valley as study areas for the biodiversity survey, to select the most suitable locations for study sites within those areas, and to test the various survey techniques available so as to identify those most effective and appropriate for the habitat and climate.

METHODS

Study Areas

The study comprised the two principal habitat types of lowland forest and cloud forest, and ranged in altitude from sea level to approximately 1600m. We surveyed within the Merendon mountain area of Cusuco National Park upland forest and the lowland forest of the El Paraiso Valley. A third site at Buenos Aires, of lower altitude to Cusuco, was also included in the survey.

Field Sampling

Pitfall traps

Sampling was conducted between early July and late August 2003. We established pitfall traps at 18 sites throughout the two study areas; nine trap sites in each area. Each trap site included between three and five 40L buckets buried flush with the ground. Buckets were spaced not more that 5m apart with a plastic drift fence approximately 30cm tall passing over the centre of each bucket, and stretching the length of the trap site with an overlap at each end of approximately half a metre. The maximum length of a drift fence was 16m.

We made holes of roughly three millimetres diameter in the bottom of each bucket for drainage, and placed moistened vegetation at the bottom of each bucket to reduce the risk of desiccation and provide an element of shelter.

Pitfall traps were checked every morning and operated for not longer than four weeks at each site.

In any situation where there was to be more than two days between checking a trap, that trap was disarmed by placing lengths of bark or other suitable material in each bucket to allow captured individuals means of escaping.

Coverboards

Four $0.5m^2$ corrugated metal coverboards were placed at each pitfall trap site at Cusuco and at four of the lower level pitfall trap sited at El Paraiso. So as to attract reptiles during thermoregulation, coverboards were situated on those areas of each trap site that received the maximum exposure to the sun; care was taken to ensure that, as far as possible, coverboards were adequately spaced across the trap site.

Opportunistic searches

Active opportunistic searches were conducted for reptiles over a wider area. These searches generally comprised walking slowly through various habitats and investigating under logs, rocks or other ground debris for sheltering animals. We carried out opportunistic searches around midday within a survey area of roughly $50m^2$.

Stream and nocturnal searches

Daylight searches of a variety of sections along the main river in Cusuco, Rio Cusuco, were undertaken to examine and describe adult and larval anurans.

General nocturnal searches were conducted for frogs, geckos and snakes. At stream transect sites we searched the immediate stream area, walking downstream through the water, and opportunistically surveyed the riparian habitat around the stream location. Searches extended to not more than 10m either side of the stream.

Capture methods and handling

All herpetofauna captured in buckets were immediately identifiable as non-venomous and removal from buckets was by hand using the correct handling procedures. All coverboards were lifted towards the fieldworker and a second fieldworker searched the area uncovered. Only fieldworkers experienced in handling and identifying herpetofauna were allowed to trap and collect specimens.

Snakes located during an opportunistic search were collected with care using a sampling hook and, when required for restraint and manipulation, the appropriate head grip. Any amphibian specimens that were captured were only handled with moist hands, and handling time was kept to a minimum. Lizards were captured by hand or by the use of a noose and pole technique.

Sampling of stream anuran adults and larvae was carried out using a ‘D’ shaped stream sampling net and turning submerged rocks or disturbing the bed substrate. All reptiles that could not be identified in the field were taken to base camp in cotton sacks, and all adult amphibians were transported to camp inside dampened cotton sacks with some moist substrate to help reduce the risk of desiccation. Larval stream anurans were collected by sampling net and transported in plastic field sampling bottles filled with stream water.

All individuals were returned to their natural habitat as soon as possible and all measures were made to prevent stress resulting from detention or handling.

RESULTS AND DISCUSSION

A total of 37 species have been identified from the survey pilot study. The three main study locations yielded 29 species of reptile, all belonging to the Squamata (16 snakes and 13 lizards) and eight amphibian species (five Anurans and a possible three salamanders of the genus *Bolitoglossa*). Mostly only one example of each species was captured over the course of the two months; see Table 1 for exceptions. Of the few species captured on multiple occasions, Lacertilians of the genus *Scerelopus* were the most abundant at Cusuco and Buenos Aires and the genus *Ameiva* at El Paraiso. Of the Ophidians only *Tantilla schistosa* and members of the genus *Geophis* were captured most numerously and only at Cusuco.

Table 1. Herpetofauna from the three locations surveyed (initial list) and survey method

Location	Family	*Generic*	*Specific*	Method
Cusuco	Elapidae	*Micrurus*	*nigrocinctus*	opportunistic search
Cusuco	Colubridae	*Tantilla (m)*	*shistosa*	pitfall traps
Cusuco	Phrynosomatidae	*Scerelopus (m)*	*variabilis*	opportunistic search
Cusuco	Elapidae	*Micrurus*	*diastema*	opportunistic search
Cusuco	Colubridae	*Ninia*	*sebae*	opportunistic search
Cusuco	Colubridae	*Geophis (m)*	*damiani*	pitfall traps
Cusuco	Colubridae	*Geophis (m)*	*hoffmanni*	pitfall traps
Cusuco	Colubridae	*Geophis spp*		pitfall traps
Cusuco	Viperidae	*Atropoides*	*nummifer*	opportunistic search
Cusuco	Viperidae	*Bothriechis*	*marchis*	opportunistic search
Cusuco	Colubridae	*Ninia*	*sebae*	opportunistic search
Cusuco	Polychrotidae	*Norops*	*cusuco*	opportunistic search
Cusuco	Colubridae	*Stenorrhina*	*degenhardti*	opportunistic search
Cusuco	Colubridae	*Pliocercus*	*elapoides*	opportunistic search
Cusuco	Leptodactylidae	*Eleutherodactylus*	*laevissimus*	opportunistic search
Cusuco	Hylidae	*Smilisca*	*baudinii*	opportunistic search
Buenos Aires	Scincidae	*Mabuya*	*unimaginata*	opportunistic search
Buenos Aires	Colubridae	*Imantodes*	*cenchoa*	opportunistic search
Buenos Aires	Phrynosomatidae	*Scerelopus (m)*	*malachiticus*	opportunistic search
Buenos Aires	Colubridae	*Adelphicos*	*quadrivirgatus*	pitfall traps
Buenos Aires	Viperidae	*Bothriechis*	*marchis*	opportunistic search
Buenos Aires	Plethodontidae	*Bolitoglossa spp*		opportunistic search
Buenos Aires	Plethodontidae	*Bolitoglossa spp*		opportunistic search
Buenos Aires	Plethodontidae	*Bolitoglossa spp*		opportunistic search
Buenos Aires	Polychrotidae	*Norops*	*crassulus*	opportunistic search
Buenos Aires	Polychrotidae	*Norops*	*tropidonotus*	opportunistic search
El Paraiso	Corytophanidae	*Basiliscus*	*vittatus*	opportunistic search
El Paraiso	Bufonidae	*Bufo (m)*	*coccifer*	opportunistic search
El Paraiso	Bufonidae	*Bufo (m)*	*luetkenii*	opportunistic search
El Paraiso	Iguanidae	*Ctenosaura*	*similes*	opportunistic search
El Paraiso	Bufonidae	*Bufo (m)*	*marinus*	opportunistic search
El Paraiso	Colubridae	*Elaphe spp**		opportunistic search
El Paraiso	Gekkonidae	*Sphaerodactylus*	*glaucus*	opportunistic search
El Paraiso	Polychrotidae	*Norops*	*johnmeyeri*	opportunistic search
El Paraiso	Colubridae	*Masticophis*	*mentovarius*	opportunistic search
El Paraiso	Polychrotidae	*Norops*	*amplisquamosis*	opportunistic search
El Paraiso	Teidae	*Ameiva (m)*	*festiva*	opportunistic search

(m), multiple captures

Table 1 shows that the most successful survey method during the pilot study was the opportunistic search. All but five species were recorded during opportunistic searches; those five were only recorded in pitfall traps. Pitfalls are selective in that they allow species over a certain size to escape and are therefore biased towards capturing small fossorial and leaf-litter specimens such as *Geophis*.

No species were recorded around coverboards, although at one site at Cusuco there were a few possible sightings of reptiles escaping into the surrounding overgrowth on our approach. This method has the potential of attracting a significant proportion of recorded reptiles in future seasons. Reptiles may use the boards either as night time shelters or shelters from the intense solar radiation during the day. Reptiles also use them during thermoregulation. This method is extensively used in the UK but may not be entirely appropriate for the tropics, however, the time they are checked and the choice of location for this method may have a significant influence.

Recommendations

Next seasons work should substantially build on the collection of voucher specimens. Therefore, it is essential that appropriate chemicals for euthanasia, fixing and preservation be taken out from either UK or USA, or that arrangements are made for their procurement from sources in Honduras.

It would also be advisable to increase efforts to collect significantly more data on the diversity of amphibians: tree frogs, stream breeding frogs, larval samples, salamanders, etc. Further work must be carried out on the diversity and distribution of fossorial and leaf-litter ophidians such as *Geophis*, as the identification of those species surveyed last season is not concrete and would therefore need further attention, and on the presence of both species of *Bothriecis* in Table 1.

In terms of survey methods I would suggest that the most effort be put into opportunistic searches. The use of controlled line-transect sampling techniques would be recommended in addition to opportunistic searches. Coverboards held promise and I would suggest their continued use on carefully selected sites.

With the addition of a significantly more experienced herpetologist next season nocturnal searches should prove more affective. The problem last season may have been either a lack of species during the searches or simply a lack of experience in terms of spotting eye shine.

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