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Correspondence, membership applications, subscription renewals and purchase orders for the Herpetological Journal and British Herpetological Society Bulletin should be sent to the above address.

The British Herpetological Society was founded in 1947 with the broad aim of catering for all aspects of interest in reptiles and amphibians. Initiated by a small number of enthusiastic and well-known naturalists, including the first President and author of the standard textbook on British herpetofauna Dr. Malcolm Smith, the Society expanded rapidly and today enjoys national status with many international connections.

Activities of members range over a number of interrelated fields. In many cases the prime interest is in maintaining, breeding and observing various species in captivity and the Society acts as a forum for the interchange of experiences in this area. Others are concerned with the observation of animals in the wild state. There are active sub-committees which help to cater for these various tastes, notably the Captive Breeding Committee and the Conservation Committee. The former encourages the development of effective breeding techniques for captive specimens, thus providing animals for observation and study in vivaria, and for conservation purposes, while simultaneously reducing the need to take fresh stock from wild and possibly declining populations. The Conservation Committee is actively engaged in field study, conservation management and political lobbying with a view to improving the status and future prospects for our native British species. It is the accepted authority on reptile and amphibian conservation in the U.K. and has an advisory role to the Nature Conservancy Council (the statutory Government body). There are also professional scientists within the ranks of the Society engaged in increasing our understanding of all aspects of reptile and amphibian biology.

Meetings

About ten meetings covering a broad sphere of interests are held each year.

Subscriptions

Ordinary Members £15. Junior Members £5. (Junior Members do not receive the British Journal of Herpetology). Institution rates £25 (U.S. $40).
All subscriptions become due on the first day of January each year.

The Bulletin is edited and produced by
John Pickett and Simon Townson

Contributions and correspondence arising from the Bulletin should be sent to:
John Pickett, 84 Pyrles Lane, Loughton, Essex IG10 2NW

FRONT COVER

Emerald Tree Monitor, *Varanus prasinus,* from Yaguan, Madang, Papua New Guinea. See *the Reptiles of Papua New Guinea*, by Mark O'Shea, p.15.

REMAINING LONDON MEETING 1991

November 20th — Mark Day (Gambian Dwarf Crocodile Rescue Project, University of Bristol): Herpetofaunal wading through West Africa.

THE BRITISH HERPETOLOGICAL SOCIETY
REPORT OF THE CONSERVATION COMMITTEE: 1989 & 1990

INTRODUCTION

Due to a growing concern as to the status of British reptiles and amphibians, and to the fast disappearing habitat on which they depended, some members of the British Herpetological Society decided in 1969 to form a Conservation Committee. From these humble beginnings the BHSCC has blossomed into an organisation which has considerable authority and expertise in the field of rare amphibian and reptile habitat management and protection. This report details our activities during the past two years, during which time the Conservation Committee celebrated its 21st anniversary. We felt it worthwhile starting by summarising the results of the past 21 years work, before going into greater detail into the events of 1989 and 1990.

In the 1970s the BHSCC undertook surveys which highlighted the scarcity of the Sand Lizard, Smooth Snake and Natterjack Toad, and subsequent political lobbying resulted in their legal protection, and in some cases the protection of their habitat. These more vocal aspects of the Conservation Committee's work were backed up by the hard physical effort of habitat management. Without the latter work it is likely that many rare reptile and amphibian populations would not exist today.

In the early 1980's considerable effort was invested in raising funds for a Conservation Officer to co-ordinate the Committee's work and success in this direction was achieved in 1985. This greatly boosted the amount of effort we were able to invest in site management and species protection. The post was initially funded on a three year contract funded by the Nature Conservancy Council (NCC), the Worldwide Fund for Nature (WWF) and the Vincent Wildlife Trust (VWT), an arrangement which greatly enhanced confident forward planning. On completion of the contract the officer was then employed by the newly formed Herpetofauna Conservation Trust (HCT), a non-membership organisation, to continue the work. This resulted in enhanced funding from VWT in particular, and the NCC and WWF. Despite the new arrangements the work of the HCT and the BHSCC was very closely linked and the two organisations are mutually dependent. Indeed three of the eight HCT Trustees are Conservation Committee members and the Conservation Officer sits on the Conservation Committee as an advisor.

This relationship is still evolving and one of the challenges of future years is to ensure that it works well. Unfortunately our amphibians and reptiles face a great many threats and much remains to be done if they are to be effectively conserved. The BHS is continuing to improve its contribution to their conservation and we welcome any advice on how this might be improved.

CONSERVATION COMMITTEE MEMBERSHIP

The following individuals have been members of the Conservation Committee during the past two years; Mr. B. Banks, Ms. M. and Dr. T. Beebee, Mr. D. Bird, Mr. A. Braithwaite, Mr. J. Buckley, Mr. J. Denton, Mr. D. and Mrs. M. Dolton, Mr. C. Fitzsimmons, Mr. P. Edgar, Mr. J. Gaughan, Dr. R. Griffiths, Mrs. E. and Prof. G. Haslewood, Mr. H. Inns, Mrs. M. Jones, Mrs. A. and Mr. M. Langford, Mr. D. Mills, Mr. M. Preston, Mr. D. Race, Mr. C. Raxworthy (1989), Mr. P. Reynolds, Mr. K. Sherrard, Mr. E. Wade, Mr. J. Webster, and Mr. W. Whitaker (Chairman).

In March 1990 it was pleasing to note that Prof and Mrs. Haslewood were made Honorary Members of the BHS in recognition of the tremendous contribution they have made to the work of the Conservation Committee.

We are grateful to the following individuals who have acted as advisors to the Committee; Dr. E. Arnold (British Museum), Dr. H. Arnold (Institute of Terrestrial Ecology), Mr. P. Bryce, Mrs. J. Clemons (Association for the Study of Amphibians and Reptiles), Dr. A. Cooke, (NCC), Mr. K. Corbett (HCT), Mr. D. Morgan (NCC), Mr. R. Rudge (1989), Dr. R. Stebbings (ITE), Dr. C. Tydeman (WWF) and Mr. J. White (NCC).

SITE AND SPECIES PROTECTION

As in previous years this work was concentrated on the Sand Lizard, Smooth Snake and Natterjack Toad. We have started to record properly instances of habitat damage or destruction to help justify the need to conserve the remaining habitat of these species. The results make depressing reading and are summarised in table 1.

Table 1. Recorded damage to rare reptile sites.

Sand Lizard

County	Cause of damage:					
	Fire		Building		Others*	
	No sites	Acres	No sites	Acres	No sites	Acres
Surrey	6	27	0	0	0	0
Dorset	11	417	5	105.25	5	6.25
Hampshire	1	5	0	0	0	0
Total	18	449	5	105.25	5	6.25

Smooth Snake

County	Cause of damage:					
	Fire		Building		Others*	
	No sites	Acres	No sites	Acres	No sites	Acres
Surrey	2	6.5	0	0	0	0
Dorset	9	400	3	35.5	2	4.5
Hampshire	2	285	0	0	0	0
Total	13	691.5	3	35.5	2	4.5

* Damage in this category was caused by motor cycles and other vehicles and gabion repairs.

The rare reptiles were particularly badly affected by fires which damaged a great number of heaths in Dorset and Hampshire during the hot dry summer of 1989 with the worst examples being Canford Heath in Dorset, the habitat of Sand Lizards and Smooth Snakes, and Bratley Plain in the New Forest, which supports Smooth Snakes. 1989 was the worst year for such fires in Dorset since 1976, on one day alone for instance a total of 40 heathland fires were reported! In 1990 fires had a more serious impact in the Weald. One of the last Surrey localities of the Smooth Snake, which the BHS have managed since the late 1960s, was almost completely burnt out. This was due to three separate fires that appear to have been caused by arson. Sand Lizards were also present on this site prior to the fire. Arson also resulted in the probable extinction of a reintroduced Sand Lizard population at Thursley Common National Nature Reserve. A Smooth Snake reintroduction site nearby was also damaged at the same time. There were also extensive fires on Hankley Common and the Ash Ranges which narrowly avoided important rare reptile habitat. It is our view that many rare reptile sites are inadequately fire-breaked and this needs to be rectified urgently if there are not to be further disasterous losses.

Development pressure in Dorset also destroyed 5 rare reptile sites. On the positive side however Conservation Committee volunteers worked closely with the NCC in Dorset to prevent damage to an important reptile site, Upton Heath. This SSSI was zoned for sand and clay extraction in old county plans, and the owner has been trying to bulldoze tracks onto the SSSI as access to the site is one of the features that has prevented mineral working taking place to date.

(As an aside conservation organisations are trying to ensure that on the new county plans the SSSI is properly protected from mineral working). On the 25th November 1989 a contractor was found bulldozing a track into the SSSI without planning permission. Several BHS members sat in front of the machines for several days until the NCC were able to obtain orders preventing the work from continuing. The order is of a temporary nature and the final outcome remains to be seen, but this is a good example of co-operation between our two organisations.

BHS members may have read of the recent Judicial Review in which BHS, funded by the WWF, challenged the decision of Poole Borough Council to grant planning permission for the building of houses on Canford Heath. The plot of land, approximately 17 acres in area, has some superb south facing slopes with populations of Sand Lizard and Smooth Snake, as well as other rare heathland species. The site had an old planning permission for building, granted long before the site was notified as a Site of Special Scientific Interest, which had lapsed. The Council passed a new planning permission, which was treated as a renewal, despite the fact that by then they were aware of the importance of the site for nature conservation, which by then had been notified as a SSSI. The recent planning permission was challenged on the grounds that the Council, in granting planning permission, did not take into account the SSSI status of the land, did not undertake a proper Environment Assessment, and that it took undue account of the previous planning permission, allowing this to sway the decission in favour of development. The case unfortunately was lost, but this was considered to be a close result. Regretfully the Judge considered the absence of the NCC at the Judicial review, and the failure of the Department of the Environment to call in the planning application for a public enquiry, indicated that the land was not of such high importance as was being claimed by BHS. WWF have agreed to fund an appeal on this important case which has highlighted some major inadequacies in our nature conservation legislation. On the positive side the case highlighted the plight of this internationally important habitat and it is reported that members of the public showed an increased awareness of the importance of Dorset's heathland.

Regretably there are other sites in Dorset with planning permissions where development cannot be prevented and where reptile populations are destined to be destroyed. At such sites the BHSCC has employed a species protection officer to rescue reptiles for release at protected localities agreed with the NCC. A total of 255 Sand Lizards and 32 Smooth Snakes were rescued for release onto other safe sites.

Damage to Natterjack Toad sites was much less frequent and confined to Cumbria and Dumfrieshire. In the latter county two important saltmarsh breeding ponds were drained, although negotiations are underway with the owners to provide replacement ponds. Another group of pools in a sandy field at Powiliemount were completely destroyed when the owner ploughed and reseeded the site. Damage to another pool by a farmer was reported to the NCC in August 1990. Serious damage also occured during October 1989 at Millom Ironworks, an SSSI and part of a proposed Ramsar site/Special Protection Area which supports one of the largest known British populations of this species. Following inadequate consultation, Copeland Borough Council and Cumbria County Council granted planning permission for a factory unit on part of the site. The work was funded partly by the Department of the Environment. Interventions from the BHS, supported by NCC, HCT, and the Cumbria Wildlife Trust resulted in an agreement by which the most important features of the site should be protected, although the initial development work damaged several acres of prime Natterjack habitat and may have squashed hundreds of animals. An undertaking was made to build a toad proof-fence around the development site, to prevent unnecessary toad mortality, and also to designate the remaining habitat as a Local Nature Reserve. One year later we are able to report that the toad fence is half constructed, but there has been no progress on the designation of a Local Nature Reserve. The Councils did, however refill the main breeding pool with tap water during the summer drought enabling thousands of toadlets to emerge, making up for some of the damage caused the previous year. We will be monitoring developments closely at this important site during the next year.

Table 2. Recorded damage to Natterjack Toad sites.

County	Cause of damage:			
	Development		Drainage	
	No sites	Acres	No sites	No ponds
Cumbria	1	10	0	0
Dumfrieshire	0	0	4	6

Although the endangered species are our current priority, where possible we have also tried to protect their commoner relatives. The Offham Marshes, an important amphibian and Grass Snake site identified by the BHS in Sussex has recently been notified as an SSSI. In Surrey the BHS has worked with NCC and Surrey County Council to ensure the protection of an important Great Crested Newt site, Stones Road Pond. This was damaged illegally by developers who have offered the BHS £10,000 to help manage the site. Negotiations on this subject are continuing.

Committee members have undertaken several contract surveys in Sussex, Kent and Hampshire to assess the importance of amphibian breeding sites that are threatened by new roads.

HABITAT MANAGEMENT

Heathland management, particularly scrub clearance has been an important aspect of the Society's work for more than 20 years now, frequently undertaken on sites that would otherwise be unmanaged. Such work, which is now co-ordinated by the HCT, requires great care to ensure that the mature heather required by rare reptiles is not damaged, consequently the BHS perform a valuable task on sites where contractors could unwittingly cause damage. We have introduced a system for recording exactly what work is undertaken by the BHS and helpers.

Table 3. Total amount of scrub clearance undertaken by BHS in 1989-90

Description	Area cleared (Hectares)	No of volunteer days worked
BHS work parties		
Dense mature pine	2.1	103.5
Scattered trees	3.3	78
Young pine	7.5	147
Mixed scrub	3.75	88.5
Gorse	2.1	82
Recoppicing birch (spraying)	2.5	4
Supervising Contractor clearance		
Dense deciduous scrub	22.9	1.5
Total	44.15	504.5

As well as recording the actual amount of work done, and the number of volunteer days worked, table 2 also illustrates the different amounts of effort required for different tasks. 1 hecture of mature pine took on average 49.3 volunteer days to clear, whilst a similar area of pine scrub took only 19.6. Gorse, a frequent problem species on rare reptile sites was also a labour intensive species to coppice taking 39 volunteer days to coppice 1 hectare. The majority of the work was undertaken in Dorset (62% of the days worked) with 31% in Surrey and 7% in Hampshire.

Bracken is another serious problem on the southern heaths where it smothers the heather and shades out the reptiles. The best method of eliminating this fern from reptile sites is to spray the fronds with a selective herbicide (Asulox). A total of 22 heathland sites were sprayed with asulox in Dorset and West Sussex to control this plant in 1989. The work was

done by Conservation Committee members under contract to the HCT. Unfortunately the area was not recorded. In 1990 a total of 26.15 hectares of bracken dominated heath were sprayed in Hampshire and Dorset on 4 sites.

A major achievement during the past two years has been the completion and implementation of conservation management plans for two important Wealden heathland sites, Woolmer Forest and Hankley Common, which are owned by the Ministry of Defence. The BHS has been one of the main organisations involved in this through our representatives that sit on the Conservation Groups of these two sites. In both cases extensive areas of scrubbed up heathland are being reinstated to open heath once more and the amphibian and reptile populations will benefit considerably as a result.

During May 1989 a meeting was organised at Syderstone Common, Norfolk, one of only two native heathland Natterjack populations where the toad has undergone a precipitous decline. The group identified several problems with habitat management at the site and proposals for a management plan were suggested. Money was also obtained from the HCT to clear scrub from this important site.

A similar venture was organised on the Scottish Solway coast in 1990. A result of recent BHS activities in this area, in association wth the NCC, has been the excavation of 5 scrapes at Southerness where the Natterjack population is in danger of becoming extinct. Funding for this project was obtained from the NCC and the HCT.

An important saltmarsh pond used by Natterjack Toads at Eskmeals, Cumbria, was restored by BHS Member Tim Skelton. The pool, an artifical scrape created in the 1970s, was one of the most productive pools in the county until recently when the pool was breached by high tides making it permanently saline. In addition it had become very overgrown by sea-club rush. The breach was repaired and as much of the club-rush as possible removed from pool. The expenses were covered by the HCT, while Cumbria County Council kindly provided the use of a caravan as accomodation while the work was underway.

SURVEY

The national Sand Lizard survey continued with several new populations being discovered. As in previous years Natterjack survey work concentrated on the last southern heathland population at Woolmer which has been monitored every year since 1972 by the BHS. The Natterjack population has responded to recent habitat management with the numbers of spawn strings laid (a measure of the numbers of females in the population) increasing from a low of 11 in 1978 to 49 in 1989.

Natterjack monitoring also took place at many other sites particularly in Norfolk and on the north west coast between Merseyside and the North Solway. Recent work on the North Solway in particular has greatly added to our knowledge of the status and distribution of this animal in Scotland. The Natterjack site register, which aims to contain all the relevant information on British Natterjack Toad populations, was updated with reports received for every British site. It was notable that for the first time in 15 years no new Natterjack populations were discovered. This does not indicate a lack of survey work, but rather that we may be close to knowing the total British distribution.

As in previous years BHS members were actively involved in collecting data for the NCC-funded amphibian survey based at Leicester Polytechnic. BHS also gave advice on the new common reptile survey which started in 1990.

TRANSLOCATIONS AND CAPTIVE BREEDING

To complement the existing BHS captive breeding programme, work recently put in hand on the Sand Lizard and Natterjack captive breeding units at Marwell Zoo has now been completed and these new vivaria are now being stocked with animals. The vivaria are not part of the formal Zoo display but are open to visitors who have sponsored this BHS project. Sand Lizards and Smooth Snakes rescued from doomed sites in Dorset were released at a total of 4 sites in the Weald, agreed with the NCC as part of a regional strategy for the conservation of these animals in the south-east.

The ongoing programme of releasing captive bred Sand Lizards onto appropriately managed sites is progressing well, particularly in Hampshire and Surrey. Several sites have been prepared and upgraded by the BHS and captive bred animals released thereon. Subsequent monitoring of similar release sites prepared in previous years have confirmed that in the majority of cases natural recruitment is now taking place.

Attempts have been made to introduce Natterjack Toads to 7 new sites during the 1980s. So far 4 of these have succeeded, most notably at the RSPB reserve at Sandy where we have established the largest existing heathland colony of several hundred animals. The other three introductions are continuing, although problems are being experienced at some of these sites. We still do not know enough about Natterjack biology to explain why the introductions sometimes fail, but these experiments are adding to our knowledge of the ecology of this animal, largely using spawn that would be wasted at other sites (through desiccation of ponds).

RESERVE REPORTS

In September 1990 the Society purchased Green Pool, a 10 acre site in Dorset that supports Smooth Snakes, Sand Lizards and Great Crested Newts. Negotiations are currently underway for the purchase of another site in Surrey which supports Sand Lizards and will be the first site that has been partly purchased using interest raised from our Land Fund. Reserve agreements have also been agreed for two small sites in Dorset which support Sand Lizards.

The Conservation Committee has set up a Trust to hold land in the name of the BHS. The purpose of this is to ensure that in the unlikely event of the Society becoming bankrupt the land would continue to be held for conservation purposes.

At the New Mill Beck reserve in Cumbria the 1989 drought desiccated the Natterjack breeding ponds before any toadlets could emerge, the first time this site has failed to produce toadlets since BHS started managing it in 1986. This will not greatly affect the Natterjack population which has seen massively high recruitment in recent years and toadlets were found again in 1990. The hot weather of both years also added to the difficulty in spotting reptiles, which are almost impossible to find in such conditions. The most exciting reserve report was from Hurtwood in Surrey where Sand Lizards were introduced several years ago. In 1988 we obtained the first evidence of breeding with several hatchlings being found and more hatchlings were reported during the following two years. A particularly interesting aspect of this site is its elevation above sea level – some 150m, believed to be the highest elevation at which Sand Lizards breed in the U.K.

PUBLICATIONS

As in previous years the BHS has continued to produce informative booklets to promote the conservation of amphibians and reptiles. "Save our reptiles" is the first colour booklet we have produced, looking far more professional than its predecessors. This was partly funded by the NCC. It aims to popularise reptile conservation. The draft of a second colour leaflet entitled "Surveying for amphibians" was prepared for publication in 1991.

In the past our leaflets were funded by other charitable institutions and were consequently given away. In recent years the Society has had to cover the increasing cost of this. Consequently we have started to charge for these leaflets, (although they are still provided free of charge to BHS members) and aim to make them self-financing, while keeping the price as low as possible.

The Conservation Committee was also instrumental in producing a colour leaflet promoting the Society in which our conservation work figures prominently. We hope, through this to recruit many more conservationists into the Society.

A number of papers were published on amphibian conservation by committee members.

PUBLICITY

Having established policy for promoting the publicity of our work we have started to organise our activities, producing an annual work plan. The idea of this is to ensure as far as possible that projects identified as priorities at the beginning of the year are completed. Achievements

to date include the promotion of our conservation work at several events including the First World Congress of Herpetology and the Green Show. For this a special display on the work of the Society was produced which will be used at other events in the future. Several other exhibitions were staged at events in West Sussex and Dorset. We have produced a regular series of conservation reports for the new British Wildlife magazine which help to fund our conservation work. Our major project however was the Toads on Roads appeal 1990. This sought to involve volunteers in helping toads cross roads, and at the same time have this activity sponsored to raise money for the purchase of rare reptile and amphibian sites. The project was a great success, gaining widespread publicity in the newspapers and on TV and raising more than £2,000.

A colour postcard was produced depicting a pair of natterjack toads, with information about the BHS on the reverse side. This will be sold to raise money for our work.

A positive result of this effort is that BHS membership is growing (5% in 1989 and 15% in 1990) and for the first time ever in its history the Society has more than 1000 members (1120).

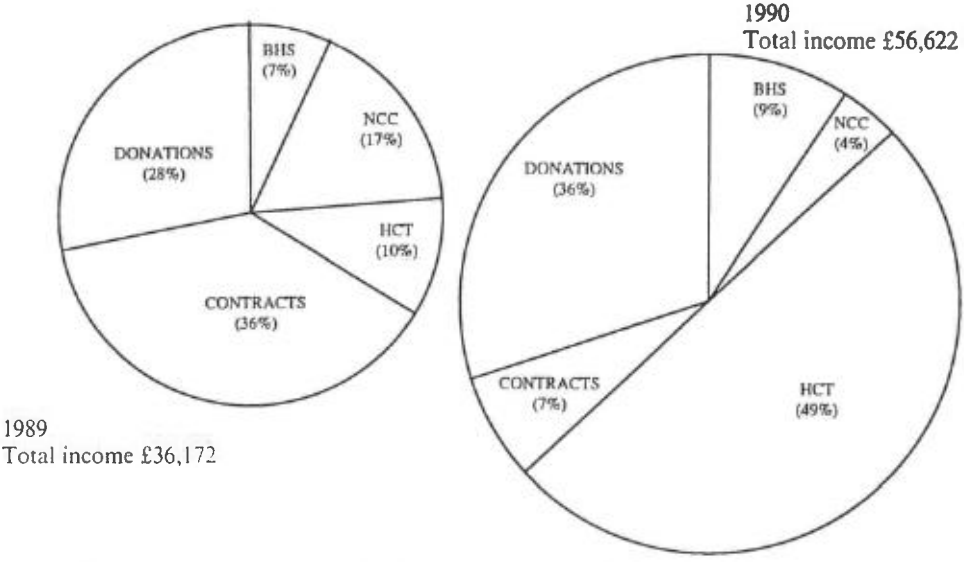


Figure 1. Sources of Conservation Committee income during 1989 and 1990.

FINANCE

During the two year period there was an increase in the amount of funding raised from £36,172 in 1989 to £56,622 the following year. This was due principally to a significant increase in funding from the HCT. The apparent decline in funding from the NCC, and WWF, was due to the fact that money from these organisations was obtained via the HCT.

BHS activities were also responsible for the increased income. In the past one of the main weaknesses of the Society was its lack of resources, and consequently its dependence on the generosity of other funding bodies. In recent years we have tried hard to increase the amount of money we raise ourselves. Consequently the amount of money contributed by the Society increased from £2396 in 1989 to £4798. We hope this trend will continue as our appeal to raise money for the land Fund has reached a total of £17,998. This sum is invested and the interest will provide a reliable income in excess of £2,500 each year. Our ultimate target remains £100,000 for this appeal. After the HCT the second most significant source of income has been from donations. A total of £30,680 was raised, of which more than two thirds was given by BHS members. The Conservation Committee is grateful for their continued generosity.

Sadly a large proportion of our 1989 income was from contracts to rescue reptiles from doomed sites in Dorset. This form of income fell from £13,350 in 1989 to £3,550 the following year due primarily to the recession in the building trade.

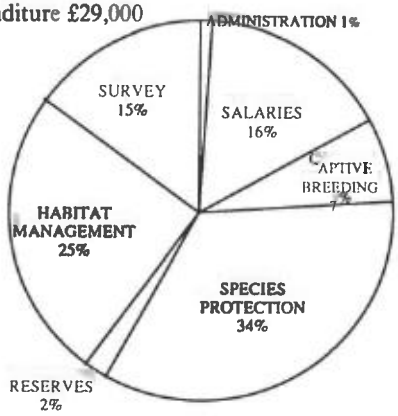
It was notable that during both years the vast majority of the funds raised were devoted primarily to active nature conservation. Administrative costs were kept to a minimum (1% of expenditure in 1989, and 2% in 1990) due primarily to the unstinting generosity of many Conservation Committee members who bore these costs individually. The administration budget covered the costs of affiliation to other Conservation Organisations such as Wildlife Link, as well as postage and stationary. The costs of both of these items increased in 1990 due to our increased promotional work. Repayments were also made on a loan for a photocopier.

The major expenditure was on habitat management which totalled £28,922 during both years, species protection – rescue and translocation of rare reptiles from doomed sites £16,096, and reserve purchase/lease £10,475. Smaller sums were spent on our sand lizard and natterjack toad captive breeding units (£4,669), and rare species survey work (£7,707).

ACKNOWLEDGEMENTS

We are grateful to the following individuals and organisations who have generously made donations to our Land Fund appeal during the past year; Dr. Baksh, Dr. T. Beebee, Mr. B. Banks, Mr. D. Bird, Lord Parmoor, Mr. A. Stevens, Mrs. S. Curry, Mrs. M. Green, J.S. Taylor, Dr. R. Rolls, Mr. J. Buckley, Mr. T. Braithwaite, Dr. R. Griffiths, Prof. and Mrs. Haslewood, Kim Lever, J. Denton, Wendy Jupe, L.H. Shepherd, M. Elliott, D.V. and R.E. Huggonin, Mr. H. Inns, Mr. Lock, Mr. C. Fitzsimmons, Mr. M. Preston, J. and P. Francis, Dr. A.S. Cooke, Dr. J. Baker, Mr. P. Hinton, Milton Keynes Natural History Society, International Herpetological Society, St. Helens Park Preservation Society, Bury Womens Institute, Crowborough Field Society, Selbourne Society, Thames and Chiltern Herpetological Society, Kent Trust for Nature Conservation, British Trust for Conservation Volunteers, Hastings Natural History Society, the Sussex Wildlife Trust, the Surrey Wildlife Trust, Mr. C.S. Nice, Avon Wildlife Trust, Campaign to Save Midhurst Common and the Ted Russell Charitable Trust. Donations to the appeal through the sponsored Toads on Roads project were received from Alison Wheeler, Ann Levick, April McEnery, Bob Bowden, Charles and Julia Draper, Chevening Estate Office, Chloe Whittal, Christopher Wicks Barker, Dave Toms, Dr. L. Love, G. Boothman, Iain Webb, Isobel Grundy, J.R. Reid, Jan Clemons, Jim McCleary, John Buckley, John Gaughan, John Tomkins, Lady Judith Studholme, Luck Desborough, M. Baker, Mark Elliott, Miss A. Millard, Miss D. Stephens, Miss E.L.E. Hoffman, Miss G.E. Dougherty, Miss I.F. Gravestock, Miss Lynne Farrell, Mo Lee, Mr. and Mrs. M. Caswell, Mr. D. Scovell, Mr. J.A. Day, Mr. K.M. Dickinson, FRCS, Mr. L.B. Reynolds, Mr. Peter Knight, Mr. R.L. Walters, Mrs. A.L. Parr, Mrs. C. Hora, Mrs. D.I. Payne, Mrs. Elizabeth G. Spencer, Mrs. H. Coppin, Mrs. Hope Smeeton, Mrs. J. Harper, Mrs. K. Hill, Mrs. Margaret Le Fevre, Mrs. P.E. Matthews, Mrs. P.M. Allen, Mrs. R. Oxford, Mrs. S.M.M. Bolton, Ms. J. Edwards,

1989
Total expenditure £29,000



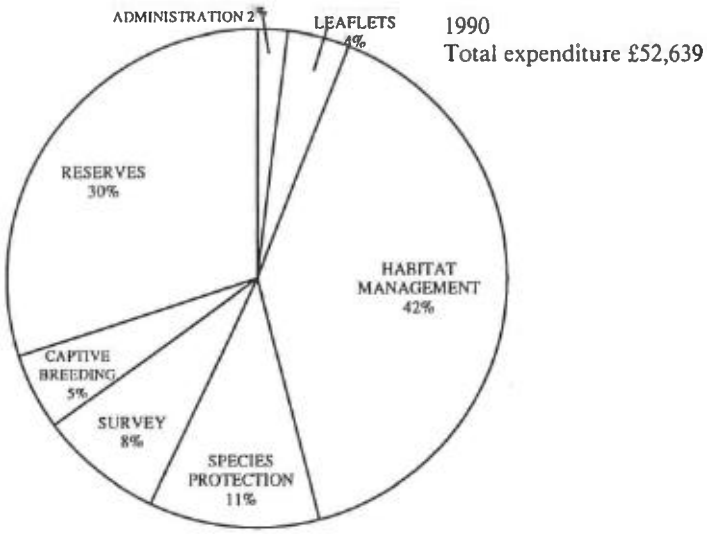


Figure 2. Conservation committee expenditure during 1989/90.

Ms. M.R. Mesure, N. & H. Denness, Paul Beckwith, Peter Towers, Peter Morrison, Ron Croucher, Rosemary McKie, Rugby High School, S.K. Bosher, Sally T. Hawkins and Victoria Logue.

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The purchase of Green Pool for £10,000 was made possible by generous donations from two BHS Members (77%), the NCC (13%) and the Co-op Wildlife Families Fund via the Conservation Foundation (10%).

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We gratefully acknowledge the financial contribution made to our work from the Nature Conservancy Council, Worldwide Fund for Nature and the Vincent Wildlife Trust through the HCT. Financial assistance with scrub clearance at Woolmer Forest was given by Hampshire County Council, East Hampshire District Council, The Hampshire and Isle of White naturalists Trust, and the NCC. The MoD also cleared large areas of scrub at the same site and Dupont donated 20 litres of Krenite to help control birch scrub.

REPORT ON THE 4TH EUROPEAN CHELONIAN SYMPOSIUM MASSA MARITTIMA (TUSCANY), ITALY, 1990

The 4th European Chelonian Symposium (IV Symposium Europeum Cheloniologicum) was held at Massa Marittima (Grosseto) in Tuscany, Italy, 18-24 July 1990, and followed the 1st (May 1980) in Nancy (France), the 2nd (October 1981) in Oxford (UK) and the 3rd (July 1988) in Marseille (France) [for further details, see Lambert, M. & Stubbs, D. Report on the 3rd European Chelonian Symposium, 3-8 July 1988, Marseille (France). *BHS Bulletin* No. 27: 3-7, Spring 1989]. The 4th Symposium was organised by Donato Ballasina of the Centro Nazionale per la Salvaguardia, la Ricerca scientifica e il Ripopolamento delle Tartarughe (CNSRT) "CARAPAX", and was supported by the Ministero dell Agricoltura & Foreste, the Regione Toscana, the Provincia di Grosseto, the Comunita Montana Colline Metallifere and RANA International. The main theme was Conservation of Mediterranean Chelonians: conservation techniques and programmes – biological, veterinarian, technical and socio-economic aspects. There were 51 registrants from 14 countries: Belgium (5), China – Beijing (1), Cyprus (1), France (6), Italy (23), Germany, D.R.L (2), Germany, F.R. (2), Greece (1), the Netherlands (3), Rumania (1), Spain (1), Turkey (1), UK (3), USA (1).

The following account is based on the programme and abstracts volume prepared for the meeting by Donato Ballasina, and a report by Bernard Devaux, the editor of *La Tortue*, le journal de la SOPTOM et du Village des Tortues, in No. 15: 10-12, October 1990.

Massa Marittima is a mediaeval town in Tuscany at an altitude of 400 m and set 24 km along the road inland from the coast at Follonica to Siena. The Carapax Centre is a tortoise village in the popular tourist area of Tuscany, similar to that of SOPTOM already existing in the South of France (Lambert & Stubbs, 1989, see above). It has been established through funding from the EC and local Tuscan Government by Donato Ballasina, and is situated near Massa Marittima. Being held in May, the participants of the Symposium found the weather pleasantly warm. The first three days of the Symposium were made over to presentations of various papers. Regrettably, fewer participants attended the Symposium than was hoped for, for unfortunately, some of the administration was local and so not all of the various European specialists had received invitations. But those making the effort to attend enjoyed the convivial and friendly atmosphere that prevailed, leaving very pleasant memories, thanks to the arrangements made by Donato Ballasina and his Belgian wife, Vierle. By the last day of the Symposium, the specialists and other enthusiasts almost constituted a family!

DAY 1, MAY 19

Morning (Chairman: R. Bour):

Opening Ceremony: The President of the Comunita Montana Colline Metallifere, Mr Alberto Niccolaini, addressed the participants during the Opening Ceremony. He indicated that the Comunita Montana, one of eighteen in Tuscany, was responsible for around 50,000 ha, which included the towns of Massa Marittima, Montieri and Monterotondo Marittimo, and 21,000 ha of public demesne (the largest in Tuscany), which was almost completely wooded. The natural history of the territory was considered important, with the presence of wild Chelonia indicating that the environment was in good condition and unpolluted. The establishment of the Carapax Centre has effectively initiated the conservation of the area as a biogenetic reserve. The Carapax Centre can thus be integrated with areas of scientific interest in Tuscany like the Regione Naturale Parco della Maremma (Grosseto) and Parco Nazionale di San Rossore (Pisa), in addition to the Parco Nazionale del Circeo (south of Rome), guaranteeing the survival of the ancient Chelonia group in Italy.

Introductions were then made by Donato Ballasina (Massa Marittima), in his capacity as Director, Carapax Project, and organizer, 4th European Chelonian Symposium, and Sandro Frisenda (Putignano) as Co-ordinator, RANA, Italy.

The Opening Ceremony was followed by a range of presentations:–

David Stubbs (Dorking) outlined the status of *Testudo hermanni hermanni* in the Massif des Maures, the species' stronghold in southern France, reporting on the results of a 3-year survey by SOPTOM (Station d'Observation et de Protection des Tortues des Maures), and concluding that the total population was between 100,000 and 150,000.

Bernard Devaux (Gonfaron), in his capacity as Director, SOPTOM's Village des Tortues, described recent developments in the Village and stressed the importance of providing breeding centres for repopulation as well as information to the public at large. He also made the point that protection of a species required aid from the public.

Donato Ballasina then outlined the establishment and development of CNSRT CARAPAX. The Carapax Project was developed by two biologists associated with RANA International, which for several years has been campaigning for the preservation of Reptiles and Amphibians in Nature. Initially funded by the European Community and the Regione Toscana, the project is supported by the Regional Government of Tuscany, the Town of Massa Marittima, the Province of Grosseto, the Comunita Montana Colline Metallifere and several other scientific institutions, and such conservation bodies as WWF Toscana, as well as individuals and private companies. The Project aims to preserve all chelonian species in the Mediterranean area, tortoises as well as freshwater and marine turtles. Turtles are seriously threatened and constitute a symbol for the whole Mediterranean environment. "CARAPAX" is a vitally important pilot project aiming at the outset to create greater awareness among the public at large as well as the local population and the many tourists who each year visit many areas with sites containing tortoises and turtles. An international TV programme in six languages has been prepared. The Carapax Centre is still under construction and aims to protect Italian tortoises and terrapins, to restock wild populations and provide information to the public at large. Finally, the Centre provides an input to the surrounding natural area of the Colline Metallifere with 23,000 ha protected, and the Parco della Maremma protecting 12,000 ha, which provide the largest biogenetic reserve for the nominate *Testudo hermanni hermanni* in the Mediterranean region.

The first morning session ended with an account by Ronald Willemsen (Doetinchem) on the habitats of *T. hermanni boettgeri* and other species in Greece. This presentation was based largely on the review paper (1989) he co-authored with Adrian Hailey [Status and conservation of tortoises in Greece. *The Herpetological Journal* 110: 315-330]. In certain areas, *T. h. boettgeri* is very abundant, averaging 20 ha^{-1}, but attaining 300 ha^{-1}. *T. marginata* is more numerous and widespread than thought, and a very useful distribution map was displayed.

Afternoon (Chairman: B. Devaux):
Donato Ballasina, Ronald Willemsen and Sandro Frisenda started the afternoon session with an account of *T. h. hermanni* in Italy. There are five or six populations on the peninsula which are separated and fragmented from each other, and often isolated. This presents a problem of biological and ecological significance.

Roger Bour (Paris) then presented results of a taxonomic study undertaken on *Testudo marginata* with Heinz Weissinger (Vienna). He suggested that a subspecies of this Greek tortoise may exist, smaller in size and localised in the southern Pelopponese.

Ronald Willemsen then described differences in the thermoregulation between *T. hermanni boettgeri* and *T. marginata* based on studies in Greece [for further details, see the *Herpetological Journal* 1(12): 559-567, June 1991]. His observations on daily activity patterns in May, June and August showed differences in modality between the two species and higher body temperatures in *T. marginata* than in *T. h. boettgeri*. He suggested that these and morphological differences explained the differences in habitat selected in locations where these species occur together.

Andrew Highfield (London) ended the afternoon with a potentially controversial paper on the evolution of tortoises in North Africa. He questions the view of Loveridge & Williams (1957) [Revision of the African tortoises and turtles of the suborder Crytodira. *Bulletin of the Museum of Comparative Zoology* 115(6): 163-541] that the North African population of *Testudo g. graeca* originated from western Europe. On the basis of osteological evidence, he proposes that particularly in Algeria and Tunisia, tortoises may have southern African roots

as relicts of extinct trans-Saharan forms having links with *Geochelone* and *Homopus*. A miniature form recorded in the coastal zone of Tunisia lays the smallest eggs of any known terrestrial chelonian (15 x 13 mm).

DAY 2, MAY 20

Morning (Chairman: D. Stubbs):

The second day addressed aquatic species.

Marco Lebberoni (Florence) reported on experiments carried out in the Parco di Maremma with Guido Chelazzi on the eco-ethology of the European pond tortoise *Emys orbicularis*. A total of 102 tortoises were marked so that their activity and behaviour could be observed from a distance. The animals are virtually inactive from the end of July to mid-September. Mean home-range is greater in males than females.

Marco Zuffi of the University of Pisa and the Natural History Museum described the results from an experimental reintroduction of *Emys orbicularis* to the Parco Lombardo della Valle del Ticino (NW Italy) that he carried out with Armando Gariboldi and Susanna Caruso. The species was once common in the Po Plain but is now extremely rare. Forty-three adults were collected in Spring 1989 from th Emilia-Romagna coast, where the tortoise is still abundant, and were released in the park in an area of low marshy land with a small lake. Dispersal has been remarkable. A percentage of 32 has not been seen since the day of release, while after June 1989 the remaining 68% has been recorded, and seven animals several kilometres away in May 1990. It is regrettable that for financial reasons the follow-up to this re-introduction had to be curtailed.

The morning session ended with a lengthy discussion led by Paolo Vincentini of the Ministry of Forests and Agriculture CITES Authority in Rome on the difficulty of enforcing CITES, and of controlling and establishing the various imports and introductions of tortoises and reptiles generally.

Afternoon (Chairman: M. Zuffi):

Walter Sachsse (Mainz) discussed the general genetical principles (characteristics of the genome, sperm storage, environmental sex determination and adjustment of reproductive strategies) relating to chelonian populations, all as a result of habitat loss associated with a reduction in numbers, fragmentation of populations, alteration in selective pressures and possible effects of predation by feral species.

Edlef Heimann (Pirna), a terrarium enthusiast in former East Germany, presented results from the successful breeding of *T. marginata* and *T. h. boettgeri* in captivity. Hundreds of hatchlings were available for distribution. He had also produced some hybrid animals. With the ban on importation, animals were thus available to other knowledgeable enthusiasts for observation, exhibition display and other educational purposes that will help to engender a sympathetic awareness for tortoises and other Mediterranean wildlife.

DAY 3, MAY 21

Morning (Chairman: D. Ballasina):

The third day addressed marine turtles. Walter Sachsse reported on the true situation for the world's seven species. Part of their biology is still not clear to us today, nor the cause for their worldwide decrease in numbers. Physiological factors are important for their conservation, including viral disease outbreaks, and also genetical factors in relation to temperature related sex determination and global temperature increase.

Riccardo Jesu (Genoa) then reported on nesting activity of the loggerhead *Caretta caretta* in SW Turkey, 1987 and 1988. The 4.5 km beach at Dalyan-Istuzu is one of the most important for the species in the Mediterranean. Clutches totalled 250 in 1987 (24% less than in 1979) and 194 in 1988. Nesting females were smaller (mean over the curve length 78 cm) than in most other rookeries and mean clutch size was also relatively low (mean 78 eggs). Emergence of hatchlings was only affected by a hotel in its vicinity. Just over a quarter of the nests were plundered by predators: foxes, *Vulpes v. anatolica*, and Ghost Crabs, *Ocypode cursor*, in both years. conservation strategies should include reduction of motor boat traffic, shielding of artificial lights visible to emerging hatchlings, protection of nests from tourists and fox predation, and hatchlings from crab predation.

The morning, and indeed the formal presentations of the Symposium, ended with a review by Walter Sachsse of fatal epidemics in terrestrial chelonians of viral origin. For 8 years, epidemics not responding to antibiotics have been observed. Mortality ranges from 30 to 95%. Nuclear inclusion bodies of at least three different viral forms were observed under an electron microscope. It is concluded that these are spread by birds and insects. Fifty animals had a fat-inflamed liver, often with local necrosis, in common. A Chelonian Pathology Congress will take place in April 1992 when some of the unanswered questions and problems will be discussed.

Afternoon:
During the afternoon, Donato Ballasina showed a 35-min video on Mediterranean chelonians produced by the Carapax Centre for television. It covered terrestrial, freshwater and marine species with their various threats and presents some solutions for conservation. One might have hoped for more strongly expressed views on the polluters and destroyers of habitat, and trade collectors, but the traditional media are unable to take too acerbic a standpoint.

Although it was regrettable that not more people were able to attend the 4th European Chelonian Symposium, one important feature was that various managers of tortoise protection centres had gathered together. It would now seem opportune for a federation of these centres to be formed where mutual experiences can be shared and the exchange of information and ideas between projects coordinated. It is intended that a meeting will be hosted by SOPTOM at Gonfaron on 25 May 1991 so that a liaison group or Federation of Mediterranean Tortoise Protection Centres – TORMED – might be formed. [Such a meeting duly took place with some 30 delegates from Italy, France and Spain in attendance. All present agreed in principle to establishing TORMED with the initial impetus derived from the three existing centres: SOPTOM'S Village des Tortues, RANA'S CARAPAX Centre and Son Cifre on Mallorce (Balearic I., Spain)]. The federation would strengthen efforts to protect species, establish new centres and develop conservation programmes on an international scale. It may also result in cooperation with equipment, personnel and funds to achieve priority conservation targets throughout the region.

DAY 4, MAY 24
Field visits were organised on the Sunday.

In the morning, Tuscan tortoises were observed in their natural surroundings. They are found at a density of about 10 ha^{-1} and are smaller on average than tortoises further west in the Massif des Maures, France.

In the afternoon, the participants visited the Carapax Centre. This has already been described in some detail by Bernard Devaux in *La Tortue*, No. 12: 21-25, October 1989, but there have been several improvements since then. The Centre still requires a central building to welcome visitors and provide them with information. Wooden shelters presently receive visitors and there is a large open air area with tables and chairs. Sitting under the sky of a Tuscan Summer was the right way to end the evening.

A total of 78 enclosures has been established at the Centre. Nine big enclosures with smaller enclosures inside separate each Hermann's tortoise according to their areas of origin. Quarantine enclosures are also numerous and there are also enclosures for tortoises of doubtful or unknown place of origin. In the lower part of the Centre, without public access, there is a large area with many pools and small enclosures for tortoises under observation or for exotic species that have been donated. A health centre has been placed in this area and there is accommodation for wardens. There is also a marshy area which lacked water in July, but which proliferated with reeds. The dryness was something of concern to Donato Ballasina. A system of well adapted nurseries was situated here for Pond Tortoises, *Emys orbicularis*.

The Centre presently has 897 chelonians of which 139 are Pond Tortoises. A release of 35 animals has been carried out in the Colline Metallifere. Release programmes are of course envisaged, but the Centre has the problem of only releasing animals from one area into the same area and avoided the mixing of populations, and this is going to restrict repopulation attempts.

All in all, the Symposium was a success, and highly enjoyable with the ambience provided by the Tuscan Summer and the atmosphere of conviviality engendered by Donato Ballasina and his wife Vierle to whom participants should be most grateful.

I would like to thank participants of the Symposium, David Stubbs and Andy Highfield, for helpful comments on the manuscript.

Michael Lambert

MEMBERS' ADVERTISEMENTS

- **For Sale: Reptile Development:** Volumes 14 and 15 of the Biology of the Reptilia are offered at £20 per volume (excluding postage and packing). The two volumes edited by Carl Gans et al., published by John Wiley in 1985, provide a comprehensive account of reptile development. The offer, a c. 50% reduction on the published price, is made by "Branta Books" and is limited to individuals only. For further details please contact Dr. Frank Billett, 2, Bellemoor Road, Shirley, Southampton SO1 5JW.
- **For Sale:** Dwarf Clawed Frogs *(Hymenochirus sp.)*

  Wanted: *Pipa, Xenopus,* or *Typhlonectes.*
  Ken East, 27A Greenhill Gardens, Edinburgh 10. Tel: 031 447 4410
- **For Sale:** Hatchling albino Californian Kingsnakes. Born April, 1991. Feeding well. Mostly striped/aberrant patterns. £65 each. Tel. Eddie, 071-254 7633.
- **Wanted:** adult male and female Boa Constrictors. Tel. Eddie, 071-254 7633.
- **For sale:** captive bred *Eryx jaculus jaculus*, F1s, F2s, true pairs. Steven Simpson. Tel. (Brighton) 0273 727328.

TORTOISES, TERRAPINS AND TURTLES: THEIR BIOLOGY, CARE AND CONSERVATION

A Conference with the above title will be held in Bristol, England from 22nd-24th April 1992.

The programme will include sessions on Biology and Ecology (Convenor Roger Avery), Husbandry (Convenor John E. Cooper), Conservation (Convenor Ian Swingland) and Veterinary Care (Convenor Peter Holt).

The Session on Husbandry is scheduled for Thursday 23rd April 14:00-17:30. It will include the third Edward Elkan Memorial Lecture which will be presented by Professor Peer Zwart of the University of Utrecht, the Netherlands. In addition four papers will be given on aspects of chelonian husbandry. Details will be announced in due course.

Further information about the Conference is available from Dr. David J. Hill, Department of Continuing Education, Wills Memorial Building, Queen's Road, Bristol BS8 1HR, England.

THE REPTILES OF PAPUA NEW GUINEA

MARK O'SHEA

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A member of the Commonwealth since 1975, Papua New Guinea comprises the eastern half of the island of New Guinea, the second largest island in the World. The western half of the island, formerly Dutch New Guinea and now known as Irian Jaya, Indonesian New Guinea or West Papua, is much less accessible and subsequently far less well known ecologically. That is not to say that Papua New Guinea's flora and fauna have been fully explored and that no surprises remain.

P.N.G., as it is frequently abbreviated, was originally two separate colonies: German New Guinea in the north and British Papua in the south, separated by the high mountainous backbone of the island. Other European nations also had vested interests in these tropical colonies, not least the French, the Italians and the Russians. British Papua was handed over to the Australian administration in the early years of this century and when the German north also fell under the Australian authority, after the First World War, Papua New Guinea was created. However the German influence is still evident to this day through some of the town names: Finschafen, Alexishafen, Helmholtz etc. The Second World War brought the Japanese to New Guinea and they quickly invaded much of the island and marched down the Kokoda Trail to within a few miles of the capital Port Moresby and the southern coast, on their way to invade Australia, before being finally repulsed. After the war P.N.G. returned to Australian control, and received independence in 1975.

Politically, therefore, as a united and independent country P.N.G. is quite young yet geographically it is very old. Of Gondwanaland origin, a land of dense jungles, hot savannas and treacherous swamps, precipitous mountain ranges with torrential rivers rushing down deep craggy gorges and reef-fringed tropical islands off the magrove-edged coast. A tropical paradise, and in many regions one hardly touched by the 20th century, apart from the occasional resort and the numerous crashed aircraft scattered through the forests and shallow coastal waters. Mainland P.N.G., which comprises 15 provinces, is only slightly larger than the United Kingdom yet its population is probably less than 5 million. The numerous archipelagos, including the large islands of New Britain, New Ireland and Bougainville, which make up the five off-shore provinces to the east and north, add to the total land surface of the country.

Communications have always been a problem in P.N.G. The great distances involved, the extensive seasonal floodings in the lowlands, the huge rivers and the difficult, mountainous terrain have all added to the isolation of the indigenous communities. There are a small number of good to excellent highways in the coastal regions and the Highlands Highway allows access to the mountain provinces but many areas are accessible only by air or on foot. Flying in P.N.G. is a real experience as many of the airstrips are short grassy areas hacked out of the bush or narrow mountain plateaus overhanging deep valleys, and many Australian bush pilots come to New Guinea to earn their wings. P.N.G. is also the land of many languages – some 750 different tongues known as *tok ples* (talk place) often confined to one village. English is spoken and taught in the schools but many people fall back on the favourite *pisin inglis* (pidgin English) and newspapers such as *Wantok* (One talk = the extended family) are published in this 'national' language. In Papua there are also two other fairly widely used languages: Hiri motu and the adapted Police motu.

Although politically and economically a modern 20th century country there is still much that is tribal about P.N.G. and society and the people are extremely proud of their heritage, celebrating their warrior past with huge elaborate festivals called *sing sings*. That is not to say that the past is dead since tribal fights between feudal villages frequently take place even today, especially in the highland provinces, and all the men are skilled in the use of spears and bows and arrows. PNG is a mixture of the modern with the traditional. Port Moresby's skyscrapers look out over the Koki stilt village whilst the modern Parliament building combines both

the old style with the new ways. This seat of modern govenment is built in the style of the *haus tambaran,* the feudal village men's house of the Sepik. It is into this environment that I have ventured twice in search of reptiles and amphibians.

In 1986 I spent three and a half months as the herpetologist on the staff of the Operation Raleigh's P.N.G. expedition to Central and Western Provinces, and in 1990 I returned to P.N.G. for a further five months, primarily to capture and 'milk' highly venomous elapids for snakebite research at the Department of Clinical Medicine at Oxford University and Liverpool School of Tropical Medicine. This second visit also provided the opportunity for further herpetological field work in Madang and Central Provinces under the auspices of a Christensen Research Institute Fellowship.

WESTERN PROVINCE

Western Province is the largest and one of the most remote. With West Sepik or Sundaun Province in the north it forms the frontier with Irian Jaya. The huge Fly and Stickland Rivers rise in the distant Star Mountains to the far north where Western Province borders West Sepik and from there they meander their way south, first through rainforests and then across a vast, almost featureless, low-lying region of *Eucalyptus* savanna, termite mounds, and flood plains. The two rivers converge south of Lake Murray to form the greatest river in New Guinea which finally empties into the ocean in the Gulf of Papua just north of the provincial administrative centre on off-shore Daru Island, one of the few localities in the southern half of the province which is not flooded for a large part of the year. There are few roads in Western Province, only faint representations of trails and settlements which are better marked on the maps than on the ground. Villages here have a habit of disappearing and reappearing many kilometres away, leaving no signs left that the original settlements ever existed.

Daru is a shambles of a town but one is immediately reminded of how important reptiles are to the people of the region. Live Green Turtles *Chelonia mydas* lie upturned on the jetty, awaiting buyers with prices chalked on their plastrons, and numerous stores such as Fly River Trading, Daru Enterprises or Western District Trading offer 'buying and selling finest grade *pukpuk* (crocodile) skins'. The other herptile encountered as soon as one steps ashore is the ubiquitous Cane Toad *Bufo marinus,* the introduction of which as a sugar cane crop pest control measure in the 1930's, has proved to be an ecological and environmental disaster for Australia, New Guinea and several Pacific islands.

Moving to the mainland it is not difficult to understand why the administrative centre was built on an off-shore island. When southern Western Province floods whole areas vanish underwater. Consequently most of the houses are built on stilts. The downstairs quarters are often only used for storage during the dry season and they are good localities for looking for huge White-Lipped Treefrogs *Litoria infrafrenata,* and the numerous species of geckoes which move into human dwellings: *Hemidactylus frenatus, Gehyra mutilata* and *G. oceanica.* At night the Brown Catsnake *Boiga irregularis* may also be encountered underneath the houses, seeking these frogs and lizards. There is a local belief that if you go out during the day and this snake sees you but you don't see it, the snake will follow you home and sleep with you that night. When someone comes down from upstairs during the night and encounters a Catsnake they usually jump to conclusions and hysteria ensues. I captured a large number of these extremely common snakes by sitting up late at night in villages, waiting for the screams. During the day the commonest arboreal snake is the graceful Coconut Snake or Green Treesnake, *Dendrelaphis calligastra,* which may be seen climbing the coconut palms in search of treefrogs which sleep in the huge fronds, or pursuing Rocket Frogs, *L. nasuta,* across the ground. The coconut palms also provide microhabitats for many species of geckoes and skinks and I investigated the crowns of any palms felled in or around the villages. Apart from fruit bats and sugar gliders the most interesting specimen collected was the skinks, *Prasinohaema semoni.* This is one of the five species of green blooded, prehensile-tailed skinks, four species of which are endemic to New Guinea whilst one species also occurs in the Solomon Islands.

The many creeks which dissect the villages are full of small fish, frogs and tadpoles which make up the diet of watersnakes such as the Common Keelback, *Tropidonophis mairii*.* These harmless snakes, and any other dark coloured snakes, are fequently killed as suspected 'Pap

blacks', a snake which holds an almost mythological fear over the inhabitants of the southern Papuan half of P.N.G.

Areas cleared and planted for the cultivation of root crops, yams, sweet potatoes etc. provide ideal habitats for reptiles such as skinks: *Emoia spp., Sphenomorphus spp.,* the Blue-Tongued skinks *Tiliqua gigas,* and the Major Skinks, *Egernia frerei;* and snakes: the diminutive parthenogenic Brahminy 'flowerpot' Blindsnake, *Typhlina bramina,* and the larger *Typhlina polygrammica,* the common Black Treesnake, *Dendrelaphis punctulatus,* and the slatey-grey snake, *Stegonotus cucullatus.*

Many of the coastal villages are surrounded by mangrove swamps, monsoon forest and numerous interlocking creeks. The pock-marked mud flats with their populations of crabs and mudskippers provide accommodation and food for the mildy venomous, rear-fanged homalopsine mudsnakes: the Smooth Watersnake, *Enhydris polylepis,* Richardson's Grey Mangrove Snake, *Myron richardsoni,* the Banded Watersnake, *Cantoria annulata,* Bockadam *Cerberus rhynchops,* and the White-Bellied Mangrove Snake, *Fordonia leucobalia,* which dorsally may be any colour from dark grey to yellow. The mangrove swamps are also home to lizards ranging in size from the tiny geckoes of genus *Lepidodactylus* to the Spotted Mangrove Monitor Lizard, *Varanus indicus.* In the saltwater around the mangroves in-shore seasnakes of the genera *Hydrophis* or *Enhydrina* may occasionally be found lurking.

Further inland the saline swamps give way to freshwater treeswamps, home to the New Guinea Side-Necked Turtle, *Emydura novaeguineae,* and the Red-Bellied Side-Necked Turtle, *E. subsglobosa.* Natricine watersnakes such as the Common Keelback, *Tropidonophis mairii,* the slender Painted Keelback, *T. picturata,* and the stout Barred Keelback, *T. doriae,* hunt fish and frogs in the denticulate channels. In the larger watercourses and rivers the large 2m Arafura File Snake or Elephant's-Trunk Snake, *Acrochordus arafurae,* may occasionally be seen surfacing for air. The local women collect these 'flabby-bodied' snakes, their meat being considered a delicacy whilst the skins are used on the tribal *kundu*-drums. Traditionally, only lactating women are supposed to capture these snakes and this they do by entering the water, exuding milk on the surface to 'attract' the snakes and then moving their feet through the mud until the snake is located. The snake is picked up and dispatched with a bite to the neck to break the spinal cord.

Large rivers such as the Fly possess large populations of crocodiles, both Saltwater, *Crocodylus porosus,* and Freshwater, *C. novaeguineae,* and a flourishing crocodile farming industry has been established from this wild stock. The rare pit-shelled, pig-snouted Fly River Turtle, *Carettochelys insculpta,* which features on the 5 toea coin, also inhabits these large saline/ freshwater courses and a particularly large species of turtle is also reputed to occur in the lower Fly River. I also obtained a specimen of *Hydrophis sp.* some 60km inland on the Oriomo River. Parker (1982) reported the rapid deaths, in the 1970's, of three young girls following bites from a small unidentified snake whilst bathing in the Ouwe Creek at Wipim. The Ouwe Creek feeds into the Oriomo River just north of Old Zim where I collected the *Hydrophis.* Seasnakes are known to enter tidal rivers and swim some considerable distance into freshwater. In the Ramu River system in northern New Guinea the common Beaked Seasnake, *Enhydrina schistosa,* represents a serious snakebite threat to river fishermen and several fatalities have occurred a considerable distance from the open sea.

The majority of Western Province comprises vast expanses of *Eucalyptus* savanna, dotted with termite mounds. These savannas appear to be either flooded or scorched depending on the time of year. Fire is a regular controller of vegetation and many tree species may be actively triggered into life by the passing of a rapid bush fire.

* The recently applied generic name for the Australasian natricine Keelbacks, *Tropidonophis* (Malnate & Underwood 1988), has been used here in place of the previously accepted *Amphiesma* and *Styporhynchus.*

The commonest lizards on the ground are the skinks and the most obvious, occurring in most habitats, are the four fingered skinks of genus *Carlia.* On the savannas the two main species are the brown *Carlia fusca* and the striped *C. bicarinata.* Males may be seen waving their tails slowly in display from fallen log vantage points. Small striped Snake-Eyed Skinks,

Plate 1. Salvador's Monitor, *Varanus salvadori*, Moitaka, National Capital District, Papua New Guinea.

Plate 2. Cat Snake, *Boiga irregularis*, Karkar Island, Madang, Papua New Guinea.

Cryptoblepharus pallidus, are also commonly seen scuttling up the white bark of the gum trees. These small skinks provide food for many other vertebrates but one of their most unusual predators is Burton's Snake Lizard, *Lialis burtonis.* Australasian snake lizards belong to a family known as the Pygopodidae. They are believed to be related to the geckoes but their limbs are greatly reduced, in *Lialis* the hindlimbs being represented by a pair of small scaly 'flaps'. *L. burtonis,* which also occurs in Australia, possesses extremely long and kinetic skull and 'forceps-like' jaws which are perfectly designed for prey handling since snake lizards prey upon, and swallow whole, small scincids such as *Carlia* or *Emoia.* The articulation of the snake lizard's jaws is such that it can swallow prey of greater body size, in relative to its own size, than many snakes (Patchell & Shine 1986). Local names for these inoffensive lizards include pencil snake or friendly snake since they refuse to bite man, often going stiff as pencils when handled.

Larger lizards also inhabit the savannas of Western Province. The Frilled Lizard, *Chlamydosaurus kingi,* may occasionally be seen displaying from fallen gum trees. This dramatic Australian agamid is only known in P.N.G. from Western Province. More frequently the Two-Striped Dragons, *Diporiphora bilineata,* and *Lophognathus temporalis,* may be seen rushing across the path, the latter species running on its hind legs in the manner of the neotropical basilisks. Monitor lizards or goannas are also in evidence. The commonest is Gould's Savanna Monitor, *Varanus gouldii,* but the most impressive species must be the Salvador's Crocodile Monitor or Artrellia, *Varanus salvadori.* This giant of a lizard is reputed to grow to a length of in excess of '6m', rivalling the Komodo Dragon for the title of the 'World's longest lizard'. Villagers report that Artrellis will bring down deer, pig and hunting dogs and have even been known to attack man. Attempts to instigate a hunt to capture a large specimen alive were unsuccessful when the local hunters vanished. Their lack of enthusiasm for the project was illustrated quite well by one hunter who insisted that he had to go and stay with his mother-in-law! However, a juvenile *V. salvadori* was sighted and I encountered captive half-grown adults at Moitaka Crocodile Farm near Port Moresby.

The lowland rainforests of Western Province are reputedly inhabited by up to six species of Angleheads, genus *Gonocephalus,* and the Water Dragon, *Physignathus lesueurii.* This latter species evaded discovery but two species of Angleheads were recorded, the White-Cheeked Anglehead, *G. papuensis,* and the Keeled Anglehead, *C. dilophus.*

Pythons are very common in Western Province, all seven mainland species being recorded within its boundaries, and some communities in the southern Trans-Fly exist almost entirely on a diet of python meat. The forest-dwelling Green Tree Python *Chondropython viridis*** is particularly common and both green adult and yellow juvenile specimens may be encountered hunting on the ground after dark or sleeping in low vegetation during the day. Larger, related species such as the Amethystine and Carpet Pythons, *Morelia amethistina* and *M. spilota,* were also found around or in villages at night. Whilst the Amethystine Python appears quite common the Carpet Python was found to be fairly rare in the province. All Western Province Amethystine Pythons encountered were dark brown dorsally overlaid with black reticulate patterning, complying with Parker's (1982) description of rainforest Amethystine Pythons.

Other pythons met with included the D'Albertis White-Lipped Python *Bothrochilus albertisi* and the Papuan Olive Python *B. papuanus* which were captured along the tidal creeks and rivers. Large pythons of these species were occasionally trapped in gill nets set by local fishermen. The D'Albertis Pythons of Western Province reach lengths in excess of 2.5m and exhibit a deep blue-black dorsum and cream venter. The head of this snake is glossy black, strongly contrasting with the white bars of the labial scales. The Papuan Olive Python grows to a vast size both in length and bulk and it may exceed the Amethystine Python in total length. Apart from a regular diet of mammals such as Wallabies this species has proven itself as a 'snake eater', a 2m Amethystine Python being retrieved from the stomach of a drowned 2m Olive Python (O'Shea 1987, 1988). P.N.G.'s most restricted python species, Macklot's Water Python, *B. mackloti,* is confined to a small area in southern Western Province centred around Masingara where it reputedly preys upon waterbirds. This species ws not recorded by me.

** The generic names *Chondropython, Bothrochilus* and *Morelia,* as applied to New Guinea pythons, have been retained here although the author is aware of the recent revision by Underwood and Stimson (1990) which places all New Guinea species in the genus *Morelia.*

Plate 3. Green Tree Python, *Chondropython viridis,* Riwo, Madang, Papua New Guinea.

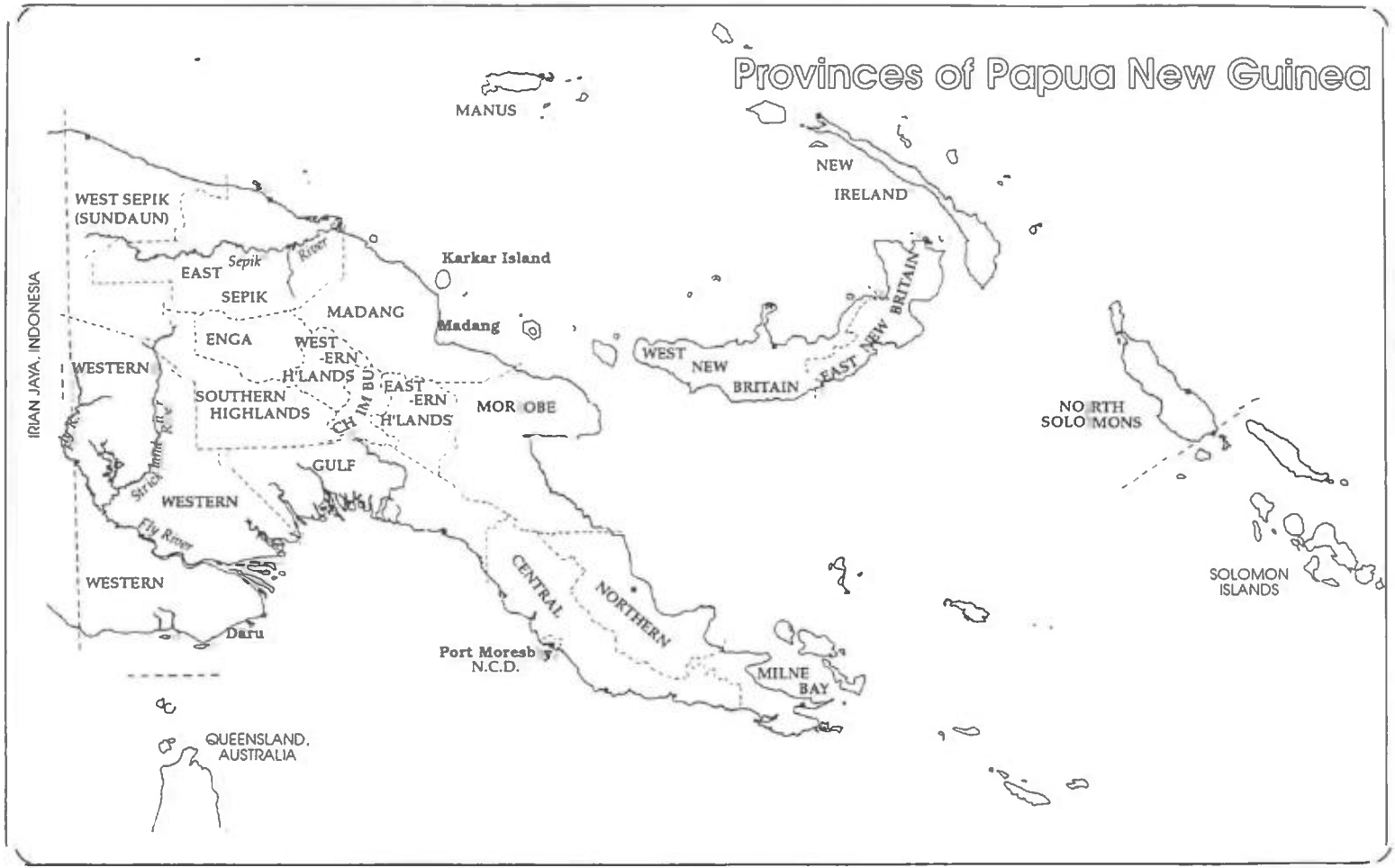
Plate 4. Boelen's Python, *Morelia boeleni,* Varirata, Central Province, Papua New Guinea.

Venomous snakes of the family Elapidae are very common in Western Province. Small inoffensive nocturnal species such as the Black-Striped Snake, *Unechis nigrostriata,* or the Brown-Headed Snake, *Glyphodon tristis,* occur around villages but most of the dangerous species are diurnal. The Whipsnakes, *Demansia atra* and *D. papuensis,* may be seen abroad even in the mid-day heat of the savannas and also in the village gardens. Although their venom is not considered to be highly dangerous to man these extremely alert and rapid snakes are capable of pursuing and capturing their lizard prey. A pair of males were observed in combat outside a newly constructed church in the village of Kunini.

The most feared snake in Papua is the Papuan Blacksnake, *Pseudechis papuanus.* Reaching lengths of over 2m and characterised by its deep glossy black, smooth scaled dorsum and relatively small eye the endemic Papuan Blacksnake is the largest and most venomous of the Australian genus *Pseudechis.* The largest member of the genus occurring in Australia, the King or Mulga Brownsnake, *P. australis,* has also been reported from southeastern Irian Jaya around Merauke and it is probable that this species may eventually be collected within P.N.G., most likely in the southern frontier region west of the Fly River (Slater 1968). *Pseudechis* is a genus of amphibiophagous snakes and it is suggested that the introduction of the Cane Toad has greatly reduced the populations of both the King Brownsnake in Queensland (Covacevich & Archer 1975) and the Papuan Blacksnake through much of its original range in P.N.G. Cane Toads have not yet spread widely in Western Province but the Blacksnake is not a common species, only a single speciment being captured by myself in 1986. The most frequently encountered highly venomous species in the region is the Papuan Taipan, *Oxyuranus scutellatus canni.* Western Province specimens, which may achieve lengths of 3.5m, are usually dark to medium brown in colour and easily distinguished from the Blacksnake despite the local belief that they are male and female of the same species. The scales of the Taipan are keeled, the vertebral column is raised so that the body attains a triangular shape and the head is elongated and 'coffin-shaped' with the large eyes shielded by shelf-like supraocular scales giving a scowling impression. Taipans are slender, rapid-moving diurnal hunters, and since their prey consists of fairly large and potentially dangerous mammals such as rats, they exhibit a rapidly repeated stab and release bite similar to that perfected by the Black Mamba. This maximises the amount of venom injected but keeps the snake's head at a relatively safe distance to prevent injury. The venom of the taipan is extremely toxic and the fatal dose for a 70kg human is believed to be only 7mg (Campbell 1969) which is very little when one considered that the average bite from a 2m Taipan may deliver 100-200mg of venom (Campbell 1967). It is clear, therefore, that in remote region such as Western Province the taipan constitutes a considerable danger to human life. Although the Taipan is generally considered to be a diurnal species it is known to become more crepuscular or even nocturnal during the dry season and villagers occasionally report sightings in the graveyards on the out-skirts of the village. This may be the result of the activities and customs of the villagers since a burial is usually followed by a three month period of mourning. During this time food and drink are daily placed beside the grave for the refreshment of the 'departed soul'. Such gifts will entice rats and mice and may subsequently attract their predators to this relatively undisturbed area.

The only highly dangerous elapid regularly active at night is the Death Adder, *Acanthophis sp.* These short, stumpy 'viper-like' snakes are found lying on trails through forest and garden habitats, especially during the beginning and end of the wet season. Since vipers are absent from the Australasian region these elapids seem to have evolved into the vacant 'niche' even to the degree of taking on the external morphology and behavioural traits of the vipers. The body is short and stout, the head is moderately angular and the eye, which possesses a vertically elliptical pupil, is shielded by a raised 'horn-like' supraocular scale. The ecology and taxonomy of the New Guinea Death Adders is in need of study and revision and it seems likely that two or possibly three distinct species may occur on the island.

Western Province is herpetofaunally without doubt the most diverse province containing representatives of most New Guinean reptile genera including 100% of the Acrochordids and Pygopodids; 90% of the Boids; 83% of the varanids, 77% of the Agamids and 76% of the Colubrids.


Provinces of Papua New Guinea
MANUS
NEW IRELAND
WEST SEPIK (SUNDAUN)
EAST SEPIK
Sepik River
Karkar Island
Madang
MADANG
ENGA
WEST -ERN H'LANDS
EAST -ERN H'LANDS
CH IM BU
WESTERN
SOUTHERN HIGHLANDS
MOR OBE
WEST NEW BRITAIN
EAST NEW BRITAIN
NO RTH SOLO MONS
IRIAN JAYA, INDONESIA
Fly River
Strickland R.
GULF
WESTERN
WESTERN
Daru
Port Moresby N.C.D.
CENTRAL
NORTHERN
MILNE BAY
SOLOMON ISLANDS
QUEENSLAND, AUSTRALIA

CENTRAL PROVINCE AND NCD

The National Capital District, comprising Port Moresby and its hinterland, is completely surrounded by the coastal belt of Central Province which separates the sea from the towering mountains of the Owen Stanley Range, the foothills of which begin some 30-50km inland, and the lower Astrolabe Range which rise almost out of the sea to the south of the capital. From a biological standpoint the NCD cannot be separated from the rest of coastal Central Province. I was based in the National Resources Wing of the Department of Biology, University of Papua New Guinea, on the out-skirts of Port Moresby on the edge of the Waigani Swamp.

There are a number of excellent tarmac roads leading out of the capital: the Hiritano Highway, The Hubert Murray Highway and the Rigo Road, leading northwest to Bereina, east to Sogeri and southeast to Kwikila respectively, but even these roads deteriorate to pebble and dirt after 20-30km. There is, however, an active programme of road improvement and many areas around Port Moresby may soon become accessible without the need of 4WD. It is still, however, practically impossible to travel out of the province by road and many of the montane settlements of Central Province are still only accessible by air.

The coastal strip of Central Province appears floristically very similar to the Eucalypt savanna of Western Province and northern Australia. Flying in to Port Moresby's Jackson's Airport one passes over a series of rolling open grassy hills punctuated by numerous White-Barked Gum Trees. For much of the year this is an arid environment with few watercourses. The most obvious, diurnal reptiles are the small skinks: *Carlia, Emoia, Cryptoblepharus* etc. and the fast running agamids, *Lophognathus temporalis.* All these species would be seen around the unversity where searches under rocks, oil drums or paving slabs also reveal skinks of the genus *Sphenomorphus,* geckoes, *Hemidactylus frenatus* and the blind snakes, *Typhlina bramina.*

Driving the roads around Port Moresby on a regular basis one begins to appreciate the massive ophidian death toll. The most frequent casualty is the Carpet Python, *Morelia spilota,* I recorded 26 identifiable specimens during two stays in NCD totalling about ten weeks. The next most common species are the Olive Python *B. papuanus,* and the Amethystine Python, *M. amethistina,* but usually alert and rapid moving elapids such as the Black Whipsnake, *D. atra,* and the Taipan, *O. scutellatus,* were not infrequent DOR finds, presumably killed as they basked on the road in the first sun of the morning.

Road cruising on the black roads at night, especially after light rain, proved fairly successful and I captured a number of Carpet Pythons and other species on the out-skirts of the capital. These snakes were relocated out towards Sogeri at a later date. The Carpet Pythons, which reach 1.5m, are extremely variable in their saddle-mark patterning but they are all identical in their temperament, every specimen striking aggressively if handled. Diurnal searches in the right areas could also produce snakes and the old Errol Flynn tin mine workings on the road to Sogeri were found to be a favourite haunt of Carpet Pythons, five or six being found there on occasions, sheltering inside the metalwork. Amethystine Pythons around Port Moresby appear to exhibit two 'morphs'. There is a brown morph not unlike that found in Western Province and the specimens I encountered around Port Moresby complied with this patterning. However, the university possess a couple of live specimens which are much more yellow in their ground colour, almost resembling large, long-headed Carpet Pythons. The exact collection locality for these snakes could not be ascertained.

The Green Tree Python is also fairly common around Port Moresby and I was presented with a gravid female by the National Museum. This specimen, which had been captured alive by security guards in the grounds of the Prime Minister's residence and turned over to the museum, a laudable but uncommon reaction to the finding of a python, eventually laid 12 eggs but they proved to be infertile.

Media interest surrounding the venomous snake project also resulted in a number of interesting though non-venomous captures: a 3m Amethystine Python in a tree at Hohola, a common Keelback on the runway at Jackson's Airport, Carpet Pythons in driveways and bathrooms, Treesnakes in diplomatic swimming pools etc. This publicity did lead to the capture of venomous specimens, however, including several Black Whipsnakes in a culvert at the P.N.G. Defence

Force barracks at Goldie River and four Taipans from Brown River and Goldie River. Death Adders are reputedly common in the old forestry areas along the Hiritano Highway, particularly near the Brown River where a single specimen was obtained.

The Taipans of Central Province differ greatly in colour from those of Western Province being a deep red-brown to black dorsally with a broad copper-brown vertebral stripe down the body. This stripe appears to be absent in the lighter brown Western Province Taipan and the all-black juveniles encountered around Port Moresby. Since Port Moresby is a fairly sprawling town, with large areas of untouched savanna surrounding and scattered throughout the built-up areas, the Taipan is very likely to come into close contact with man and DOR specimens were recorded in the capital.

The black Taipans of the Port Moresby area are probably responsible for the continued reports of Papuan Blacksnakes, *Pseudechis papuanus,* although there has not been an authenticated record for many years. A number of trips into Blacksnake-type country, swampy grassland and savanna woodland some distance from the capital, failed to locate any Blacksnakes, the only snake species encountered being Whipsnakes and Common Treesnakes, *D. punctualtus.* The Common Treesnakes of Central Province are quite different in colouration from their relatives in Western Province, being light brown with blue interstitial skin rather than jet black.

Out of Port Moresby the various roads lead into quite different habitats. The Hiritano Highway crosses wide stretches of flood plain and passes through small remnants of lowland rainforest, coconut and rubber plantations. Some of these habitats, particularly along the Laloki River, are reputedly home to populations of the Small-Eyed Snake, *Micropechis ikaheka,* but this species is far more common in Madang Province. The Rigo Road runs along the coast, between the sea and the Astrolabe Range, through areas of low-lying savanna, forest and cultivation, but the Hubert Murray Highway to the east provides access to higher ground. Beyond the Errol Flynn Mine and the Pheonix Inn the road begins to climb. Passing between the twin peaks of Warirata (860m) and Hombrom Bluff (554m) the road 'snakes' up the steep, Laloki River valley, past the Rouna waterfall and the hydroelectric dams to Sogeri. From here one road leads to the Varirata National Park, an area of forested valleys inhabited by Birds of Paradise, whilst another leads towards Owers Corner and the beginning of the Kokoda Trail from where it is possible to cross the mountain ranges on foot into Northern Province. The whole area is remote and the few settlements are extremely isolated. Herpetologically this area is very poorly known and deserves further study, especially since Salvador's Crocodile Monitor, *V. salvadori,* is reported to occur within the Varirata National Park.

Even more remote regions of Central Province lie within the Owen Stanley Range and they can only really be reached by air. The highest peaks in the range are Mt Victoria (4072m) and Mt Albert-Edward (3990m) but many other peaks rise to over 3500m. I visited the settlements of Tapini (approx. 900m) and Woitape (approx. 1500m) in 1986 to make collections of reptiles. The common snakes of the area appear to be Slatey-Grey Snakes, *Stegonotus cucullatus,* and the Catsnake, *B. irregularis,* with the Death Adder, *Acanthophis sp.,* being the only dangerous elapid at these altitudes. Smaller, secretive and fairly inoffensive elapids of the genera *Taxicocalamus* and *Aspidomorphus* eluded discovery as did perhaps the most alluring snake in the whole of New Guinea, Boelen's Python, *Morelia boeleni.* This python is endemic to New Guinea and confined to forested montane regions. An elusive snake which has only been reported from a scattering of localities: Kainantu, Eastern Highlands Prov., Wau and the mountains behind Lae, Morobe Prov., Mt Brown and Woitape, Central Province, the Star Mountains, northern Western Prov., the Wissel Lakes, Irian Jaya (McDowell 1975) and most recently from Bundi, Madang Prov. It seems likely that the species is more widespread than has been appreciated and that its reported 'rarity' is probably more a result of the remoteness and inaccessibility of its distribution. My opportunity to make an acquaintance with the Boelen's Python came when I requested to borrow one of a pair from the National Museum to film a sequence with the BBC Natural World film crew. Boelen's Python is stunningly beautiful, stout bodied, muscular species with a broad, short snouted head and a deep velvety blue-black, highly iridescent dorsum rivalling that of the Amethystine Python or the Brazilian Rainbow Boa. On the anterior third of the body there is a series of white, forward-slanting transverse finger-like bars which reach from the ventral surface to a point mid-laterally. The white and black baring of the supralabials further adds to the startling livery of this impressive python.

From Tapini I walked to the village of Matsialavava (1600m), *en route* collecting several species of skinks: *Carlia fusca, Lobulia elegans, L. stanleyanum, Emoia sp.* and *Sphenomorphus sp.* The most interesting capture was a large specimen of *Prasinohaema flavipes,* a second species of prehensile-tailed, green-blooded skink. Far from being located in an arboreal position this skink was found on the ground in a cultivated garden in Matsialavava, the nearest trees being coffee bushes. The trail from Woitape to Avios also produced an attractive red specimen of the Montane Keelback, *Tropidonophis montana,* and it is quite likely that the Owen Stanley Mountains contain many more interesting and infrequently observed species.

I also made a trip out to Lion Island off the coast of Port Moresby to collect Sea Kraits, *Laticauda colubrina* and *L. latifasciata.* Unlike truly marine hydrophiid seasnakes the Sea Kraits are amphibious, moving onto land to lay their eggs. They have even been observed climbing the shale and boulder cliffs of Lion Island.

MADANG PROVINCE

I spent three months in Madang Province in 1990 based at the excellent Christensen Research Institute, the facilities of which rival anything available at the university. C.R.I. has a comfortable accommodation block, a fully equiped wet lab. with aquaria and cages, an air-conditioned dry lab., museum, library, dark room and computer room. Situated 14km north of Madang town in a beautiful and secluded locality known as Nagada Harbour next to the coastal village of Riwo. Adjoining C.R.I., and providing restaurant facilities for those scientists who are not self-catering, is the exclusive dive-resort of Jais Aben. Local labour, boats and vehicles are all available to researchers. Outside P.N.G., C.R.I. maintains strong links with Oxford University, the California Academy of Sciences, Stanford University and C.S.I.R.O. (Australia).

Much of the original forest along the coastal region of Madang Province has been cleared and the North Coast Road from Madang runs through a succession of coconut, coffee and cocoa plantations and occasional patches of virgin forest. Many of the plantations are abandoned and they are returning to a semi-wild state with dense vegetation clothing the ground and epiphytic plants cluttering the trunks of the palms. During the war Madang town was a Japanese stronghold and much of the area was the subject of heavy bombardment by the American navy and air force. Numerous water-filled bomb craters pock-mart the area, especially around Madang and Alexishafen 21km north along the coast. Further inland there are areas of substantial virgin forest but much of this has vanished in recent years due to extensive logging for the timber trade.

Initial searches around C.R.I. and Jais Aben revealed numerous skinks: *Carlia fusca, Emoia spp.* (including *Emoia longicauda* on the sea-spray covered rocks at the water's edge) and bright green Tree Skinks, *Dasia smaragdina,* on the coconut palms, and geckoes: House Geckoes, *Hemidactylus frenatus,* and Palm Geckoes, *Gekko vittatus.*

Snakes ranging from treesnakes *Dendrelaphis calligastra* and *D. punctulatus,* both very different in colouration from their southern Papuan relatives, to Green Tree Pythons, were also encountered fairly frequently within the compound but snakes were also found in the shallow water along the beach below the Institute. I captured a Little File Snake, *Acrochordus granulatus,* the smaller relative of the Western Province Arafura File Snake, and two Sea Kraits, *Laticauda colubrina,* the larger specimen of which, measuring almost 1.5m, readily took a Zebra Eel with patterning very similar to its own.

A programme of road widening resulting in the felling of many roadside trees and coconut palms provided myself and other zoologists with the opportunity to collect specimens which would otherwise have been unobtainable. Searches of the epiphytes on felled palms revealed large Palm Geckoes and small colubrids, *Stegonotus modestus* and *S. diehli.* The process of talking to locals and explaining ones interest in snakes provided a useful means of obtaining additional specimens and I was called out on a couple of occasions to capture large pythons which would otherwise have been killed out of hand. Other interesting specimens arrived including an Emerald Tree Monitor Lizard, *Varanus prasinus,* and Jacari's Snake Lizard, *Lialis jacari,* the P.N.G. endemic related to Burton's Snake Lizard from Papula and Australia.

The primary purpose of my three months in Madang Province was the collection of Death Adders and Small-Eyed or Ikaheka Snakes, *Micropechis ikaheka,* for the venom research project. Death Adders are reputedly common in the cultivated gardens which surround the villages and also in the grass growing beneath the coffee trees. Searches of both these habitats failed to reveal any specimens and it was not until the delayed dry season began and people started to work in their gardens that Death Adders were collected. The Small-Eyed Snake is reported to spend the daylight hours inside coconut husk piles. The plantation workers husk coconuts on a sharp spike driven into the ground and discard the old husks into piles which eventually become overgrown with creepers and home to a wide variety of animals. Since large piles can cover quite a considerable area help to search them is essential. Initially I would visit a plantation along the coast and, having obtained permission to dismantle the husk piles, hire a few workers to help in the search. The husk pile searches for *Micropechis* in the mainland plantations proved unproductive although a number of other species were collected, the commonest being the Pelagic Gecko, *Cyrtodactylus pelagicus.* The genus *Sphenomorphus* contains almost half of the 120 or so species of New Guinea skinks and the largest members of this genus, the 300mm+ Muller's Skink, *Sphenomorphus muelleri,* was occasionally captured inside the coconut husk piles as were smaller species such as *S. unilineatus.* However, snakes were not found to be common in the mainland husk piles, the sole specimen found during 30-40 such searches being a D'Albertis Python, *Bothrochilus albertisi,* in pre-slough condition. Many invertebrates were also found inside the husk piles: tarantula spiders, scorpions, vinegaroons and giant centipedes but the most common inhabitants were aggressive ants. Once an ant colony was located in a particular husk pile very little else of interest would be found. It is possible that these creatures deterred colonisation by snakes and other large animals.

The roads around Madang were also the cause of many snake road deaths. Whereas the Carpet Python was the commonest casualty around Port Moresby the D'Albertis Python was the most frequently encountered DOR near Madang with the Amnthystine and Olive Pythons also in evidence. I spent many hours road cruising at night, often with the assistance of the local constabulary who captured a Green Tree Python and delivered it to C.R.I. the following morning. Quite a few live snakes were collected. The Madang D'Albertis Pythons were not only much smaller than those from Western Province, usually less than 1.5m, but they were also much lighter in colouration, being copper-brown dorsally becoming lighter brown laterally and yellow ventrolaterally with an immaculate white ventral surface. This much lighter dorsal colouration contrasted much more vividly with the shiny black head than had the patterning of the Papuan specimens. The several Amethystine Pythons encountered were essentially similar in patterning to those in Western Province except that they lacked any dark patterning over lying the brown dorsal ground colour on the anterior third of the body. Other snakes collected on the roads included the Slatey-Grey colubrids, *Stegonotus parvus* and *S. modestus,* and a single specimen of Pacific Ground Boa, *Candoia aspera* which was found in the middle of the road during torrential rain. It is unusual to find DOR lizards but several specimens of Muller's Skink were collected and the only two Small-Eyed Snakes seen on the mainland were also road casualties.

Having heard that a Small-Eyed Snake had been killed on the volcanic island of Karkar off the Madang coast arrangements were made for a visit to search for these otherwise elusive snakes. Karkar Island, which measures 25km by 20km, is an active volcanic island which has erupted twice, in 1974 and 1979, the last time killing two vulcanologists. Much of the lower slopes of the island are covered in coconut, coffee and cocoa plantations and I based myself at Kaviak Plantation on the northwest coast where, thanks to the generosity of the owners and managers of the plantation, I was able to work with teams of workers to uncover some of the thousands of husk piles. Small-Eyed Snakes are reputedly very common on the island, several hundred having been reported killed during an anti-crop pest/anti-fire programme of husk pile removal some years earlier.

The most immediately noticeable item about the coconut husk piles on Kakar was the lack of ants. Secondly, the herpetofauna seemed to be much richer than in the mainland husk piles. Several species of emoid skinks could be seen on the tops of the piles, the most attractive being the Blue-Tailed *Emoia caeruleocauda.* Inside the piles species recorded include Muller's Skink, Blue Tongued, *Tiliqua gigas,* and the large brown *Eugogylus rufescens,* a skink which

preys upon other skinks. The juvenile of this skink is barred black and white in contrast to the more sombre adult brown livery. A juvenile Mangrove Monitor Lizard, *V. indicus* was also found within one husk pile but the most interesting lizards collected were the Crocodile or Spiny Skinks, *Tribolonotus gracilis.*

On the mainland these lizards were found to be fairly rare, only occurring in riverine forest and often in pairs. Here, on Karkar, up to a dozen could be found in a single husk pile. *T.gracilis* does not really resemble a skink since its horny, crested head, rough dorsal scales and four rows of raised spines present a much more agamid appearance. The most rugose of a genus of eight species distributed from mainland New Guinea to Manus Province, New Britain and Bougainville and North Solomons, these skinks are even more unusual than even their external spiny morphology and startling orange eye 'make-up' might suggest. They possess an unusual abdominal gland and also glands on their feet which may be connected with territorial olfactory marking (Greer & Parker, 1968) and although the females have two functional ovaries they only have a functional right oviduct so it is necessary for the left ovary to migrate across the body cavity prior to ovulation. When handled or disturbed these lizards also emit a surprised 'squeak' which carries for a considerable distance, an unusual trait for a non-gekkonid lizard.

Snakes were also captured much more frequently in the island husk piles: Catsnakes, Slatey-Grey Snakes and the most numerous species, the Pacific Ground Boa, *Candoia aspera.* These stout, rugose scaled, short-tailed boas were found in almost every pile searched and their lack of aggression or desire to escape has earned them the name of Sleepy Snakes. Only a single specimen, a large and gravid female, showed any aggression, defending herself with a display of loud hissing and open-mouthed strikes. The Small-Eyed Snake was located in the husk piles on Karkar and fifteen specimens ranging from juveniles to adults almost 1.5m in length were captured although specimens up to 2.5m are reputed to occur on the island. These are quite impressive snakes, especially when newly captured since they strike rapidly to either side if not restrained quickly. Even touching a specimen will invoke a convulsion and a rapid sideways strike so it is easy to imagine how people are bitten when they accidentally step on a snake in the dark. The head of the Small-Eyed Snake is dark grey and the eye is extremely small. The anterior section of the body may be white, cream, yellow or light brown, occasionally spotted with darker pigment, but by the second third of the body a few darker cross bands are appearing. These bands increase in depth of colour, width and frequency posteriorly until by the tail the over-riding colouration of the body is that of the dark banding. The Small-Eyed or Ikaheka Snake resembles the Asiatic Kraits and certainly its secretive, nocturnal and unpredictable habits do mirror those of *Bungarus.* Venom collected Karkar specimens produced some extremely high dry weight yields with specimens between 1-1.5m producing 200-240mg on their second milking. However, the toxicity or LD_{50} has yet to be determined for this species.

In the coffee and cocoa trees which grow in the plantations it was possible to find Brown Catsnakes and Pacific Tree Boas, *Candoia carinata.* The *C.carinata* throughout Madang Province are of the slender-bodied, arboreal long-tailed form which occurs in sympatry with the terrestrial, stout-bodied *C.aspera.* There is also a terrestrial, stout-bodied, short-tailed form of *C.carinata* which bares little resemblance to the arboreal form but this species only inhabits areas where *C.aspera* is absent, notably Halmahera in Indonesia to the far west and the North Solomons to the east, since they are unable to occur sympatrically (McDowell, 1979).

MOROBE PROVINCE

I had planned to spend more time in Morobe and Eastern Highlands Provinces searching for the dwarf Death Adders of Henganofi and the giant 1m specimens reported to occur along the Markham River valley but in the event only a short visit to the Wau Ecology Institute in the mountains of Morobe Province was possible. A number of snakes were recorded as DOR enroute: *Boiga irregularis, Bothrochilus albertisi, B. papuanus.* One large 5m *B.papuanus* had been noosed and dragged onto a busy road to be run over by the traffic. This is not an unusual occurrence and I found DOR Carpet Pythons in Port Moresby with string around their necks. Other specimens are simply killed and laid across the road. A Green Tree Python and a Catsnake were found lying next to each other on a road in Madang Province. There is a disturbing trend towards the unnecessary slaughter of harmless, even beneficial, snakes

in tropical countries which needs to be redressed by an education progamme pointing out the benefit to human populations of large, non-venomous, rodent-eating snakes.

ISLAND PROVINCES

Apart from visits to off-shore islands, Daru, Lion Is., Karkar and one or two or three small islands off the Madang coast, I had not had the opportunity to investigate the archipelagos to the north and east. The larger of these islands are home to several very interesting reptiles, notably the Bismarck Ringed Python, *Bothrochilus boa,* on New Ireland, the Monkey-Tailed Skink, *Corucia zebrata,* on Bougainville, the elusive elapids *Parapistocalamus hedigeri* and *Salomonelaps par* also in the North Solomons Province and the various other species of *Tribolonotus sp.* scattered throughout the archipelagos. Perhaps that opportunity may yet arise.

SUMMARISED TABLE OF SPECIES RECORDED

Papua New Guinea possesses an impressive herpetological checklist comprising in excess of 275 reptiles (2 crocodiles; 13 freshwater and marine turtles; 170+ lizards and 90+ marine and land snakes) plus over 80 species of frogs. New species are being discovered and named with considerable regularity whilst other species are being synonymised. The taxonomy of many groups are in a state of flux due to a general paucity of specimens and the lack of collections from many remote regions has created an extremely patchy picture of their georgraphical distribution. It would, therefore, be wholly impractical for me to attempt here to compile a complete distributional checklist so I have confined this table to species which I or my assistants collected or recorded during the periods April 16th–July 31st 1986 and March 10th–August 17th 1990. The absence of a record for a particular species from a province does not necessarily indicate that it is absent from that province, merely that I did not personally record its presence. Species which were only encountered in captivity are not included in this table eg. *Crocodylus porosus, C. novaeguineae* and *Python boeleni.* Figures alongside snake records indicate number of specimens including DOR examples. Although amphibians were not being studied during the 1990 trip those species recorded have been included. 20 species of frogs and 97 species of reptiles are recorded.

SWP Southern Trans-Fly Western Province (Bensbach to Fly R. and Daru)
CCP Coastal Central Province (Port Moresby, NCD to Rigo)
MCP Montane Central Province (Tapini and Woitape)
CMP Coastal Madang Province (Wasabamal to Usino and Ramu R.)
KMP Karkar Island, Madang Province (Kaviak Plantations)
MMP Montane Morobe Province (Lae and Markham R. to Wau)

	SWP	CCP	MCP	CMP	KMP	MMP
RANIDAE						
Platymantis papuenis				X	X	
Rana arfaki	X					
Rana daemeli	X	X				
Rana sp.				X		
BUFONIDAE						
Bufo marinus	X (Daru only)	X		X		X
LEPTODACTYLIDAE						
Limnodynastes convexiusculus	X					
MICROHYLIDAE						
Asterophrys turpicula	X					
Sphenophryne gracilipes	X					
Sphenophryne sp.	X					
Oreophryne sp.						X
HYLIDAE						
Litoria bicolor	X			X		
Litoria caerulea	X					

	SWP	CCP	MCP	CMP	KMP	MMP
Litoria congenita / rubella	X					
Litoria dorsalis	X					
Litoria gracilenta	X					
Litoria infrafrenata	X	X		X		
Litoria nasuta	X					
Litoria nigrofrenata	X	X				
Litoria sp.A						
Litoria sp.B						
CHELONIIDAE						
Chelonia mydas	X					
CHELIDAE						
Carettochelys insculpta	X					
Emydura subglobosa	X					
GEKKONIDAE						
Cyrtodactylus pelagicus	X			X	X	
Gehyra mutilata	X					
Gehyra oceanica	X					
Gehyra sp.	X					
Gekko vittatus				X		
Hemidactylus frenatus	X	X		X	X	
Lepidodactylus lugubris	X	X				
PYGOPODIDAE						
Lialis burtonis	X					
Lialis jacari	X			X		
SCINCIDAE						
Carlia bicarinata	X	X				
Carlia fusca	X	X		X	X	
Carlia novaeguineae	X					
Cryptoblepharus pallidus	X	X				
Ctenotus spaldingi	X					
Dasia smaragdina			X			
Egernia frerei	X					
Emoia atrocostata	X			X		
Emoia caeruleocauda				X	X	
Emoia kordoana	X					
Emoia jakati				X	X	
Emoia longicauda	X					
Emoia obscura			X		X	
Emoia pallidiceps			X			
Emoia submetallica			X			
Emoia sp.90D*				X		
Emoia sp.90E				X		
Emoia sp.90F					X	
Emoia sp.90G				X		
Emoia sp.90H				X		
Emoia sp.90X						X
Eugongylus rufescens	X			X	X	
Lobulia elegans			X			
Lobulia stanleyanum			X			
Prasinohaema semoni	X					
Prasinohaema flavipes			X			
Sphenomorphus crassicaudus	X					

* Specimens from six species of *Emoia* and six species of *Sphenomorphus* are currently unidentified. These species are recorded in the table as sp.A, sp.B etc. prefixed with their year of collection.

	SWP	CCP	MCP	CMP	KMP	MMP
Sphenomorphus jobiensis	X		X	X	X	
Sphenomorphus melanopogon	X					
Sphenomorphus muelleri				X		
Sphenomorphus nigricaudis	X					
Sphenormorphus undulatus	X					
Sphenormorphus sp.86A			X			
Sphenormorphus sp.86B			X			
Sphenormorphus sp.90A unilineatus				X		
Sphenormorphus sp.90B				X		
Sphenormorphus sp.90C					X	
Sphenormorphus sp.90D				X		
Tiliqua gigas	X	X		X	X	
Tribolonotus gracilis				X	X	
AGAMIDAE						
Chlamydosaurus kingii	X					
Diporiphora bilineata	X					
Gonocephalus dilophus	X					
Gonocephalus papuensis	X					
Lophognathus temporalis	X	X				
VARANIDAE						
Varanus gouldii	X					
Varanus indicus	X				X	
Varanus prasinus				X		
Varanus salvadori	X					
TYPHLOPIDAE						
Typhlina bramina		X[3]				
Typhlina polygrammica	X[3]					
BOIDAE						
Bothrochilus albertisi	X[2]			X[14]		X[3]
Bothrochilus papuanus	X[1]	X[7]		X[2]		X[1]
Candoia aspera				X[7]	X[18]	
Candoia carinata				X[6]	X[2]	
Chondropython viridis	X[4]	X[1]		X[7]		
Morelia amethistina	X[3]	X[5]		X[4]		X[1]
Morelia spilota	X[1]	X[44]				
ACROCHORDIDAE						
Acrochordus arafurae	X[2]					
Acrochordus granulatus	X[1]			X[1]		
COLUBRIDAE						
Boiga irregularis	X[9]	X[13]	X[1]	X[4]	X[6]	X[3]
Dendrelaphis calligastra	X[17]			X[2]		
Dendrelaphis papuensis		X[2]				
Dendrelaphis punctulatus	X[12]	X[1]		X[2]		
Enhydris polylepis	X[4]					
Fordonia leucobalia	X[7]					
Myron richardsoni	X[1]					
Stegonotus cucullatus	X[2]	X[2]	X[4]			
Stegonotus diehli				X[1]		
Stegonotus modestus				X[4]		
Stegonotus parvus				X[6]	X[2]	X[1]
Tropidonophis doriae	X[2]	X[1]				
Tropidonophis mairii	X[15]	X[4]				
Tropidonophis montana			X[1]			

	SWP	CCP	MCP	CMP	KMP	MMP
Tropidonophis picturata	X[1]					
ELAPIDAE						
Acanthophis spp.	X[1]	X[1]	X[1]	X[6]		
Demansia atra	X[3]	X[10]				
Glyphodon tristis	X[3]					
Micropechis ikaheka				X[2]	X[15]	
Oxyuranus scutellatus	X[1]	X[9]				
Pseudechis papuanus	X[1]					
Unechis nigristriata	X[1]					
LATICAUDIDAE						
Laticauda colubrina		X[1]		X[2]		
HYDROPHIIDAE						
Hydrophis spp.	X[1]					

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REFERENCES

Brown, W.C. (1991). Lizards of the genus *Emoia* (Scincidae) with observations on their evolution and biogeography. *Mem. Calif. Acad. Sci.* **15**: 94pp.

Campbell, C.H. (1967). The taipan *(Oxyuranus scutellatus)* and the effect of its bite. *Med. J. Aust. 1967* **1**: 735-738.

Campbell, C.H. (1969). *A Clinical Study of Venomous Snake Bite in Papua.* PhD. Thesis, Dept. Med. Univ. Sydney.

Covacevich, J. & Archer, M. (1975). The distribution of the cane toad *Bufo marinus* in Australia and its effects on indigenous vertebrates. *Mem. Queensland Mus.* **17**: 305-310.

Maluate, E.V. & Underwood, G. (1988). Australasian natricine snakes of the genus *Tropidonophis. Proc. Acad. Nat. Sci. Philadelphia* **140**: 59-201.

McDowell, S.B. (1975). A catalogue of the snakes of New Guinea and the Solomons, with special reference to those in the Bernice P. Bishop Museum. Part II Anilioidea and Pythoninae. *J. Herp.* **9**(1): 1-79.

McDwell, S.B. (1979). A catalogue of the snakes of New Guinea and the Solomons, with special reference to those in the Bernice P. Bishop Museum. Part III Boinae and Acrochordoidea. *J. Herp.* **13**(1): 1-92.

O'Shea, M.T. (1987). The Pythons of New Guinea in Coote J. (Ed.)*Reptiles: Proceedings of the 1986 U.K. Herpetological Societies Symposium on Captive Breeding.* British Herpetological Society.

O'Shea, M.T. (1989). *Liasis papuanus* (Papuan Olive Python). Feeding. Life History Notes. *Herpetol. Rev.* **19**(2): 36.

O'Shea, M.T. at press. The highly and potentially dangerous elapids of Papua New Guinea in Gopalakrishnakone, *Snakes of Medical Importance in the Asian-Pacific Region.* Dept. of Anat., Univ. of Singapore.

Parker, F. (1982). *The Snakes of Western Province.* Wildlife in P.N.G. 82/1.

Patchell, F.C. & Shine, R. (1986). Feeding mechanisms in pygopodid lizards: how can *Liasis* swallow such large prey? *J. Herp.* **20**(1): 59-64.

Slater, K.R. (1968). *A Guide to the Dangerous Snakes of Papua.*

Underwood, G. & Stimson, A.F. (1990). A classification of pythons (Serpentes: Pythoninae). *J. Zool., Lond. (1990)* **221**: 565-603.

Whitaker, R., Whitaker Z. & Mills D. (1982). *Reptiles of Papua New Guinea.* Wildlife in P.N.G. 82/2.

'FIERY BODIES' - ARE PYROSOMAS AN IMPORTANT COMPONENT OF THE DIET OF LEATHERBACK TURTLES?

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INTRODUCTION

Until the careful work of Bleakney (1965) and Brongersma (1969) the diet of Leatherback Turtles (*Dermochelys coriacea* (L.)) was obscure; they were variously thought to be herbivores, omnivores, predators on fish or crustacea, or specialist squid-eaters. Bleakney and Brongersma (*op. cit.*) established from analysis of stomach contents that the diet of Leatherbacks caught or stranded in coastal waters of North America and Europe was made up of jellyfish (medusae) and associated animals (such as hyperiid amphipods). Direct observations of jellyfish-eating have since been made, particularly around the Irish, Welsh and French coasts, where Leatherbacks are regularly observed consuming large medusae in August and September. The concept that Leatherbacks are specialized medusivores has been widely accepted, and Holland *et al* (1990) recently demonstrated that the fatty acid signature of *Dermochelys* blubber is compatible with a jellyfish diet. However, in this paper we demonstrate that another group of animals, the pyrosomas ('fiery bodies' so named by virtue of their bright bioluminescence) may also be important dietary items in some circumstances.

Three major groups of gelatinous, pelagic marine animals are known; the cnidarians (medusae and siphonophores), the ctenophores (combjellies) and the tunicates. As far as Leatherback diet is concerned, most observers have concentrated upon the carnivorous cnidarians, particularly the swarms of jellyfish which are seen in temperate and tropical coastal waters, and on which *Dermochelys* is known to feed. However, in the waers above the continental slope, and in the open ocean, tunicates (which are predominantly herbivorous) are at least as common. Two groups of tunicates, the pyrosomas and the salps, attain sizes great enough to make them potential prey for adult Leatherbacks; they also occur in dense swarms in areas of upwelling where primary production is high.

Pyrosomas are colonies of tunicate zooids embedded in the walls of gelatinous tubes which are closed at one end and open at the other (Berrill, 1950). Each zooid draws water individually from the surrounding sea (through the branchial siphon), but all zooids exhale through the atrial siphons into the interior of the tube, thereby producing jet propulsion via its open end (guarded by a diaphragm). This propulsion is powerful enough to permit extensive vertical migrations. During the day pyrosomas are often found at depths of 500-800 m (within the known diving capability of Leatherbacks - Eckert *et al*, 1986), but migrate upwards at night, often into surface waters (Marshall, 1979). Pyrosomas are brightly luminescent, producing blue-green light (482m) with a secondary green peak (525m) according to Boden and Kampa (1964). Pyrosoma light displays last for many seconds, even minutes. Pyrosomas range in size from a few cm to more than 4 m according to Marshall. Specimens 0.2-0.5 m are very common in summer. They can be soft in texture, but most of the larger pyrosomas are rather cartilagenous/ leathery despite their gelatinous nature.

Salps are barrel-shaped tunicates. Some are solitary and can be up to 0.2 m in length; others occur in chain-like colonies (up to 2 m length), whose jet propulsion (muscular in this case) is synchronized. Like pyrosomas, salps are bioluminescent and distributed widely through the top 800 m of the water column. Salps have a very high water content (98.3% according to

Riley and Gorgy, 1948), which would superficially make them rather meagre food resources. However, Kashkina (1986) notes that salps (and by implication other tunicates including pyrosomas, since all share a common feeding mechanism) have a stomach (the 'nucleus') full of compacted phytoplankton, detritus and microzooplankton. He also lists a wide variety of fish which feed upon salps and pyrosomas, often as major items of diet. Fish living in upwelling areas, near sea mounts and on the continental slope, seem particularly dependent upon pelagic tunicates.

Davenport (1988) suggested that the Leatherback might forage upon pyrosomas during deep dives; he thought that the colonies might be located by their bioluminescence. Direct evidence to support this hypothesis was lacking, although Marshall (1979) stated that sea turtles (species unspecified), together with sea birds and fish, had been observed to feed on glowing pelagic tunicates at the sea surface at night.

This paper lists records of occurence of pyrosomas in the gut of Leatherback Turtles and also presents details of the food value of pyrosomas, including an analysis of their fatty acid composition.

ANALYTICAL METHODS

Large numbers of *Pyrosoma atlantica* were collected on Cruise 195 of R.V. *Discovery* off the west African coast. Collection, by midwater net (8 m^2 mouth), took place in September 1990 in a large sea area (roughly 17-21 N; 19-25 W) at depths between 500 and 1000m. The colonies were washed briefly in fresh water, dried in absorbant paper, placed in polythene bags and frozen at -20°C. On return to a shore facility four colonies were analyzed in the following manner. The colonies were each weighed, dried in a freeze-drier and reweighed. Duplicate pieces of dried material were taken from each colony, weighed, ashed in a furnace at 570°C, allowed to cool in a desiccator and reweighed. Other samples of dried material were analyzed for protein content by a micro-Kjeldahl technique, for caloric content by wet oxidation (using an appropriate correction for unreacted protein) and for lipid content by solvent extraction and subsequent gravimetric measurement. Samples of pyrosoma lipid were further analyzed for fatty acid composition by gas chromatography.

RESULTS

1. RECORDS OF LEATHERBACKS FORAGING ON *PYROSOMA* IN THE INSULAR NORTH PACIFIC OCEAN

a) Iverson & Yoshida (1956) plus personal communication to G. Balazs by Tom Hida.

Date and Location: May 21st, 1954, 5 57.5' N, 161 11.0' W; on the high seas, 100 km east of Palmyra Island.

A Leatherback of greater than or equal to 91 cm carapace length was tangled in longline fishing gear. The "gastrointestinal tract found to be filled completely through with Pyrosoma".

b) by Jones & Shomura (1970).

Date and Location: July 21st, 1969. 3 30' N, 145 0' W; on the high seas.

106 cm carapace length Leatherback hooked alive in the "shoulder" in longline fishing gear. Report states "stomach contents of the Leatherback turtle were examined and consisted entirely of *Pyrosoma* colonies".

c) Balazs & Gilmartin (unpublished data)

Date and Location: March 24th, 1982. 21 10' N, 157 43' W; Waimanalo Bay, Oahu, Hawaiian Islands.

137 cm carapace length Leatherback stranded ashore alive, with all four flippers recently amputated, presumably by sharks. "When necropsied, the gastrointestinal contents were found to consist of liquid, one whole *Pyrosoma* and several *Pyrosoma* fragments, and three pieces of cellophane".

From these records it seems that pyrosomas are found in the gut of turtles foraging in oceanic waters (rather than on the continental shelf). Pyrosomas may also be identifiable throughout the gut (Iverson & Yoshida, 1956).

2. RECORDS OF LEATHERBACKS FORAGING ON *PYROSOMA* IN THE SOUTH PACIFIC OCEAN

Some years ago one of the authors (JD) saw a mounted Leatherback in the Dunedin Museum, South Island, New Zealand. The associated label stated that the turtle had been caught in oceanic waters north of North Island, New Zealand; it had pyrosomas in the stomach.

3. RECORDS OF LEATHERBACKS FORAGING ON PYROSOMA IN THE MEDITERRANEAN

Location: Gulf of Genoa, northern Mediterranean.

Capra (1949) found "remains of six specimens of a *Pyrosoma* species in the intestine of a Leathery Turtle, which had become entangled in nets off the Punta della Chiappa. One *Pyrosoma* specimen had a length of 50 cm, but it was much lacerated; the others measured 15 to 20 cm".

4. ANALYSIS OF *PYROSOMA ATLANTICA*

TABLE 1

Water and organic content of *Pyrosoma atlantica*

Colony no.	Wet wt (g)	dry wt (g)	dry wt as % wet wt	water as %wet wt
1	52.57	2.87	5.46	94.54
2	46.92	2.27	4.84	95.16
3	21.33	1.57	7.36	92.64
4	16.49	1.25	7.58	92.42
		mean	6.31	93.69
		SD	1.37	1.37

Colony no.	Ash as % dry wt	Organic content as % dry wt	Organic content as % wet wt
1	65.7	34.3	
			1.82
1	67.5	32.5	
2	62.4	37.6	
			1.80
2	63.4	36.6	
3	60.4	39.6	
			3.02
3	57.4	42.6	
4	55.3	44.7	
			3.41
4	54.7	45.3	
mean	60.8	39.2	2.51
SD	4.7	4.7	0.83

Table 1 shows the water and organic content of *Pyrosoma atlantica*. The tunicate colonies have a water content of about 94%; some 39% of the dried material is organic in nature, 61% inorganic. In consequence, only 2.5% of the weight of live colonies is composed or organic material. The water contents are similar to those of cnidarians (medusae and siphonophores) (Marshall, 1979), but pyrosomas are less watery than salps. The organic content of pyrosomas is close to the upper limit of the range (0.5-2.5%) given for medusae by Teissier (1926).

TABLE 2

Biochemical composition of *Pyrosoma atlantica*

Colony no.	mean protein content (g protein/mg dry wt)	mean lipid content (g lipid/mg dry wt)	mean calorific content (cals/mg dry wt)
1	90.6	9.0	0.78
2	110.4	–	1.04
3	91.3	14.0	1.26
4	134.4	–	1.66
mean	106.7	11.5	1.18

Table 2 shows the biochemical makeup of dried *Pyrosoma*. Taken with the organic content data shown in Table 1, this means that about 27% of the organic material in pyrosomas is composed of protein, 3% of lipid and (by difference) 70% of carbohydrate (presumably mainly mucopolysaccharides to give the gelatinous structure). Both protein and lipid values are low by the standards of marine animals such as fish and mollluscs which might be expected to have protein and lipid contents of about 45% and 8% respectively). However, the values are not dissimilar from those reported from cnidarians. The caloric value (about 3 cals/mg dry organic wt) is also very low, lower than all of the organisms listed by Crisp (1971).

TABLE 3

Fatty acid composition (%) of two colonies of *Pyrosoma atlantica*. Data for Leatherback turtle carapace blubber (neutral fraction) and for jellyfish (*Rhizostoma, Cyanea*) are given for comparison; they are taken from Holland, Davenport & East (1990)

Fatty acid	*Pyrosoma* Colony no. 1	2	*Dermochelys*	*Rhizostoma*	*Cyanea*
A. Saturated					
12:0	–	–	5.6	0.3	0.1
13:0	–	–	tr	0.6	0.3
14:0	14.8	12.5	11.5	5.1	3.5
15:0	–	–	0.6	2.0	1.3
16:0	36.5	25.9	15.9	27.3	19.0
17:0	–	–	0.8	2.3	1.0
18:0	3.3	1.9	7.5	21.7	12.0
19:0	–	–	0.3	0.5	1.2
20:0	–	–	0.3	tr	1.8
B. Monounsaturated					
16:1 7	–	–	9.5	3.8	4.7
16:1 9	6.1	5.9	–	–	–
18:1 9	10.1	12.2	25.4	6.8	5.5
18:1 7	1.6	2.2	4,9	3.5	3,1
20:1 9	–	0.4	2.2	0.8	3.4
22:1 11	2.8	1.3	–	–	2.5
C. Polyunsaturated					
18:2 6	1.9	3.2	1.5	1.6	0.4
18:3 3	1.3	1.2	0.6	1.6	0.4
18:4 3	2.3	3.1	0.4	2.8	0.6
20:8 6	2.3	3.5	2.1	2.8	8.7
20:5 3	4.2	5.9	4.5	9.7	13.8
22:5 3	1.2	0.7	1.8	1.3	3.2
22:6 6	11.7	20.3	4.6	5.3	12.1

tr = trace quantities; – = not detected

Table 3 shows the fatty acid composition of *Pyrosoma*. As with jellyfish, pyrosoma lipids are rich in the saturated fatty acids 14:0 and 16:0, the monounsaturated fatty acid 18:1 9 and the polyunsaturated fatty acids 20:5 3 and 22:6 6. There are also reasonable levels of arachidonic acid (20:4 6). These data, combined with those for Leatherback blubber (Holand *et al*, 1990) are consistent with the concept of a phytoplankton – pyrosomas – Leatherback food chain (assuming that Leatherbacks accumulate fatty acids directly from the diet, rather than synthesizing them *de novo*).

DISCUSSION

The records drawn together here, plus the results of the analysis of *Pyrosoma atlantica* indicate that pyrosomas are important items of the Leatherback diet and have a composition quite similar to medusae. It is tempting to speculate that pyrosomas are more important to Leatherbacks swimming in mid ocean than they are to turtles foraging in coastal water, but more data are needed to clarify this point, particularly as Capra (1949) reported pyrosomas from the gut of a turtle swimming in the relatively shallow Gulf of Genoa. As Den Hartog & Van Nierop (1984) point out, the whole concept of medusivory stems from analysis of stomach contents of a relatively small number of Leatherbacks stranded or observed in northern temperate waters. Given that Leatherbacks are also known to eat the Portuguese Man O'War (a siphonophore – *Physalia*) (Bacon, 1970) and inappropriate floating objects such as plastic bags and polystyrene, it seems likely that *Dermochelys* is an opportunist rather than a specialist predator on fairly large, slow moving gelatinous prey.

A longstanding problem in considerations of the nutrition of Leatherbacks is that their food is very watery and the organic component is made up largely of mucopolysaccharides. This is true whether the diet is predominantly of medusae (the conventional view) or is made up to some extent of tunicates (this paper). Such a poor quality diet means that adult Leatherbacks must consume very large quantities of food (perhaps 20-30% body weight per day, rather than the 3-5% of Green and Loggerhead turtles). Duron (1978) reported that large Leatherbacks foraging on the medusa *Rhizostoma* off the French coast each ate about 200 kg of jellyfish per day. However, there are still problems in assimilating protein and lipids from jellyfish or tunicates, against a background of essentially indigestible mucopolysaccharide. Kashkina (1986) has raised an interesting possibility; that salp-eating fish probably only assimilate energy-rich material from the salp stomach, and pass the bulk of the gelatinous tunic through the gut without digesting it. This reasoning could equally be applied to medusae, which will contain partly digested food within the stomach and radial canals, and also have concentrations of organic material in the gonads during the breeding season. If a Leatherback turtle could gain access to the more 'valuable' parts of prey, it would not need to waste time and energy in digesting the tunic of tunicates and the mesogloea of coelenterates. Leatherback turtles cannot chew food items, which appear to be swallowed whole, or at least in large chunks. However, the entire oesophagus of *Dermochelys*, which may be more than 2 m long in large specimens, is lined with hundreds of long, semirigid cornified conical processes; the oesophagus is also very muscular, probably allowing the oesophageal contents to be squeezed by peristaltic waves. If cnidarians and salps were effectively shredded, the tubular conformation of pyrosoma colonies presents a relatively large surface area to the surrounding medium. At least one of the records presented here (Iverson & Hoshida, 1956; Hida, pers. comm.) indicates that some pyrosomas are still identifiable in the hind gut – supporting the idea of the tough test passing through the digestive tract relatively unchanged.

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REFERENCES

Bacon, P.R. (1970). Studies on the leatherback turtle *Dermochelys coriacea* (L.), in Trinidad, West Indies. *Biological Conservation*, **2**, 213-217.

Balazs, G.H. & Gilmartin, W.G. Unpublished data.

Berrill, J.J. (1950). *The Tuniccata*, The Royal Society: London.

Boden, B.P. & Kampa, E.M. (1964). Planktonic bioluminescence. *Oceanography and Marine Biology Annual Review*, **2**, 341-371.

Bleakney, J.S. (1965). Reports of marine turtles from New England and eastern Canada. *Canadian Field Naturalist*, **19**(2), 120-128.

Brongersma, L.D. (1969). Miscellaneous notes on turtles, IIB. *Proceedings of the Koninklijke Nederlanse Akademie Van Wetenschappen Series C*, **72**, 90-102.

Capra, F. (1949). La *Dermochelys coriacea* (L.) nel Golfo di Genovo e nel Mediterraneo (Testdu. Sphargidae). *Ann. Mus. Civ. Stor. Nat. Genovo*, **63**, 270-282.

Crisp, D.J. (1971). Energy flow measurements. In *IBP Handbook No. 16. Methods for the Study of Marine Benthos* (ed. N.A. Holme & A.D. McIntyre). Blackwell: Oxford.

Davenport, J. (1988). Do diving leatherbacks pursue glowing jelly? *British Herpetological Society Bulletin*, **24**, 20-21.

Den Hartog, J.C. & Van Nierop, M.M. (1984). A study on the gut contnets of six leathery turtles *Dermochelys coriacea* (Linnaeus) (Reptilia: Testudines: Dermochelyidae) from British waters and from the Netherlands. *Zoologische Verhanelingen Leiden*, **20**, 1-36.

Duron, M. (1978). Contribution à l'étude de la biologie de *Dermochelys coriacea* (Linné) dans les Pertuis Charentais. *Thèse Universite Bordeaux 3me cycle.* 1465.

Eckert, S.A., Nellis, D.W., Eckert, K.L. & Kooyman, G.L., 1986. Diving patterns of two leatherback sea turtles (*Dermochelys coriacea*) during interesting intervals at Sandy Point, St. Croix, U.S. Virgin Islands. *Herpetologica*, **42**(3), 381-388.

Holland, D.L., Davenport, J. & East, J. (1990). The fatty acid composition of the leatherback turtle *Dermochelys coriacea* and its jellyfish prey. *Journal of the Marine Biological Association of the United Kingdom*, **70**, 761-770.

Iverson, E.S. & Yoshida, H.O. (1956). Longline fishing for tuna in the Central Equatorial Pacific, 1954. *U.S. Fish and Wildlife Service, Special Scientific Report Fisheries No. 184* 33p.

Jones, E.C. & Shomura, R.S. (1070). Narrative report *Townsend Cromwell*, Cruise 44. *Bureau of Commercial Fisheries, Biological Laboratory, Honolulu.* Unpublished report, 1 pp.

Kashkina, A.A. (1986). Feeding on fishes of salps (Tunicata, Thalliacea). *Voprosy Ikhtiologii*, **3**, 440-447.

Marshall, N.B. (1979). *Developments in Deep Sea biology*, Blandford Press: Poole, Dorset, U.K.

Riley, G.A. & Gorgy, S. (1948). Quantitative studies of summer plankton populations of the Western North Atlantic. *Journal of Marine Research*, **7**(2), 100-118.

Teissier, G. (1926). Sur la teneur en eau et en substances de *Chrysaora hyoscella* (L.) aux différents stades sont ontogénèse. *Bulletin Societe Zoologique Francais*, **51**, 266-273.

A NOTE ON THE OCCURRENCE OF THE ROOFED TURTLE, *KACHUGA TECTA* IN SALINE WATER IN SOUTHERN BANGLADESH

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The Roofed Turtle, *Kachuga tecta* is known to inhabit fresh water bodies like ponds, lakes, canals and rivers where the water is stagnant and slow running. Slow moving or quiet vegetation-choked waters appear optimal (Moll 1987). However, it has also been observed in the weedy backwater of a river and in a slow moving canal crammed with aquatic vegetation which flowed into an ox bow lake (Moll 1987). Khan (1982) reported *K. tecta* occupying flowing and stagnant fresh waters in Bangladesh. During one of my field trips to Char Alexandar, Ramgoti in Greater Noakhali District from August 1-4, 1989 for the herpetofaunal survey, I observed some *K. tecta* in creeks and canals which were being daily flooded by sea water (from the Bay of Bengal) periodically, during high tides.

As far as literature is concerned on the habitat of this species, there is no mention of it inhabiting brackish or saline water. Studies on the chelonian fauna of Bangladesh are few excepting some preliminary information by Shafi & Quddus (1977), Khan (1982, 1987), Husain (1979) and Hossen (1989). Some of the publications in India on the chelonians also did not mention *K. tecta* occupying brackish or saline water. Worth mentioning are Smith (1931), Daniel (1983), Das (1985). Pritchard (1979) and Ernst & Barbour (1989) also did not mention this habitat for *K. tecta*. However, Das (personnal Communcation, 1989) has also observed *K. tecta* in saline water in India. This is the first record of *K. tecta* inhabiting saline or brackish water in Bangladesh.

REFERENCES

Daniel, J.C. (1983). *The Book of Indian Reptiles.* Bombay Natural History Society, Bombay.

Das, I. (1985). *Indian Turtles – A Field Guide.* World Wildlife Fund – India (Eastern Region), Calcutta.

Ernst, C.H. & R.W. Barbour, (1989). *Turtles of the World.* Smithsonian Insitution Press. Washington, D.C., and London.

Hossen, L. (1989). Ecology of some freshwater turtles of Bangladesh. M.Sc. Thesis. Department of Zoology, University of Dhaka. Unpublished.

Husain, K.Z. (1979). *Bangladesher bonya jontu swampada o tar sangrakshan.* (In Bangla) *Bangla Cacdemy Bignan Patrika.* vol. 5 No. 3: 29-31.

Khan, M.A.R. (1982). Chelonians of Bangladesh and their conservation. *J. Bombay Nat. Hist. Soc.* **79**(1): 110-116.

Khan, M.A.R (1987). *Bangladesher bonya prani.* (In Bangla). Vol. 1. Amphibians & Reptiles. Bangla Academy, Dhaka.

Moll, E.O. (1987). Survey of the Freshwater Turtles of India. Part II: The Genus *Kachuga*. *J. Bombay Nat. Hist. Soc.* Vol. **84**(1): 7-25.

Pritchard, P.C.H. (1979). *Encyclopedia of Turtles.* Tropical Fish Hobbyist Publication, New Jersey.

Shafi, M. & M.M.A. Quddus (1977). *Bangladesher motshu swampada.* (In Bangla). *Bangla Academy Bignan Patrika*, 3(2): 14-36.

CHINA HOSTS
ASIAN HERPETOLOGICAL MEETINGS 1992

Asiatic Herpetological Society, the Chinese Society for the Study of Amphibians and Reptiles (CSSAR), the China Amphibian, Reptile Specialist Group of Species Survival Committee of I.U.C.N., the All Union (USSR) Herpetological Society, and the International Society for the Study and Conservation of Amphibians (ISSCA), including the Second International Conference on Oriental Amphibians will hold a joint meeting in Anhui Province, China during July, 1992.

This announcement invites members of these societies and other interested individuals to attend the meeting and present papers or posters dealing with the following general topics.

1. The biology and conservation of Asian turtles and tortoises.
2. The bilogy and conservation of giant salamanders of the genus *Andrias*.
3. The biology and conservation of the Chinese Alligator.
4. Herpetological studies of the Himalayas and adjacent regions.
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7. Tropical Asian herpetological studies.
8. The biology and conservation of Asian amphibians and reptiles in general.
9. Venemous snakes and snake bite treatment in Asia.
10. The captive reproduction of Asian amphibians and reptiles.

The meetings will be held in **Huangshan** City (formerly Tunxi), **Anhui Province, China** from **15 July to 20 July 1992.** The name of the city, Huangshan, means Mount Yellow which is named after the famous mountain nearby the city. Huangshan Mountain is a United Nations human cutural estate. Anhui Province, located in eastern China is of great herpetological interest. About 100 species of amphibians and reptiles, including the Chinese Alligator and the Chinese Giant Salamander occur in the Province. Excursions will be arranged to observe and photograph the Chinese Alligator Research and Reproduction Centre. This is the only centre in China for conserving this endangered species. There are more than 3000 Chinese Alligators at the center, among which over 200 are second generation.

Additional excursions will be arranged to visit natural habitats and cultural sites in the province.

Individuals interested in attending the meeting should write to the following addresses for additional information and to register and submit abstracts:

1. Within China: Dr. Huang Jie-tang, Quimen Institute of Snake Bites,
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2. In USSR: Dr. Ilya Darevsky, Zoological Institute, Leningrad, USSR

3. In the U.S.A. and all other countries:
Dr. Theodore J. Papenfuss, Musuem of Vertebrate Zoology,
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Some general information about the Anhui meeting

1. The meeting will be held at Huaxi (Flower Stream) Hotel. This hotel will provide comfortable conditions with private rooms, with bath room and dining room.
2. The total cost for six days hotel, including all meals, banquet, and a one day visit to the Alligator Research Centre will cost about $500 U.S.
3. The hotel will provide rooms for meetings and poster presentations.

Registration Fee: Advance registration fees received by December 31, 1991 will be reduced.

Registration fee (by December 31, 1991) ..... US $125 for members and $180 for non-members of the societies.

Registration fee (by April 1, 1992) ..... US $180 for members and $240 for non-members of the societies.

For first circular about the meeting write to:
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