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The **Herpetological Bulletin** is produced quarterly and publishes, in English, a range of articles concerned with herpetology. These include full-length papers of mostly a semi-technical nature, book reviews, letters from readers, society news, and other items of general herpetological interest. Emphasis is placed on natural history, conservation, captive breeding and husbandry, veterinary and behavioural aspects. Articles reporting the results of experimental research, descriptions of new taxa, or taxonomic revisions should be submitted to The Herpetological Journal (see inside back cover for Editor's address).

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Front cover illustration. Adult female *Rana juliani* from Belize. See article on page 21. Photograph © Sam Shonleben.

EDITORIAL

British Herpetological Society Council

It is with much regret that Council bids farewell to our Membership Secretary, Monica Green. Monica has served as the Society's membership secretary almost since she first joined the BHS in 1947 – its year of foundation – and for much of her term in office has also been resposnsible for distributing the *Bulletin* and *Journal*. It is of course fitting that such a long and distinguished service record should be marked in a formal and appropriate manner, but for the present I am sure I speak for everyone who knows Monica, as well as the Society at large, in conveying this initial message of appreciation. In her own words – spoken recently during a telephone conversation – 'my heart and sole remain with the BHS', and we look forward to seeing her again at future events.

Following the 2005 elections, a number of other changes to Council have recently been implemented. As the Society's new President we welcome Trevor Beebee, Professor of Molecular Ecology at the University of Sussex. Prof. Beebee is co-editor of *Amphibia-Reptilia*, a Trustee of the Herpetological Conservation Trust, and has been a long-standing member of the BHS. His primary interests lie in the molecular ecology and conservation biology of amphibians, particularly British and European species.

Russell Greenacre, Editor of *The Natterjack* has stepped down from this post, and for his efforts over the past two years in sustaining its production we owe him a large debt of thanks. Trevor Rose remains as co-editor but will now also be responsible for the distribution of the *Bulletin*, as well as providing assitance to the new (when formally elected) Membership Secretary.

Taking over as primary editor of *The Natterjack*, we welcome Mikaella Lock. Mikaella joins us as a relatively new member of the BHS, having lived and worked for the past five years in Thailand. She has extensive experience in the field of publication editorship and desgin, and also as a translator in French and Thai. In addition to her efforts with the *The Natterjack*, Mikaella is currently also helping with the preparation of manuscripts for the *Journal* and *Bulletin*.

Lastly, we welcome the return of John Pickett. For many years John was Editor of the *Bulletin* and joins us again as an Ordinary Member. *ED*

Student Grant Scheme 2005

The BHS Student Grant Scheme began in 2004 to promote original research on issues of herpetology in the form of short, well-defined studies that can be achieved as undergraduate projects. Last year we awarded grants of up to £300 to five people for an impressively diverse set of projects. Reports from Neil D'Cruze and Sam Shonleben are already in print in BHS publications, and a report from Kelly Coupland should be published soon. We have yet to receive reports from Calista Bebbington and John Baker on their undergraduate research, but we look forward to receiving these soon and hopefully to seeing them published.

Following from last year's success, we continued the Student Grant Scheme this year. With only £1,000 to split between successful applicants, the Research Committee has to make tough decisions and we awarded £250 to each of four successful applicants as follows:

- Brett Lewis – study and field assessment of Great crested newt mitigation projects 2004-2005.
- Catriona Hendry – a study of the ecology of an alien species, the Aesculapian snake in North Wales.
- Emma Sherratt – comparative evolutionary morphometrics of the caecilian skull.
- Georgina Reynolds – investigating the optimum density of artificial refugia for surveying common species of reptile.

To ensure the continued existence of this scheme, it is essential that recipients of grants submit their reports promptly.

CHRIS GLEED OWEN

Erratum

Two of the illustrations on the front cover of the previous issue of *Herpetological Bulletin* were unfortunately printed in the wrong sequence. Viewing in a clockwise direction from top left, the third photograph (i.e., lower right) is of *Norops rodriguezii*, and the final picture is *N. humilis*. *ED*

Preliminary notes on the amphibian fauna of Tanjung Puting National Park, central Kalimantan, Indonesian Borneo

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DURING 2002 and 2004, while involved in volunteer work for Orang utan Foundation International at Camp Leakey, Tanjung Puting National Park, Central Kalimantan, Indonesian Borneo, I conducted surveys of amphibians over one (2002) and four (2004) nights respectively. Camp Leakey study Area, originally set up as a research station for study of the Orang utan (*Pongo pygmaeus*), is located on a tributary of the Sekonyer river, which forms part of the north-west boundary of the National Park (2°35'–3°35' S, 111°45'–112°15'E). The study area consists of approximately 50 km^2 tropical heath forest and ombrogenous peat swamp forest within an elevational range of 0–30 metres (Galdikas & Shapiro, 1994). Searching took place during 19:00–21:00 hrs., with anurans located via torching for 'eye shine'. Frogs were then photographed, in situ where possible, and SVL measurements were taken. All were then released. With the exception of that on 5th October 2002, all surveys were taken after periods of rainfall during the day (local rainy season October to April). I will return to the area in 2005 as part of the Project Kodok initiative (Edinburgh University and IUCN DAPTF) for the initial phase of a 5-year amphibian survey of the National Park.

Species Accounts

Family Microhylidae

Kalophrynus pleurostigma Tschudi, 1838
Rufous-sided sticky frog (Figure 1).
(22/10/04) Single female, 46 mm SVL. Found in leaf litter on peat swamp forest floor (see Fig. 1). Absence of spines on the upper surface indicated a female. A black spot was present in front of the left leg only. Malkmus *et. al*. (2002) and Inger & Stuebing (1997) state that a spot is present at each groin, but these can vary in number from 1 to 3 (Djoko T. Iskandar, pers. comm.). The throat and chest area were bright red.

Family Ranidae

*Fejervarya limnocharis**
Field / Grass frog (Figure 2).
(20/10/04) 1 male, 62 mm SVL, 1 female, 49 mm SVL, 1 juvenile 26mm SVL. Found in mud and grass areas on the bank of the Sekonyer Kanan river, next to a jetty that marks the entrance to Camp Leakey. The male, although larger than the female, was distinguished via a black band across the throat. This species, while superficially similar to *F. cancrivora*, was distinguished from the latter by less extensive webbing on the hind-feet. Other individuals were seen.

The genus *Fejervarya*, originally placed as a subgenus of *Limnonectes* (Dubois, 1992), was resurrected to genus rank by Dubois & Ohler (2000), after molecular work by Emerson *et. al*. (2000) indicated that neither *F. cancrivora* nor *F. limnocharis* represented the sister group to *Limnonectes*. Recognising *Fejervarya* as a distinct genus (e.g. Iskandar, 1998) renders it monophyletic (Frost, 2004).

*Note: some authors (e.g. Lim & Lim, 1992:33) cite 'Boie, in Wiegmann, 1835' and 'Boie' (Inger, 1966:205; Inger & Stuebing, 1997:144-45) as the original author of this species. Malkmus *et. al*. (2002) use both '(Wiegmann, 1835)' (Table 12, p. 134) and '(Gravenhorst, 1829)' (p. 135). Frost (2004) cites '(Gravenhorst, 1829)' with '*Rana limnocharis* Wiegmann 1834' as a synonym. Here I use '(Gravenhorst, 1829)' as this has priority over junior dates – see Dubois & Ohler, 2000.

Limnonectes malesianus (Kiew, 1984)
Peat swamp frog (Figure 3).
(22/10/04) 1 male, 102 mm SVL. Found in peat swamp forest; in leaf litter (See fig. 1). Diagnostic features are its size, a fine white line running down the centre of the dorsum from the tip of the snout, and also on the upper surface of the lower leg (tarsal area). Fangs (odontoid processes on the lower jaw in males) were present. This species is one of the *blythii* group that form part of a monophyletic clade of fanged frogs of southeast Asia. Bornean species of the genus *Fejervarya* were originally placed in this genus, but did not form part of the clade, thus rendering *Limnonectes* paraphyletic. They were subsequently treated as a separate genus (see *Note above).

Family Rhacophoridae

Polypedates colletti (Boulenger, 1890)
Collett's tree frog, Hourglass tree frog.
(05/10/02). 1 female, 73 mm SVL. Found on forest floor, amongst leaf litter, peat swamp forest. Sexed by size and identified by characteristic dark hour-glass shaped marking on the dorsum, and pointed snout. This individual had probably descended to the forest floor to breed after rain, although little rain had fallen previously and forest pools were still dry. During handling, the main colour changed from dark to light tan. This represents the first distributional record for this species from Kalimantan, Indonesian Borneo. Previously only known from Sabah and Sarawak, Malaysian Borneo, this is a significant range extension for the species. Voucher photographs were taken and although not of publishable standard are available from the author on request.

Polypedates macrotis (Boulenger, 1891)
Dark-eared tree frog (Figures 7, 8)
21/10/04. 1 male, 51 mm SVL. Found calling in shrubs and trees 1–3 metres above ground after around 30 min. of rain during the day. This species was common in foliage around human habitation in Camp Leakey, and was also seen on buildings. Identified from paired dark stripes on the dorsum, and dark brown band covering the eardrum. The call was recorded.

Rhacophorus appendiculatus (Gunther, 1859)
Frilled tree frog (Figure 4).
21/10/04. 2 males, 36 mm and 37 mm SVL. Seen

Figure 1. *Kalophrynus pleurostigma*, female, 46 mm SVL. (All photographs by author).

Figure 2. *Fejervarya limnocharis* (male, 62 mm SVL).

Figure 3. *Limnonectes malesianus* (male, 102 mm SVL).

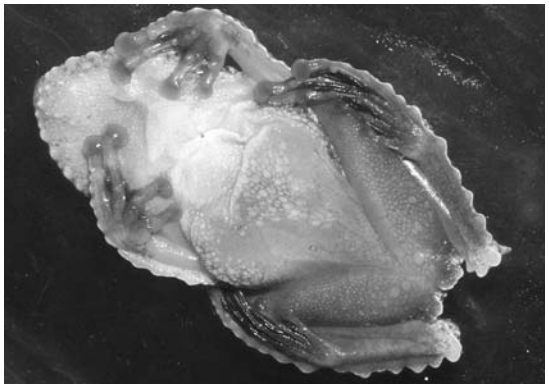

Figure 4. *Rhacophorus appendiculatus* (male, 37 mm SVL).

in the same locations as *P. macrotis* (above) and in some cases the same tree. However *R. appendiculatus* was also seen on the ground and was present in much greater numbers (see Fig. 1). Both species also called at the same time, but *P. macrotis* was much quieter. *Rhacophorus appendiculatus* is characterised by a wavy-edged fringe of skin on the outer edges of the forearm and lower leg. Inger & Stuebing (1997) report that some individuals have a pinkish tinge on the front of the thigh. Individuals from Camp Leakey seem to be slightly different in that the 'flash' markings are bright orange. The call also differs from that described in Inger & Stuebing (1997) and Malkmus *et. al*. (2002) as a series of soft clicking notes. Males produced both a series of soft notes and a series of low croaks interspersed with each other. Every 10–15 min. the males would perform a faster, louder series of croaks for about 30–60s. This species, with a widespread distribution from the Philippines through Borneo, Sumatra to peninsular Malaysia, could represent several different forms. Variation occurs in the extent of the toe webbing in specimens from Sabah and Sarawak, and the Philippines (Inger, 1966). Arm and leg fringes are wider in frogs from Sarawak, but absent in Philippine examples. One male was filmed using a digital camera, and the call was also recorded. Sarawak specimens also have significantly longer legs and there is a significant difference in size in males from across Borneo. Molecular analysis may prove useful in the further investigation of this widespread species. Morphometric analysis of Camp Leakey specimens is also desirable.

ACKNOWLEDGEMENTS

Thanks are extended to Orang utan Foundation International for allowing me to undertake this survey in spare time, in particular Ashley Leiman and Stephen Brend for help and support. Also Cheryl Morley for help in the field, members of team 4, and camp staff.

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Marine turtle conservation: the integration of a community-based, environmental education programme in southwest Madagascar

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ABSTRACT – Traditional subsistence utilisation of marine turtles, by the Vezo of south west Madagascar has taken place for centuries, and as a result populations have been steadily declining. The authors undertook an integrated environmental education programme, spanning a period of 12 months, and targeted the three main groups involved in coastal management and marine resource ulitisation. These groups included; the local fishing community, marine science students and local fisheries officers. The programme included workshops, a taught course and community based presentations, conveying basic information regarding marine ecology and sustainable resources utilisation. The programme addressed the needs of each of the groups and addressed the conservation issues facing the coastal region with particular emphasis on marine turtles, in a subtle non-judgmental manner. To complement future education programmes and reduce the local population's reliance on already depleted local coastal resources and dwindling marine turtle populations, the authors suggest there is a need to develop alternative livelihood strategies for the region.

THE subsistence hunting of marine turtles takes place in many artisanal coastal communities throughout the tropics (Suarez & Starbird, 1996; Hunter & Williams, 1998; Suarez, 2000; Leotaud, 2001). Despite legal protection, Green turtles *Chelonia mydas*, Hawksbill turtles *Eretmochelys imbricata*, Loggerhead turtles *Caretta caretta,* Olive ridley turtles *Lepidochelys olivacea* and Leatherback turtles *Dermochelys coriacea* are all actively fished and utilised by the Vezo sea fairing ethnic group, indigenous to the coastal regions of south west Madagascar.

Marine turtle populations have been steadily declining in the region since the first study of the estimated population size took place in 1930 (Petit, 1930). The decline has been attributed to the pressure placed on the marine turtle populations of the western Indian Ocean from the traditional Vezo fishing communities (Kar & Baskar, 1982. Rakotonirina & Cooke, 1994; Walker *et al*., 2003). Marine turtles once held great cultural significance to the Vezo (Kar & Basker, 1982. Walker *et al.*, 2003), but continued exploitation of marine turtles in the region has resulted in increasingly lower catch levels over time, in turn, causing the dilution of the cultural importance of marine turtles. Today, traditional fishers no longer base their target species solely on

marine turtles, and only very few of the older fishers observe the cultural traditions such as the ceremonial slaughter associated with turtle fishing. Marine turtles are now exclusively fished opportunistically as part of a multi species fishery, due to a regional turtle population crash, with fishers reporting a four fold drop in catch numbers in the last 10 years (Walker *et al*., 2003). More emphasis is now placed on utilising marine turtles for financial gain (Walker *et al*., 2004), in this impoverished region of the world.

Marine turtle nesting sites within the region, have also been subjected to exploitation over many years (Rakotonirina & Cooke 1994; Walker *et al*. 2003). Only three of the twelve known green turtle, and one of the three known hawksbill nest sites remain actively used in the region, due to molesting of nesting females and collection of eggs (Walker *et al*., 2003). Despite a reasonable understanding of the biology and ecology of the species exploited, local Vezo populations still had some fundamental misunderstandings regarding marine turtles. For example many people found the low reproductive potential of marine turtles difficult to grasp, when they clearly witnessed them laying so many eggs.

It has been recognised that small scale, community based environmental education programs are the most effective and necessary forms of conservation in developing rural subsistence communities that are heavily reliant on natural resources (Ratotonirina & Cooke, 1994; Durbin & Ralabo, 1994; Jacobson & Norris, 1998; Kapurusinghe, 2000; Hunter, 2000). Often, people are aware of environmental problems which effect them, and know that they are the result of human activity (Durbin & Ralambo, 1994), but fail to make the link that they personally should change their behaviour as they see no point in just one person changing. Therefore, when undertaking an environmental education program it is important to try and include all sectors of the community that export a particular resource. Throughout the world there are many examples of governmental and non-governmental bodies approaching marine turtle conservation by means of well managed attempts at community based environmental education (MTCA, 1997; Hunter, 2000; Leotaud, 2001). Most of these programmes have demonstrated that for people to come up with solutions they must first know and understand the problem. Basic biology and ecology of marine turtles and that of other locally exploited species is generally well understood, with a few exceptions, as one would expect from communities that base there sole livelihoods on the local natural resources.

Over a period of two years Frontier Madagascar, a joint collaboration between the UK based Non Governmental Organisation (NGO), The Society for Environmental Exploration (SEE) and The Institute Helieautique et des Marines, Toliara (IH.SM) have been initiating community based marine conservation efforts in the region of south west Madagascar, particularly in the village of Anakao (Fig. 1). Anakao supports the largest fishing community in the area, with many fishers exploiting marine turtles (Walker *et al*., 2003; Ratotonirina & Cooke, 1994).

Background

The traditional fishing community of Anakao is located in the arid south west region of Madagascar, 20 km south of the port of Toliara (Fig. 1). The arid conditions ensure that the agricultural potential of this coastal region is limited. Therefore, the coastal communities of the region rely heavily on resources provided by the marine and coastal environment. Mangroves (Cook *et al*., 2000), reef fisheries (Laroche & Ramanarivo, 1995) and marine mega fauna, such as sharks (Cooke, 1997) and marine turtles (Walker *et al*. 2003; Rakotonirina & Cooke, 1994) are all showing signs of over-exploitation, as the fishing population has increased in the Toliara region by a factor of five over a period of 17 years (DRH/FAO 1992). Slight shifts in the cultural standings of the Vezo, who view the sea as a commons (Koechlin, 1975), has also attributed to the over-exploitation of the local marine environment. The Vezo, particularly in the Anakao locality have switched from their semi nomadic way of life to a more settled existence, allowing for more concentrated pressure on local marine

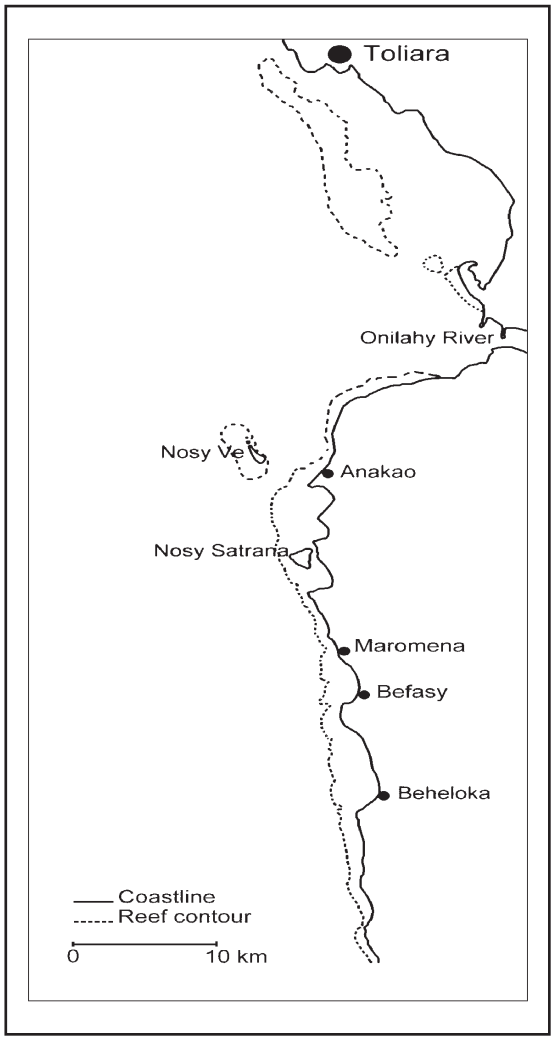

Figure 1. Southwest coast of Madagascar.

and coastal recourses. Anakao is the focal point of the marine turtle fishing efforts in the region with the village acting as a sink for captures (Walker *et al*., 2004). Fishers from Anakao and the surrounding villages, supply dealers based in Anakao who in turn process the meat and sell it on to traders or members of the community. The whole operation is carried out on a small-scale, subsistence level.

The legal protection of marine turtles in Madagascar has been ignored, by both the authorities and fishers alike. Laws were passed in as early as 1923 solely targeting the protection of marine turtles, decree 24 passed in October 1923 declared protected nesting sites on five islands around the country including Nosy Ve (Fig. 1). In the case of Nosy Ve the law has seldom, if ever been, respected. In the resent past the Food and Agricultural Organisation (FAO) conducted awareness trips to the coastal villages south of Toliara regarding conservation of mangroves, marine turtles and sharks, but funding for such exercises has been their limiting factor and the environmental education exercise was short lived. At present there are no strategies in place undertaking practical conservation measures to protect habitats, nest sites or marine turtles themselves within the region, or education programmes to promote awareness of sustainable resource utilisation within the local small subsistence fishing communities.

Sensitivity and respect is of paramount importance when approaching the subject of resource use of endangered species such as marine turtles, within communities such as Anakao. For example a brief marine turtle awareness program was carried out by a French NGO from La Reunion in Anakao, but was greeted with some hostility by some sectors of the target audience. The project was deemed to be too aggressive and judgemental by some members of the community (Webster, pers. comm.).

With this in mind an education programme was devised to target all those involved in the local subsistence marine turtle fishery, to be delivered in a subtle, sensitive non-judgmental manner that respected local culture and traditions. The programme took a three-tiered approach targeting three main stakeholders. Firstly, community members, fishers, turtle dealers and turtle traders. Secondly, marine science students from Institute Halieautique et des Sciences Marines (IH.SM) based in Toliara, and finally, local government fisheries officers based in Toliara, who were considered the present jurisdiction body for the region's fisheries activity. The programme included village presentations, workshops and a structured taught course, the Darwin Initiative funded Madagascar Marine Biodiversity Training Program

(MMBTP) (Webster *et al*., 2003a), implemented over a period of 12 months, by a team of trained staff. The team consisted of a Training Coordinator, Marine Scientist and a local Training Officer. Participants involved in the education and training programme were made aware of the programme and activities, and their involvement was purely voluntary. Due to the integrated nature of the marine environment and the traditional subsistence resource utilisation within it, a marine turtle education programme had to be included as part of a well balanced education programme encompassing all spheres of the marine environment and the resources it provides (Webster *et al*., 2003a).

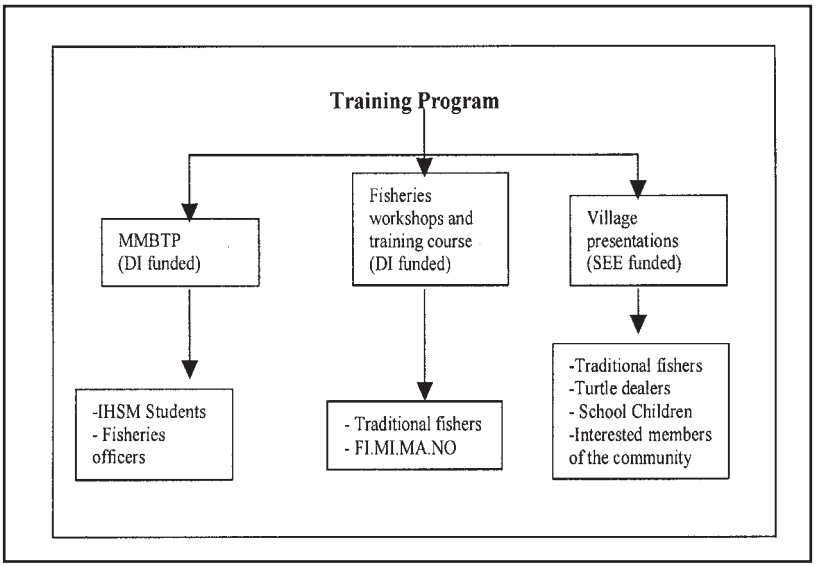

Figure 2. Flow Chart showing the three education tools used and each respective target audience.

Education programmes undertaken

The education programme was broadly split into three sections (Fig. 2), the first two being the MMBTP targeting local students and fisheries officers. Thirdly, workshops for local fishers, and village-based presentations targeting a wide demographic with the community of Anakao were undertaken.

Madagascar Marine Biodiversity Training Programme.

The Darwin Initiative funded MMBTP was conducted between October 2001 and October 2002. The aim of the programme was to educate different sectors of the local population on sustainable resource management. Turtle resource utilisation is considered a component of the local traditional fishery and was centred on for parts of the programme. The first group included IH.SM students, the second, local government fisheries officers from Toliara, and the last group comprised of local fishers, and representatives from *Fikambanana Miaro sy Mampandros an'l Nosy Ve* (FI.MI.MA.NO), a community based organisation, responsible for the guardianship of the culturally significant island of Nosy Ve, and its surrounding reefs (Table 1). Significant numbers of marine turtles are harvested from the surrounding reefs of Nosy Ve each year (Walker *et al.,* 2003). Activities included:

Marine Science students, IH.SM.

A continuing education programme (MMBTP) that centred on the practical aspects of marine resource management, surveying and monitoring (Table 1) was undertaken. It was felt that the students had a very good theoretical knowledge of the marine environment and local resource use, but lacked any practical field based study. This was rectified by incorporating practical monitoring and surveying methods and field techniques, with workshops and discussion groups which included the conservation issues associated with marine turtle exploitation. Twelve students completed the course, taught in French, undertaken by a full time training coordinator. As a result a habitat monitoring plan was devised for the local area (Webster *et al.,* 2003b) to enable the programme to gain some sustainability.

Table 1. Summary of the training programme, highlighting the different components of the training and the target audience.

Target Demographic	Number of participants	Details of training program	Length of training program
IH.SM Students	12	Practical exercises (survey and monitoring techniques): • Lagoon and beach mapping exercise to create a data base prior to a fictitious hotel development. • Underwater visual census surveys, noting commercially important species. • Mangrove biodiversity and socio-economic surveys. • Socio economic surveys regarding local turtle harvest and exploitation. • Intertidal zone mapping exercise for a fictitious turtle nesting beach.	2 weeks for each project.
	12	Reporting of results (data analysis and development of management recommendations).	2 weeks for each project
	17	Workshop: • *Presenting the Darwin initiative Marine Biodiversity Training project.* IH.SM Library, Toliara, 18th March 2002.	1 day
	26	Workshop: • *Scientific Research, Public Awareness and Management Strategies for the Sustainable Use of Marine and Coastal Resources.* Anakao School 10th July 2002.	1 day
Fisheries Officers (Toliara Inter Regional Fisheries and Marine Resources Branch)	6	Find group motivation exercise to improve access to information: • Visits to existing libraries to find reports of particular relevance to the post holder and contacting a number of external organisations for data and information pertinent to each officer's role.	3 days
	6	Workshop: • *Regional Problems for the Marine and Coastal Environment and the Fisheries Department and Identification of Solutions.* IH.SM Library, Toliara 23 May 2002.	1 day
Local community representatives (FI.MI.MA.NO Anakao).	7	Discussions / Lecture. (Very short, informal and interactive allowing participants to share there experiences) • Turtle life cycles • Marine Mega fauna • Coral reefs as habitats	4 days
Fishers and there families (Anakao)	26	Workshop: • *Scientific Research, Public Awareness and Management Strategies for the Sustainable Use of Marine and Coastal Resources.* Anakao School 10th July 2002.	1 day
	4	Notes passed out on marine turtle biology and ecology (specifically to turtle dealer and fishers)	2 days
School children	90+	Children's workshops at Anakao school (23rd November 2001): • Marine turtle play • Drawing completion	1 day
	290+ (over 2 showings)	Chinese puppet show, to highlight sustainable resource exploitation (7th March 2002).	2 days
	150+	Musical presentation on marine mega fauna (12th June 2002).	1 day

Fisheries Officers (Toliara INTER regional Fisheries and Marine Resources Branch). Workshops were organised to highlight conservation implications facing the local marine and costal environment. Information concerning current thinking on tropical artisanal fisheries management was disseminated via lectures and discussion sessions (Table 1). Most fisheries officers in Madagascar are poorly funded and only have accesses to dated theories and techniques, with some undertaking training over 20 years ago (Webster *et al*. 2003a). The training programme aimed at complimenting existing knowledge, providing information that could contribute to their job objectives and aimed at improving work results, particularly with regards to environmental protection (Webster *et al*. 2003a). Again, the workshops were conducted in French by the training coordinator and a marine scientist.

Local Fishers, Community and FI.MI.MA.NO Representatives. A practical workshop and a three-day training course, introducing ideas behind sustainable resource management and basic marine ecology, including turtle biology and ecology were undertaken (Table 1). Seven FI.MI.MA.NO representatives completed the course and numerous local fishers most of whom were involved in marine turtle fishing. Information was disseminated in spoken French by the training coordinator and the marine scientist. Concepts were translated into Vezo Malagasy by the local counterpart training officer.

Local Community Village Education Presentations. The DI funded MMBTP was complimented by environmental education presentations in the village of Anakao. A quarterly education programme was run in the village for one or two days, targeting a particular demographic sector and tailoring it to the audience. All education programs were delivered in spoken French and then each phrase repeated in Vezo Malagasy, activities included:

November 2001 – a play presented at the Anakao school, involving two turtles, one that is caught and sold, and one that is kept free and visited by tourists, trying to highlight the long term monetary value of marine turtles gained from tourism (Figure 3). The play involved local school children (5–15 years) and tried to emphasise the drawbacks of harvesting smaller specimens that have not had a chance to become sexually mature, and the effects of egg harvesting. The play tried to promote a more responsible approach to turtle exploitation, rather than trying to dissuade the community to completely stop marine turtle exploitation, due to the importance of the animals to the local economy and livelihoods. A drawing competition was also held for the children, who were asked to draw a species they considered important that lived on the reef. Approximately 90 school children were in attendance, with 20 adults.

Figure 3. Turtle ecology sketch, village presentation, Anakao. Photograph by G. Hemery.

March 2002 – Chinese shadow puppets show highlighting the message of sustainability in resource use. The show was performed twice with audiences including school children (5–15 years) and fishers, turtle dealers and other village representatives. Adaptations were made

appropriately for each audience, with over 100 children and 30 adults present at the first showing and 160 adults and children present for the second showing. A simple song was introduced concerning the sustainable exploitation of marine species.

June 2002 – visual, verbal and musical presentation concerning marine mega fauna (including turtles), life cycles, migration and tagging. The audience was general, including all sectors of the village, with approximately 150 people in attendance. Songs were included in the presentations, in an attempt to pass on a basic conservation messages. Notes on turtle biology and ecology were passed on in both spoken and written Malagasy to the four turtle dealers in Anakao and their families.

DISCUSSION

Due to the failure of laws forbidding the capture of marine turtles (Walker *et al*. 2003), it is the belief of the authors that the only means of controlling non-sustainable resource exploitation in this region is through well managed environmental education programmes. The education programme was thought by the authors to be important in highlighting the few certain aspects of turtle biology that were poorly understood or misunderstood. Indeed, Walker *et al*. (2003) claimed that most fishers who exploited marine turtles noticed a consistent decline in marine turtle catch numbers over the last 10 years, but that very few attributed the decline to an increase in turtle fishing effort, most making the claim that marine turtles were becoming increasingly 'clever', thus harder to catch. It was the aim of the education programme to demonstrate the relation between people's actions and their effects on the environment, and to encourage people throughout the community to take collective responsibility for these actions.

As well as educating the fishers and those involved in the marine turtle trade, the training of the local students from IH.SM was important, enabling them to be trained in the more practical aspects of survey and monitoring work and putting into practice the theoretical knowledge they have already gained form there study. The local fisheries officers also benefited, as the training programme helping to update and improve their general knowledge of resource conservation and integrated resource management. It is hoped that the programme stimulated community discussion and action groups, for example encouraging FI.MI.MA.NO to take more responsibility for local natural resource management.

Most working groups involved in community based marine turtle conservation efforts, agree that for management to work in developing coastal communities it must be compatible to the needs of each individual community (Hunter, 2000; Loetand, 2001). These needs have to be analysed and understood, must maintain flexibility for the dynamics of indigenous society and most importantly be initiated, monitored and maintained by the communities themselves. Environmental education is the first step in a well-rounded conservation effort. When the local population recognise the importance of biodiversity conservation and natural resource management then further initiatives can be developed such as the setting up of protected areas and empowering the local community to take responsibility for the management of such areas.

If a conservation effort in the Anakao region is to be successful in the long term, successful efforts else where in Madagascar and the Indian Ocean need to be learned from. Between 1969 and 1974, The World Wide Fund for Nature (WWF) supported extensive marine turtle surveys in the south west Indian Ocean (Kernf *et al.,* 2000), resulting in five new marine reserves in Mozambique and La Reunion. As a result, WWF and The World Conservation Union (IUCN) co-sponsored Marine Turtle Specialist Group (MTSG) developed a community based conservation programme in the Fort Dauphin (southeast Madagascar) area. The area was an important nesting ground for Green, Hawksbill and Loggerhead turtles (Kernf *et al*., 2000). The programmes have partly come about as a result of the Malagasy government's identification of the site as a priority of tourism development, thus it was hoped that marine turtles would increase the tourism potential of the area.

At present there is no incentive for people in the Anakao region to stop fishing marine turtles,

indeed a 100 kg Green turtle is worth far more to a fisher than the reef fish captured while investing the same or even a lesser fishing effort (Walker *et al*., 2004). Throughout the programme it was hoped the dilution and reduction in the cultural status of turtles amongst the Vezo communities in the region will make fishers more willing to accept change and respect the conservation issues surrounding marine turtle fishing. This would suggest a need for the development of a low impact, sustainable alternative livelihood development in the area, to alleviate the pressure placed on the coastal marine resources, especially marine turtles. Environmental education takes time for people to accept ideas and modify their lifestyles accordingly. Changing people's perceptions through environmental education is the first step in a well-rounded conservation and development project.

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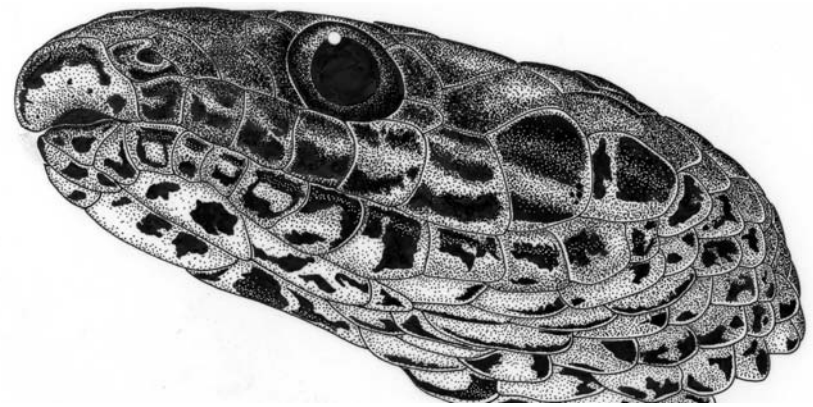

Head detail of *Coniophanes bipunctatus* (Twin-spotted snake). Reproduced with kind permission of the artist/author, Julian C. Lee, from *The Amphibians and Reptiles of the Yucatán Peninsula* (Cornell University Press, 1996).

A population of skinks (*Mabuya* spp.) and the gecko *Hemidactylus bouvieri boavistensis* behind coastal dunes on Boa Vista, Cape Verde Islands

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THE Cape Verde Islands lie some 1600 km south of the Canary Islands, 500 km west of Senegal in the Atlantic Ocean in the path of the northeast trade winds. Of the nine inhabited islands, the three most easterly generally have a desert landscape of sand/stone with coastal salt flats often fringed by magnificent sandy beaches, some of which are among the most important breeding sites in the world for loggerhead turtles. Terrestrially, there are 37 lizard species recorded from the Cape Verde islands (Schleich, 1984, 1987) many of which are endemics of which the best-known are the giant skink (*Macroscincus coctei*) and the giant gecko (*Tarentola gigas*) both only found, or formerly found, on the small islands of Raso and Branco as the former of the two species became extinct in the 1940s (Greer, 1976). There are several species of skinks and geckos found distributed throughout the Cape Verde islands belonging to the genera *Mabuya* and *Tarentola* or *Hemidactylus* respectively. The only other element of the terrestrial herpetofauna of the islands is the toad *Bufo regularis* which we observed in concrete water tanks on the island of Santiago where it is said to have been introduced by the Portuguese to control mosquitoes when such water reservoirs were first constructed. They also occur in similar situations on the island of São Nicolau and Santo Antão.

During a visit to some of the Cape Verde islands in June 2004 we took the opportunity to briefly examine habitat utilisation by lizards of the maritime fringe on the islands of Sal, Boa Vista, Santiago, Fogo and Maio. These habitats are variable depending on local topography, being mainly rock in sampled areas on Fogo and Santiago, saltflat vegetation with little rock on Maio and a combination of both habitats on Sal and Boa Vista. On Fogo, we saw skinks inland up to 2000 m, but on both Fogo and Santiago we found no skinks or geckos in the cliff base boulder screes (the only maritime interface available to us) although Schleich (1987) found both groups on Fogo and Santiago but associated mainly with buildings or a built environment. On Sal, near Santa Maria and on Maio between Vila do Maio and Morro, in sandy, saltflat/dune vegetation we found only *Mabuya* spp., *M. stangeri maioensis* on Maio and *M. stangeri salensis* on Sal. On Boa Vista, behind the dunes which fringe the 10 km long, wide sandy bay south of Sal Rei, in an arid area of rocks and sand, are the remains of stone walled enclosures of unknown agricultural origin and it was here that we found our richest skink/gecko populations. On an earlier visit in 2003 we had located this site and felt it was one of the few areas where it would be possible to quantitatively assess lizard numbers given suitable field equipment.

STUDY AREA AND METHODS

The 'stone walls' of old agricultural enclosures behind dunes some 5 km south of Sal Rei on Boa Vista, cross an almost vegetation-free area of sandy, salty, soil intermixed with small coarse fragments of the local volcanic rock, extending from the landward side of the dunes, 50 m from the beach, towards the village of Rabil. The 'walls', if such they are, consist of lumps of rock up to about 50 cm diameter in linear structureless piles rarely more than 40 cm high and up to 1m wide, and, in the case of the wall we examined, running east /west, although others run in other directions forming a generally interlinked system.

Our aim was to quantify the number of lizards per unit length of wall and to assess the value of this habitat in relation to isolated stone refuges away from the wall. The work was carried out 22nd–25th June 2004 although we first identified the site on an earlier visit in August 2003.

In order to catch the animals we devised a flexible plastic 'quadrat' constructed from 4 m of 40 cm high 'Newtguard' polythene sheet held as near square as possible with four corner posts so as to enclose an area of approximately 1m^2. Ten quadrats were recorded at 5 m intervals along the wall (Fig. 1) and a further 10 around randomly isolated stones over 30 cm diameter situated up to 20 m from the wall and further 10 situated around similar stones over 20 m from the wall. The nature of the environment made it difficult to create an exactly square quadrat but using 4 corner stakes it was made as square as possible. Sand was then moved to ensure that there were no escape holes under the plastic. The stones were then systematically removed, where possible keeping them within the quadrat and any animals counted, and if possible caught, measured and

	A	B	C	D	REMARKS
1	180	*	*	*	15 lizard eggs
2	*	*	80	*	
3	185	75	*	*	yellow belly
3	*	*	80	*	
4	*	*	60	*	plants in quadrat
4	135	50	*	*	well coloured
4	200	*	*	*	
5	140	55	*	*	plants in quadrat
5	180	*	*	*	
6	185	80	*	*	fat
6	180	*	*	*	
6	170	65	*	*	
6	*	*	70	45	yellow eyelids
6	*	*	42	22	"
6	*	*	72	50	"
6	*	*	63	40	"
6	*	*	63	40	
7	*	*	40	20	
7	*	*	70	45	
8	*	*	*	*	no catch - ant colony
9	180	70	*	*	
9	170	*	*	*	
9	*	*	45	22	
9	*	*	35	20	
9	*	*	70	35	orange tail
10	130	*	*	*	12 fresh lizard eggs
10	130	*	*	*	
10	130	60	*	*	regenerated tail
10	*	*	85	42	
10	*	*	65	35	
10	190	75	*	*	yellow sloughing
	STONES OVER 30cm DIAMETER UP TO 20m FROM WALL				
11	80	30	*	*	
12	*		42	20	
13	*		75	45	
13	*		35	15	
13	*		35	15	
14	*		70	35	
15	*		40	20	
15	*		60	30	
15	140		*	*	
	TEN RANDOM STONES OVER 30cm DIAMETER, OVER 20m FROM WALL				
16	*		*	*	no catch
17	*		42	20	
18	*		*	*	no catch
19	*		*	*	"
20	90		*	*	
21	*		30	12	
22	*				"
23	*				"
24	*				"
25	*				"

Table 1. Boa Vista stone wall, June 2004.

A = skink total length (mm);
B = skink tail length (mm);
C = gecko total length (mm);
D = gecko tail length (mm).

Figure 1. Quadrat on section of wall. All photographs by author.

Figure 2. *Hemidactylus bouveri boavistensis.*

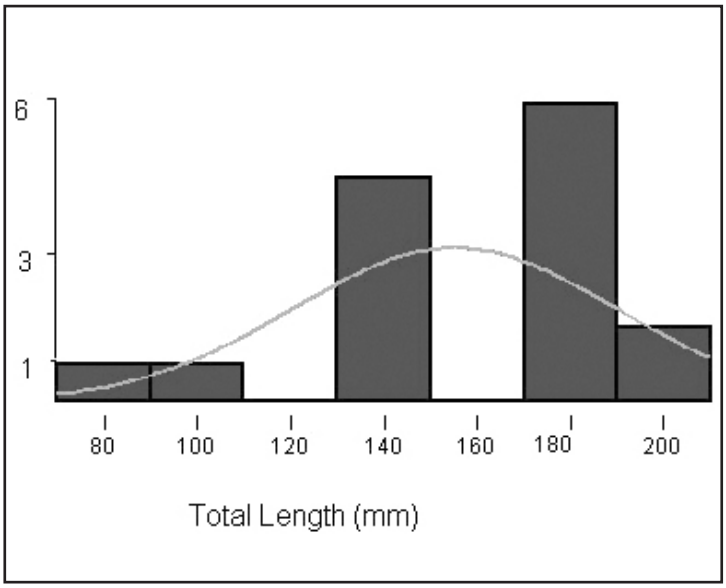
Figure 3. *Mabuya stangeri*.

Figure 4. *Mabuya delalandii*.

photographed. If necessary captured animals were temporarily kept in cotton bird bags while awaiting processing. The stones and the animals were then replaced.

RESULTS

All the geckos were *Hemidactylus bouvieri boavistensis* or Half-finger geckos (Figure 2) and the lizards (skinks) were all *Mabuya* spp. with certainly *M. stangeri* (Figure 3) and *M. delalandii* (Figure 4), the former usually larger usually with bright thigh spots depending on sub-species, the latter a rust-brown back with dark shoulder spots and a bright border to the back stripe – scale counts overlap in the two species, but even within quadrats skinks are elusive! Geckos and skinks were frequently found under the same rock and no statistical correlation was found between their intra-species distribution. Figures 5 and 6 show that although there was a preponderance of large skinks, their distribution approached normality, unlike the geckos, where a bimodal histogram suggests at least two year classes were present. What we believed to



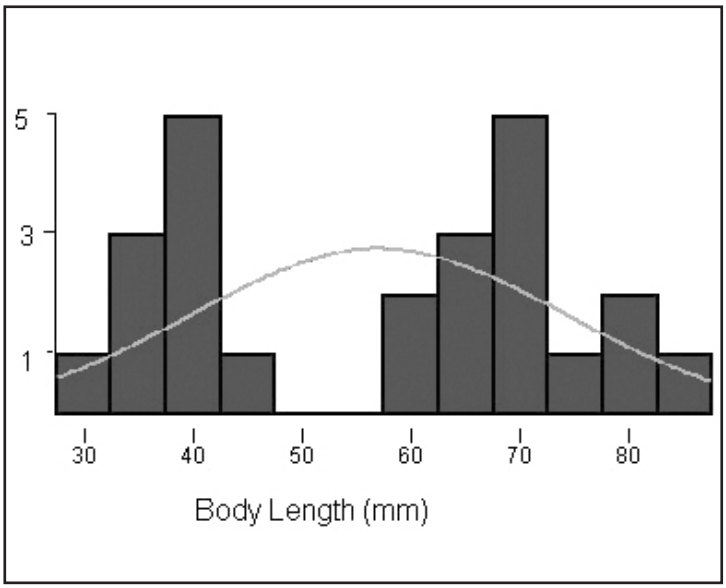


Figure 5 (above). Total gecko body length (mm) plotted against numbers of individuals.

Figure 6 (below). Body length categories of lizards caught along wall on Boa Vista plotted against number.

be skink eggs were found under stones in two quadrats and, along the wall, the only quadrat with no skinks or geckos included an ant colony under one large stone. The further we moved from the wall, the scarcer became suitable sized stones and our catch rate also dropped proportionately.

DISCUSSION

On Maio and Sal we watched *Mabuya* spp. moving within and between stones and saltmarsh scrub or between clumps of the latter when the former were absent. The problems associated with catching skinks within the saltmarsh scrub was a major reason for focussing on the rocky habitats of Boa Vista. Our survey area on Boa Vista had very sparse vegetation, insufficient to detract from the efficiency of capture. There were several kilometres of derelict stone walls in the general area in which we were working and if our quadrats were typical of the area, and we believe that they were, then there would seem to be in the order of some 30 individuals of both skink and gecko per 100 m of derelict wall – a quantification of population size which previous work does not provide (Schleich, 1982). The walls provide good habitat continuity and probably harbour good populations of both lizard types, which was in contrast to the sparsity of animals under suitably sized stones with increasing distance from the wall, suggesting isolated stones, which are the norm for this area, are possibly avoided due to their isolation. In this location the wall provides the corridor for movement that, in thick saltmarsh scrub, may be provided by the vegetation. This suggests that these man-made structures are an advantage to the overall biodiversity of this part of the island.

Because of the limited numbers of skinks and the fact that two species were present, no conclusions can be drawn from the body length data except that young and older animals plus eggs are present suggesting no spatial separation of age classes and an entire life cycle spent within the wall. However, with geckos, two distinct peaks (and possibly a third) are seen on the histogram

suggesting 2 (or 3) age cohorts within the population.

Having visited the area in the previous year we felt that the flexible plastic quadrat would work within the rock pile environment. The technique helped quantify the animals in the sample area but clearly for areas with larger rocks or other environments different techniques would be required but we would recommend it for similar situations elsewhere where population quantification is required.

The Cape Verde islands are best known to herpetologists for their importance as a world-class loggerhead turtle breeding site, but their 'bread and butter' terrestrial species offer considerable interest and have begun to exercise the minds of, particularly, molecular ecologists (Brehm *et al*., 2001; Brown *et al.,* 2001; Carranza *et al.,* 2000, 2002), however most people ask 'where?' when the islands are mentioned, visit them for their herpetology, empty beaches and hospitality before the new airport brings in the tourist throngs!

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Mabuya aurata septemtaeniata (Family, Scincidae): first record for the United Arab Emirates

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THE Golden Skink *Mabuya aurata septemtaeniata* has a geographical distribution which is recorded as northeast Saudi Arabia, Bahrain, northern Oman (Muscat), Iraq, Iran and Massawa in Eritrea (Arnold, 1986). This species also occurs in Qatar, where its distribution is recorded in a book on Qatar's herpetofauna by El-Sherif & Al-Thani (2000). The recent record of this species from the United Arab Emirates (UAE) (collected 15th June 2004) is a new distribution record for the UAE. As per Hornby (1996) the UAE has a total of 67 species of amphibians and reptiles with the Family Scincidae being represented by five species, namely Asian snake-eyed skink *Ablepharus pannonicus* (Lichenstein, 1923), Ocellated skink *Chalcides ocellatus* (Forskål, 1775), Tesselated mabuya *Mabuya tessellate* (Anderson 1895), Sand fish *Scincus mitranus* (Anderson, 1871) and *Scincus scincus conirostris* (Blanford, 1881). The new record increases this number to six.

A herpetological survey of offshore islands is being conducted by the Terrestrial Environment Research Center (TERC) of the Environmental Research & Wildlife Development Agency (ERWDA) of Abu Dhabi. So far, the survey has recorded a total of five species of geckos, one lizard and three species of snake from offshore islands of the Abu Dhabi Emirates (Soorae, 2004). During a routine survey on 24th April 2004, a skink was observed at 09:15 hrs on Jernain Island (24.92791°N, 52.85328°E) in some irrigated, heavily vegetated creepers at approximately 2 m above sea-level and approximately 20 m away from the shoreline. The following two days were spent observing this species, but attempts to obtain a specimen for positive identification was not possible. A specimen was finally obtained on 15th June 2004 and after further study was confirmed as the Golden skink, *Mabuya aurata septemtaeniata* (Reuss, 1834), a species not previously recorded for UAE.

This species was identified using keys developed by Arnold (1986) and Leviton *et al.* (1992). To confirm the identification of this species detailed photographs were also sent to José Rosado, Curatorial Associate in Herpetology, Department of Herpetology, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA who confirmed its identification with specimens in their collection (Rosado, pers. comm.).

The main identifying characters as per Arnold (1986) are the presence of three keels on the dorsal scales, and the lack of contact between the first supraocular scale and the frontal scale on the dorsal surface of the head. The species also has a pattern of dark stripes on its foreparts and light dorsolateral streaks along the body. Leviton *et al.* (1992) also mention that the prefrontal scales are not in contact. The scale patterns mentioned in these two keys conform exactly to the specimen collected. The specimen collected has the following dimensions: snout to vent length 7.3 cm, tail length 9 cm, body diameter of approximately 1.5 cm and a total body length of approximately - 16.3 cm. This particular specimen was found in the vicinity of the main guest house on Jernain Island (approx. 6 km^2) where it uses an irrigated planted creeper (mat-forming, yellow flowering composite – Asteraceae – with dense foliage) as a hiding place. It was observed leaving this planted

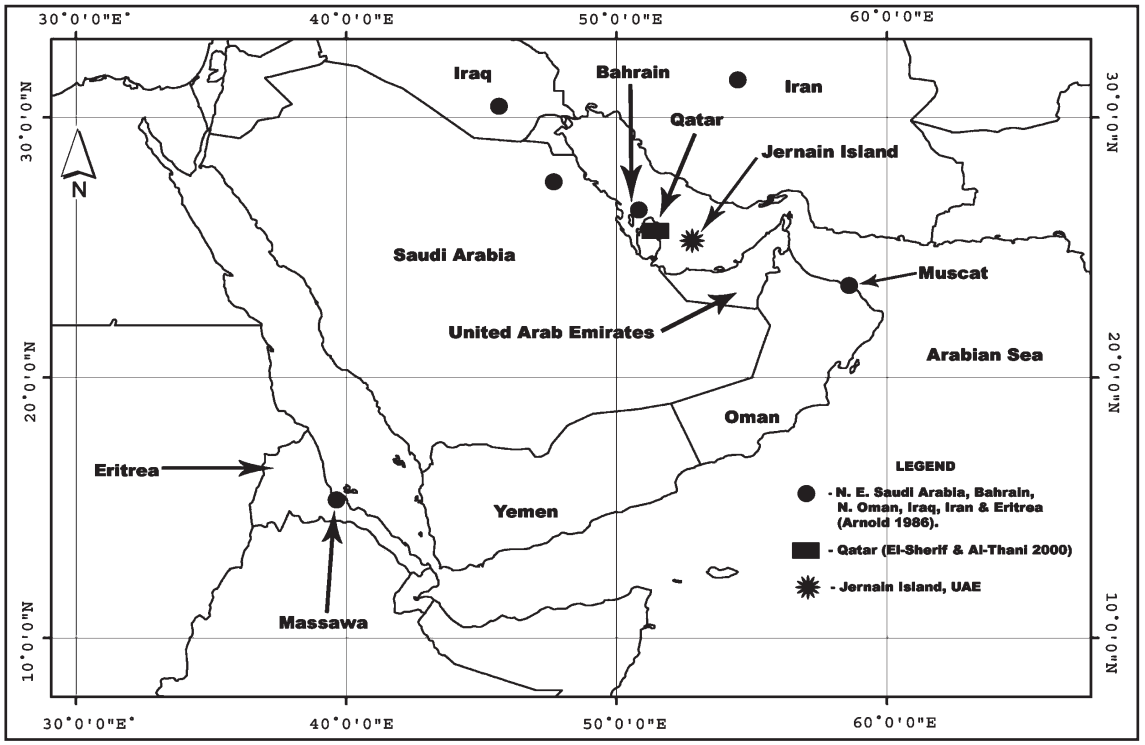

Figure 1. Distribution of *Mabuya aurata septemtaeniata* in the Arabian Peninsula and neighbouring countries.

creeper to actively hunt around some planted trees nearby and also use stones as basking places during the day. They were very alert and upon approaching a specimen it would immediately move off and flee to the safety of the planted creeper for refuge. This made them extremely difficult to catch and a specimen was finally obtained by using rodent-capture glue put on a cardboard piece left near a spot where these skinks were seen frequently passing.

As shown in Figure 1 Jernain island seems like a range extension of this species distribution from northeast Saudi Arabia, Qatar and now Jernain Island, UAE, which may be the limit of its southern geographical range. Arnold (1986) considers the Muscat, Oman and Massawa, Eritrea populations to be accidental introductions. The fact that this species has only been found on one island amongst a total of 13 surveyed during a herpetological survey in 2003–2004 (Soorae, 2004) may also be the result of an accidental introduction.

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Sex-based variation in the Central American frog *Rana juliani* Hillis and deSa, with notes on reproductive ecology

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THE Central American frog *Rana juliani* is endemic to the Maya Mountains of Belize. Originally discovered by Julian Lee (Lee, 1976; as *R. maculatum*), who collected the first known specimens, it was formally described in his honour by Hillis & deSa (1988). The latter study included the species as part of the *Rana sierramadrensis* species group (highland species), sister to *R. maculata* and *R. sierramadrensis*, based on adult and larval morphological characters. A more recent molecular treatise (Hillis & Wilcox, 2005) placed *juliani* in the *Rana palmipes* clade of lowland species, as sister to *R. vaillanti*. Interestingly, this species also occurs in Belize, and *juliani* may be a highland form derived from it, as its morphological characters appear to be generally convergent with highland species. In spite of previous phylogenetic work, *R. juliani* remains a little known species, with mostly male specimens available for analysis. Lee (1996) stated that 'there are too few [female] specimens to assess sexual size dimorphism'. During postgraduate study in Belize in May and June 2004, I had the opportunity to study a population of *R. juliani* in an area of which it is fairly common.

STUDY AREA AND METHODS

The study area consisted of a creek approximately 4 km east of the Las Cuevas Research Station (500 m elevation, 16°44'N, 88°59'W) in the Chiquibil Forest Reserve, Maya Mountains, Belize (Cayo District). The surrounding forest is of lowland tropical broadleaved rainforest type situated on underlying limestone geology. The creek itself was formed from limestone base rock and extends for approximately 5 km to the nearby Monkey Tail River. During my visits at the beginning of the rainy season (25th, 28th and 29th May 2004), standing water was present in the creek for about 1 km of its length. Water seems to be present year-round at the creek, with some pools up to 5 feet in depth. With the onset of the rains, pools fill up and presumably flow towards the river. In addition to *R. juliani*, other anuran species seen at the creek were *Rana berlandieri (= Rana brownorum)*, *Eleutherodactylus sabrinus, Smilisca baudinii* and *Smilisca cyanosticta*. All three *Rana* species recorded from Belize occur in sympatry at the creek, *R. vaillanti* having previously also been recorded in the vicinity by Gardner *et. al*. (2001) and Hawthorne *et. al*., 2003). A visual encounter survey (VES) technique was used to search for frogs along a pre-established transect that ran along the bank on the west side of the creek for 500 m (see Gardner *et. al*., 2001). Searches were conducted on days with rainfall, once during the day (commencing at 13:00 hrs) and once at night (commencing at 21:00 hrs) (see dates above). To standardise effort, each search was limited to one hour, giving an average

Figure 1. Adult female *Rana juliani*.

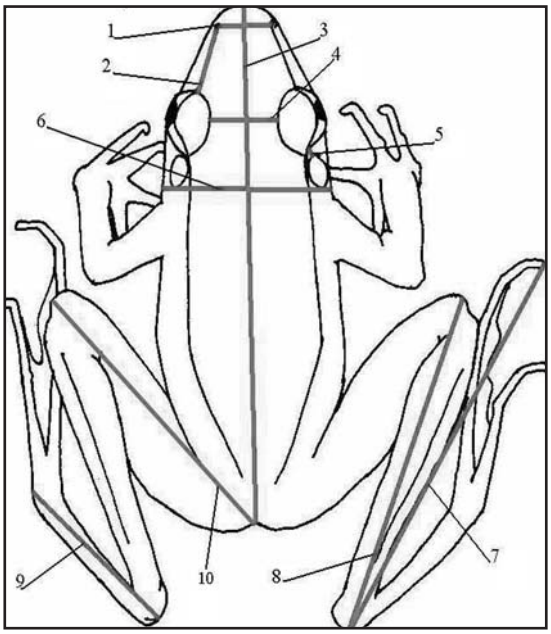

Figure 2. Diagram of frog in dorsal view illustrating morphometric measurements taken from each specimen: 1 = internarial distance, 2 = orbit to nare distance, 3 = snout-vent length (SVL), 4= interorbital distance, 5 = orbit to tympanum distance, 6 = head width (measured from posterior edge of tympanum), 7 = foot length (ankle to tip of outstretched 4th toe digit), 8 = tibial length, 9 = tarsal length (ankle to tip of tarsal bone when phalanges bent at 90º angle to tarsal bone), 10=thigh length (vent to tip of knee).

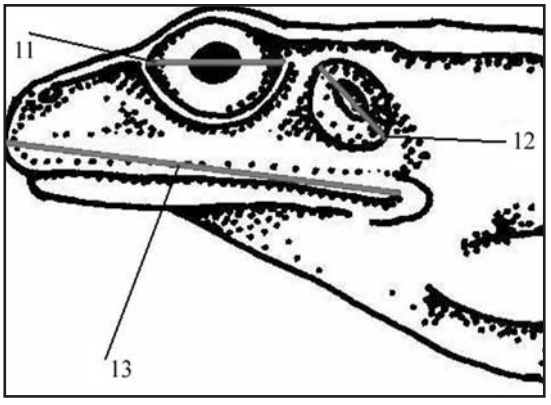

Figure 3. Diagram of lateral view of head region of frog, illustrating morphometric variables measured: 11 = orbit diameter, 12 = tympanum diameter (at widest point), 13 = head length (posterior of jaw gape to tip of snout).

Date	Day/night	*berlandieri*	*juliani*	*vaillanti*	*Rana* spp.
25/05/04	Day	0	0	0	3
	Night	2	2	0	1
28/05/04	Day	0	0	0	2
	Night	1	3	0	0
29/05/04	Day	0	0	0	1
	Night	0	8	0	0

Table 1. VES counts for *Rana* spp. at the creek.

search time rate of 0.5 km/h. Animals visible and/or active on the ground surface were counted, as conducting surveys after rain gave maximum chance of encountering animals in this way. All animals encountered were caught to confirm identification. Animals not caught were labelled as '*Rana* spp'. Visual encounter results are shown in Table 1. Morphometric variables recorded for each specimen were as follows: snout-vent length (SVL), interorbital distance, internarial distance, orbit-nare distance, tibial length, tarsal length, thigh length, foot length, head length, head width, orbit diameter, tympanum diameter, and orbit-tympanum distance (see Figs. 2 and 3). All measurements were made with digital calipers.

RESULTS AND DISCUSSION

All but one specimen of *R. juliani* was caught at night. Some were encountered during the day, but were well-camouflaged and too quick for capture. These may have been *R. vaillanti* or *R. juliani,* but could not be identified. Large tadpoles were also seen but were in deep pools and could not be caught. Since the tadpoles of all species of Belizean *Rana* attain a similar size, the tadpoles could have belonged to any of these species. No *vaillanti* were seen at night. *Rana juliani* were fairly easy to spot after dark by means of their orange 'eye shine' reflected back from torchlight. In most cases the frogs were easy to approach, not moving until a net was placed over them. One large female preserved as a voucher specimen (SSLC011, 92.6 mm SVL) contained a large 28.6 mm SVL undigested coleopteran in the stomach.

Sex	SVL	interorbital	internarial	eye - nares	head length	head width	eye diameter
Female *n*=12	83.50 ± 12.2	7.83 ± 1.16	6.91 ± 1.13	8.28 ± 1.26	28.42 ± 4.16	29.43 ± 4.46	10.73 ± 1.58
Male *n*=10	59.92 ± 5.78	5.11 ± 0.18	5.12 ± 0.62	5.75 ± 0.51	19.41 +/- 1.50	19.79 ± 1.52	7.68 ± 0.74
Sex	**tympanum diam.**	**eye – tympanum**	**tibial length**	**tarsal length**	**thigh length**	**foot length**	
Female *n*=12	7.19 ± 1.35	2.82 ± 0.63	55.01 ± 7.46	28.23 ± 3.88	33.93 ± 7.04	73.90 ± 10.16	
Male *n*=10	5.21 ± 0.88	1.89 ± 0.23	36.14 ± 3.22	18.48 ± 1.61	29.86 ± 1.88	48.76 ± 4.24	

Table 2. Morphometric measurements (means and standard deviations in mm.) for *R. juliani* specimens.

Sex-based variation

Morphometric measurements (means and standard deviations in millimetres) were taken from specimens from the creek supplemented with material from other collections (see appendix for list of specimens). These data are shown in Table 2. Maxillary teeth are present in both males and females, and vomerine tooth counts range from 5–7 (males) to 5–9 (females). In both males (n = 4) and females (n = 7) the vomerine dentary process is elliptical in shape. This characteristic does not appear to be a sexually dimorphic in *R. juliani*, although further specimens are needed to corroborate this. Cochran & Goin (1970) describe the vomerine teeth in Colombian *Rana vaillanti* and *Rana palmipes* (then both known as *R. palmipes*) as distributed 'in two small, slanting, widely separated series between the choanae' but there are no records of sexual dimorphism for this characteristic.

Reproductive ecology

There are a few details available on reproduction in *Rana juliani.* Males lack vocal slits and sacs, and most published accounts treat the species as mute and/or voiceless. However, *R. juliani* appears capable of making a distress call. One female that I handled produced loud cries and then 'played dead', assuming a completely limp posture in my hand. This behaviour had great effect in that, fearing the worst, I placed the frog in shallow water at the edge of the creek, whereupon it made an immediate recovery and escaped (see Fig. 3). I did not handle enough males to observe this behaviour. Male *R. juliani* are not known to produce an advertisement call, and it is not known how they attract females (elicit female choice),

Figure 3. Adult female *R. juliani* in shallow water of creek having recovered after 'playing dead'.

Figure 4. Adult female *R. juliani* photographed at night part-buried in leaf litter.

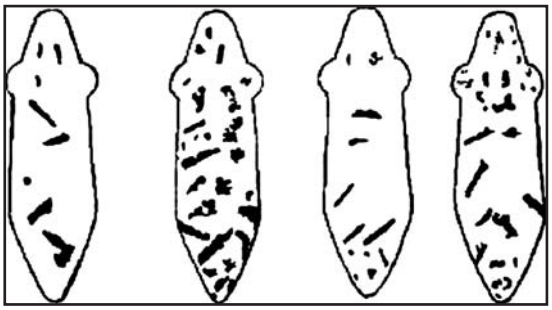

Figure 5. Variation among individuals of *R. juliani* in character of dorsal markings.

intimidate other males, and/or hold territories. In species of Asian voiceless *Rana* that also lack vocal sacs, males possess fangs (odontoid processes on the lower jaw), hypertrophied jaw muscles, have longer, wider heads than females, and are also larger (Emerson & Berrigan, 1993). Male *R. juliani* show none of these characteristics, and have similar sexually dimorphic traits that other voiced species possess, i.e. nuptial pads on the pollex in the breeding season and smaller body size than in females. Three general causes have been cited for voicelessness in frogs: the lack of closely related species in the same habitat, the presence of a high level of background noise in the habitat, or the use of permanent breeding sites (Duellman & Trueb, 1994). *Rana vaillanti*, the most closely related species to *R. juliani* (Hillis & Wilcox, 2005) is also present at the creek, but it is interesting to note that no vocalisations have been recorded from this species in this location. Campbell (1998) describes *R. juliani* as a typical stream-breeding species lacking vocal slits and sacs, alluding to the aforementioned hypothesis of background noise (cited above). During my observations at the beginning of the rainy season, females were gravid but flow rate at the creek was nil. The rains had not begun in full, but I do not think that background noise could have been a significant factor in this case. An Asian voiceless species, *Rana blythi* (= *Rana leporina*) displays a female-biased sex ratio and non-clumped distribution, and males may also hold territories (Emerson & Inger, 1992).

The reproductive ecology of *R. juliani* has not previously been investigated. Of the total number of specimens observed at the creek, 77% were females, and almost all of these were found at or near the water's edge (one was partially buried in leaf litter; see Fig. 4). Individuals were not found in close proximity to each other, but with no quantitative data available on spatial distribution, further analysis is clearly needed to determine whether the females keep a minimum distance away from each other. Due to the timing of the onset of the rains, and the reproductive condition of the individuals concerned, the distribution pattern observed may represent females waiting for breeding males. This behaviour, however, has not been observed in *R. juliani* or other *Rana* species. All dissected females (n = 5) contained eggs, and one particularly large specimen (SSLC018, 97.7 mm SVL) collected on 29th June had a minimum clutch size of 1210 eggs. This information is concordant with the suggestion by Lee (1996) that breeding occurs during the summer rainy season. Tadpoles take around six weeks to metamorphose (Lee, 2000); the larger tadpoles I observed in the creek are possibly those of another, unidentified *Rana* sp. that either breeds outside the rainy season, or are from the previous year's reproductive effort and in which metamorphic development has been extended. Gravid *R. juliani* have also been found in February (Lee, 2000). Reproduction in *R. berlandieri* (= *brownorum*) is associated with summer rains. *Rana vaillanti* seems similar in this respect, but egg clutches have been found in February in Belize. It is possible that the large number of females encountered is due to their congregation at a suitable breeding site at the onset of the rains. Further study of these frogs outside the rainy season is needed to investigate sex ratios, home range sizes, and dispersion. As *R. juliani* is essentially restricted to riparian habitats, it may breed year round where the presence of water is permanent, with a concentrated period of reproduction during the rainy season. Some of the smaller streams along which this species occurs, however, are know to dry out in the dry season (Meyer & Farneti Foster, 1996). The position of

females along the creek banks may also indicate that they hold territories in breeding seasons. If so, sexual selection in this species may involve male choice, although the selection factors for this are unclear. Sympatric *R. juliani* and *R. vaillanti* may also hybridise.

There is an obvious requirement for the further study on the ecology and natural history of *R. juliani*. These frogs seem to be more active and easier to locate after dark, and are easily approachable once located by torchlight. One can get close enough to photograph or sketch individuals, an advantage in that each frog seems to have unique dorsal markings (see Fig. 5). Dark flecks and spots were present on the dorsum of all individuals and these marks from a unique 'fingerprint' with which to identify individual frogs. This allows for the possibility of a long-term behavioural study in the future that could shed light on the reproductive ecology and selection for voicelessness in these frogs.

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Appendix: Specimens Examined

Sam Shonleben collection (donated to the Natural History Museum, London [BMNH], awaiting accession): SSLC004–005, 008–018; creek, approx. 4 km E of Las Cuevas Research Station, Chiquibil Forest Reserve, Cayo District, Belize. BMNH 1973.2361 – 2365; Double Falls, British Honduras. UMRC 97–1 (series of 4 specimens; JCL field numbers 7029–7032); Little Quartz Ridge, Toledo District, Belize.

NATURAL HISTORY NOTES

Natural History Notes features articles of shorter length documenting original observations of amphibians and reptiles mostly in the field. Articles should be concise and may consist of as little as two or three paragraphs, although ideally will be between 500 and 700 words. Preferred contributions should represent an observation made of a free-living animal with little human intrusion, and describe a specific aspect of natural history. Information based on a captive observation should be declared as such in the text and the precise geographical origin of the specimen stated. With few exceptions, an individual 'Note' should concern only one species, and authors are requested to choose a keyword or short phrase which best describes the nature of their observation (e.g. Diet, Reproduction). The use of photographs is encouraged, but should replace words rather than embellish them. Contributions are accepted on the premise that they represent a previously unreported observation, and may be edited prior to acceptance. Standard format for this section is as follows:

SCIENTIFIC NAME (Common Name): KEYWORD. Text (there are no constraints on how information is presented but the date, time, and locality – with full map co-ordinates if possible – must be included, as should precise details on the nature of the observation with some discussion of its significance, and references to pertinent literature). If the information relates to a preserved specimen, its catalogue number and place of deposition should also be given. REFERENCES. Then leave a line space and close with name and address details in full.

***CHIRONIUS LAEVICOLLIS* (Pale-necked whipsnake): REPRODUCTION.** *Chironius laevicollis* is a large terrestrial, diurnal colubrine snake, which feeds on frogs (Dixon *et al*. 1993; Marques, 1998), and inhabits rainforests in eastern Brazil, from the States of Bahia and Minas Gerais up to Santa Catarina (Dixon *et al*. 1993; Marques & Puorto, 1996). This note presents unpublished information about oviposition and hatching, clutch size, relative clutch mass (RCM), and size of newborns for *C. laevicollis*, based on individuals collected in the littoral region of São Paulo State, southeastern Brazil.

One female *C. laevicollis* (IB 70049: 1273 mm in snout-vent length (SVL), 590 mm in tail length (TL), and 630 g) collected in São Sebastião (23°50'S 45°18'W) was brought to Instituto Butantan (IB) and laid 10 eggs on 16th January 2004. Two other females were collected in Caraguatatuba (23°37'S 45°24'W). One of them (IB 71561: 1413 mm SVL, 650 mm TL, and 775 g) laid 14 eggs on 10th September 2004. The other one (IB 72012: 1350 mm SVL, 608 mm TL, and 770 g) laid nine eggs on 16th November 2004. The eggs (n = 33) averaged 43.2 mm in length (range = 36.5–52.0 mm) and 22.6 mm in width (range = 18.7–24.0 mm). The RCM (mothers weighed after oviposition) varied from 0.18 to 0.25 (mean = 0.22), which is lower than that reported for most other oviparous snakes (see Seigel & Fitch, 1984).

The eggs were incubated in a plastic container with moistened vermiculite as substrate, at room temperature varying from 20 to 32°C. Hatchings occurred from 20th–21st May 2004, 16th–19th January 2005 and 15th March 2005, respectively. Newborns (n = 18) averaged 276.05 mm SVL (range = 230–295 mm), 126.5 mm TL (range = 110–134 mm) and 10.5 g (range = 6.6–12.5 g), and had a uniformly green ground colour (Figure 1), differing markedly from the mother, which was a yellowish brown (for details see Marques & Sazima, 2003). Marques (1998) suggested that reproduction in *C. laevicollis* is seasonal, although this inference was based on a limited number of preserved specimens (five individuals containing vitellogenic follicles from August to December, and two with oviductal eggs in October and November). Our observation is consistent with the notion of seasonal reproduction in this species, with oviposition at the end of the dry season and beginning of the rainy season (September – January), and recruitment during the rainy season and beginning of the dry season (January – May). This pattern is the same as that recorded for other species of *Chironius* (Dixon *et al*. 1993; Marques & Sazima, 2004).

Figure 1. Newborn of *Chironius laevicollis* after 36 days of birth (male, 335 mm SVL, 145 mm TL and 12 g).

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***ANILIUS SCYTALE* (Red pipesnake): REPRODUCTION.** The Red pipesnake inhabits northern South America from southern and eastern Venezuela, Guyana, Suriname, and French Guiana through the Amazon Basin of Colombia, Ecuador, Peru, Bolivia, and Brazil (McDiarmid *et al*., 1999; Uetz, 1995–2005). It is a viviparous snake with fossorial habits that feeds mainly on elongate fossorial and aquatic vertebrates (Martins & Oliveira 1999), and which escapes from predators either by fleeing (flight category, Seigel & Fitch, 1984) or by using some form of active defence (stand-and-fight; Seigel & Fitch, 1984).

Life history data on Ecuadorian populations of this species are scarce or unpublished. The only reproductive data available for *Anilius* in Ecuador is that reported by Duellman (1978), who states: 'one female collected in June with small ovarian eggs'. Cunha & Nascimento (1981) reported on seven females from Brasil (520–945 mm total length [TTL]) collected between March and November with ovarian eggs (3–37 eggs/female), two females collected in March and July with eight and ten developing embryos each one, and seven other females (530–841 mm TTL) collected between February and July with developed embryos (5–8 embryos/female, 184–218 mm TTL). Among these, one female (841 mm TTL) had twelve embryos with a mean TTL of 203.9 ± 2.1 SE mm (194–214 mm TTL, mode = 210 mm), and another (680 mm TTL) had nine embryos with a mean TTL of 196.0 ±2.3 SE mm (185–205 mm TTL, mean = 201 mm). Cunha & Nascimento (1981) stated that *A. scytale* appeared not to have a defined breeding season, independent from the rainy or dry season, and suggested a gestation period of four to six months. In the Iquitos region (Peru), Dixon & Soini (1986) reported on one female (1184 mm TTL) that gave birth to six young in February 1972, a smaller female that gave birth to four young in January 1966, and a very young specimen taken in early March. Martins & Oliveira (1999) reported on one female (598 mm snout-vent length [SVL], 24 mm tail length [TL]) that gave birth to eight young (154–163 mm TTL) in October, another (898 mm SVL, 29 mm TL, 181 g) that gave birth to 15 young (206–234 mm TTL; combined mass of all 15 young = 52 g; relative clutch mass [RCM] = total offspring mass/female total mass = 0.29); a female (424 mm SVL, 17 mm SVL) with seven fully developed embryos (157–173 mm TTL) in October; and, a female (898 mm SVL, 29 mm TL) with five developing embryos.

On 26th January 1999, a female *A. scytale* was collected in the Centro Mashient, province of Morona-Santiago, Ecuador. The specimen (FHGO 2355) was maintained in captivity and gave birth to 18 living and 8 stillborn young on 6th February 1999 (FHGO 2356-64, 2373-74, 2378, 2380, 2387-88, 2390-91, 2393-95, 2397, 2403, 2440). The female had a TTL of 1027 mm, and a mass of 155.7 g when collected. The 18 young had a mean TTL of 213.7 ± 2.5 SE mm (190–230 mm TTL, mode 218 mm), and mean mass of 2.8 ± 0.1 SE mm (2.2–3.3 g, mode = 2.8 g). Four of the stillborn snakes had a mean TTL of 212.5 ± 3.1 SE mm (206–221 mm TTL) and mean mass of 2.7 ± 0.1 SE mm (2.4–2.9 g). Total litter mass was c. 70 g, RCM = 0.45. The 18 young snakes remained alive for between 53 to 69 days and died of unknown causes.

Additional data presented herein indicate that *A. scytale* litter size varies from 4 to 18 young, with an SVL range of 154–234 mm). Reproductive females have a mean SVL of 718.5 ± 54.2 SE mm (424–1142 mm, n = 15), and relative clutch mass values range from 0.29–0.45. Notwithstanding the small sample size, RCM and SVL range in this species appears to be relatively high compared with other viviparous snakes (e.g. Seigel & Fitch, 1984; Seigel *et al*., 1986). Also, although a decrease in RCM is often associated with increasing body size in viviparous snakes (Seigel *et al*., 1986), *A. scytale* shows a different trend. However, this could be explained by the species' fossorial habits, supporting Iverson's hypothesis (in Seigel *et al*., 1986) regarding the secretiveness of fossorial species permitting higher RCM. Species with burrowing habits are generally less

exposed to visual predators and the reproductive cost to females is thus likely to be relatively minor in comparison with species that occur primarily above ground, supporting Seigel *et al*.'s hypothesis (1986) regarding the ecological explanations for RCM and SVL relationships. Ovarian eggs, developing embryos and young have been reported from January to July, and in October and November, suggesting continual reproduction (Seigel & Ford, 1987) and supporting Martins & Oliveira's hypothesis (1999).

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***LACERTA* (*ZOOTOCA*) *VIVIPARA* (Viviparous or Common lizard: ALTERNATE GREEN COLOUR PHASE**. Most literature states a notable diversity of pattern and colour variation in the species *Zootoca vivipara*. Colin Simms (1970) described a significant proportion of many populations of the species to exhibit a 'green' colouration, to the degree that he stated specimens were 'approaching the green of the grass they live in'. It was during a routine *Vipera berus* field study on Wednesday 20th April of this year that such a Viviparous lizard was captured at a site near Black Hill, Quantock Hills, Somerset (see photograph). The site consisted of a south-facing slope covered in a variety of heather, gorse, and dry grasses. The abundance of dead material scattered on the ground suggests that the area had undergone swailing prior to our arrival with plant life beginning to come through once more and provide a scrub-like habitat. Thick shelter and refuge was present in the form of a series of heather and gorse hedgerows arranged along the centre of the site. Many lizards had previously been witnessed displaying regular colouration throughout the site and also in surrounding areas. The lizard was collected whilst moving across grass and scrub towards refugia (heather and gorse). The physical appearance and patterning exhibited by the individual was typical of the female of the species. A constant yet faded vertebral stripe and and dark flanks was observed although additional patterning (ocelli, streaks, or other markings) was absent. Significant features included a distinct turquoise blue marking covering part of the head over the left eye, and also the absence of three digits on the right forelimb. Frank D. Bowles (2000) described a specimen which displayed a turquoise sheen, commonly seen in varying light conditions and when photographed. It was this same turquoise sheen that was witnessed in this particualr lizard when exposed to light. During that afternoon a further two individuals were seen to exhibit the same full colouration although no detail was observed. One of these displayed a more bold colour in comparison to others. The captured lizard was examined, photographed, and released the same afternoon.

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***SCINAX NASICUS*, *HYLA ALBOMARGINATA*, *HYLA BISCHOFFI* AND *PHYLLOMEDUSA DISTINCTA* (Tree frogs): AVIAN PREDATION**. Two Brazilian species of birds, *Pitangus sulphuratus* (Tyrannidae) and *Trogon surrucura* (Trogonidae) are food-generalists, feeding on fruits, arthropods (mainly insects), and small vertebrates, including tadpoles (Eguiarte & Rio, 1985; D'Heursel & Haddad, 1999; Develey & Endrigo, 2004). Nestlings are frequently fed with insects by their parents (Lago-Paiva, 1996; Skutch, 1956). Although anurans are preyed upon by several species of birds (e.g., Remsen *et al*., 1993; Master, 1998; 1999; Poulin *et al*., 2001; Prado, 2003), these two bird species have never been reported to feed on post-metamorphic anurans. Therefore, we present data on four species of Brazilian hylids (Anura; Hylidae) that were preyed upon by these two species of birds during brooding. Observations were made in the Municipality of Corumbá, Mato Grosso do Sul, south-western Brazil (19º34'S, 57º00'W; 100 m) and in the Municipality of Guaramirim, Santa Catarina, southern Brazil (26º27'S; 49º00'W; 20 m). The male of the observed pair of *P. sulphuratus* (Great kiskadees) was observed capturing an adult *Scinax nasicus* that was sheltering under a woody house during the day. After capturing the frog, the bird perched in a branch of tree where the nest was built. The anuran was killed by being beaten against the branch of the tree, and then offered to the nestlings. The pair of *T. surrucura* (Red-bellied trogon) was observed building nests in arboreal termitarias on five occasions between 2002 and 2004 (twice in 2002 and 2003, and once in 2004). The nest was approximately 30 m from the pond where several species of frogs breed, including *Hyla albomarginata*, *H. bischoffi*, and *Phyllomedusa distincta*. Both male and female were observed capturing adults of *H. albomarginata* (n = 6), *H. bischoffi* (n = 1), and *P. distincta* (n = 1) (Figure 1A). After subjugation, the trogons were seen lacerating the tree frogs with their beak and claws (Figure 1B). After that, trogons moved to the nest and fed the nestlings on their final days of nest development. Nestlings were fed with tree frogs on all the five observed broodings. Although frogs are not the main food source of Neotropical birds (e.g., Remsen *et al*., 1993), they may be frequently preyed due to their conspicuous abundance in nature (Duellman & Trued, 1994; Poulin *et al*., 2001)and high energetic budget that can be offered to nestlings.

Figure 1. Adult *Trogon surrucura* (Red-bellied trogon) carrying an adult *Hyla albomarginata* (tree frog) (A) that was offered to its nestlings in the nest built in an arboreal termitaria (B) in the Municipality of Guaramirim, Santa Catarina, southern Brazil.

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Red salamander, *Pseudotriton ruber*. Illustration by Will Brown, produced from original photograph enhanced and manipulated using digitial imaging software. www.//blueridgebiological.com

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EDITORIAL

Correction

A correction has been notified by the author of the following article published in *Herpetol. Bull*. 92 (Summer 2005): Preliminary notes on the amphibian fauna of Tanjung Puting National Park, central Kalimantan, Indonesian Borneo.

Page 2; instead of *Fejervarya limnocharis*:

Limnonectes paramacrodon
Lesser swamp frog (Figure 2)
(20/10/04) 1 male, 62 mm SVL, 1 female, 49 mm SVL, 1 juvenile, 26 mm SVL. Found in mud and grass areas on the bank of the Sekonyer kanan river, next to a jetty that marks the entrance to Camp Leakey. The male, larger than the female in this species, was distinguished via a black band across the throat. Other individuals, some larger than those caught, were seen. This species, along with *L. malesianus*, forms part of the monophyletic Limnonectes clade of Southeast Asian fanged frogs. Its relations within the group are unclear. Identification of *L. paramacrodon* was confirmed by Prof. Djoko Iskandar (Bandung, Indonesia).