

UK BUSHMEAT WORKING GROUP

24th April 2009

14:00 – 17:00

Mappin Pavilion, Zoological Society of London

Meeting report

Attendees List

Rob Ogden – TRACE Wildlife Forensics Network
Mike Bruford – Cardiff University
Anne-Lise Chaber – ZSL/Royal Veterinary College
Mark Baxter - Defra
Colin Foster – HM Revenue and Customs (HMRC)
Rob Griffin – Food Standards Agency (FSA)
Edmund Kingcott - independent
Andrina Murrell – Born Free Foundation
Helen Thirlway – International Primate Protection League
Katherine Homewood – University College London
Matthew Hatchwell – Wildlife Conservation Society
Marcus Rowcliffe – ZSL Institute of Zoology
Julio Benavides – University of Montpellier/ZSL
Christoph Schwitzer – Bristol Zoological Gardens
Noëlle Kümpel – ZSL
Chris Ransom – ZSL
Catherine Lawson – ZSL
Ayako Uozumi – ZSL

The Chair, Noëlle Kümpel, outlined the purpose of the UK Bushmeat Working Group (UKBWG) as a forum for discussion on bushmeat-related research and policy amongst government, industry, NGOs and academia. ZSL took over secretariat responsibilities of the UKBWG from the Tropical Forest Forum in 2006 and is funded by Defra. She welcomed attendees to this meeting, the first since May 2007, and asked them to introduce themselves before drawing attention to the agenda.

Rob Ogden, Director, TRACE Wildlife Forensics Network *The use of wildlife DNA forensic methods to investigate the illegal meat trade*

The work presented by **Rob** stems from collaboration between TRACE, Wildlife DNA Services and Bangor University. **Rob** outlined that DNA evidence can be used to identify species, individuals, parentage and geographical origin. He explained that DNA analysis can be used for forensic identification (for investigation and enforcement, advanced applications, heavily validated methods, and directly supporting prosecutions) or genetic monitoring (surveillance and detection, applied research tools, intelligence gathering, certification). The DNA sequence of particular gene regions can be used to identify species by targeting variation that occurs between but not among species; this can be done either by comparing the entire sequence or by designing assays to target exact points of variation. He noted that mitochondrial DNA (mtDNA) was preferred as it provides many genes useful for species identification, is haploid (single-stranded) and therefore easy to analyse and, because there are multiple copies of mtDNA in one cell, is particularly good for low yield samples.

Rob went on to detail three case studies of his work:

Case Study 1: Assessment of illegal meat entering Heathrow (in association with DEFRA (Global Wildlife and International Animal Health), HM Revenues and Customs (HMRC), Wildlife DNA Services, IFAW, and the Food Standards Agency)¹

The aim of this study was to identify illegally imported meat, in particular the prevalence of CITES-listed species, by forensic genetic species identification. Twelve flights were sampled over the course of five sampling trips in 2005-2006 (5 from West Africa, 4 from Asia and 1 each from Qatar, UA and Australia)². Most of the meat found was dried fish and this was not recorded. Sixty-two meat samples were collected of which 13% were wild species (duiker, bush pig, pangolin, cane rat [which might be farmed]) and 87% were domestic species³. The majority appeared to be for personal use/gifts but some was likely for commercial use. Of the wild meat samples, **Rob** highlighted that HMRC commented that it was their opinion that passenger luggage was no longer the primary route for the transportation of bushmeat.

Case Study 2: Undercover purchasing of bushmeat in London Boroughs in 2006¹

Three samples, all cane rats, were obtained and cost an average of £80/kg from London boroughs. The work served to prove how difficult it is to investigate the bushmeat trade in the UK (this was intelligence-led) but that it is still prevalent and the high prices demonstrate a commercial driver for the trade. **Rob** commented that it took considerable time to build up the relationships necessary to gain access to this information and also that little was known about the entry routes of the meat found.

Case Study 3: Kezie Foods

As part of a PhD in Wildlife Forensics looking at the authentication of imported meats, Lindsay Peppin, from Bangor University, collected samples from Kezie Foods (a UK-based exotic food suppliers). Samples were identified using DNA sequencing and it was found that they were not what they claimed to be:

Claim	Actual
Kudu	Roe deer
Impala	Blue wildebeest
Bison	Cow
Springbuck	Bontebuck

Rob went on to discuss the FSA project on UK bushmeat importation which identified 4 key problems associated with the bushmeat trade: zoonoses, livestock disease, meat hygiene and conservation. **Rob** explained that the target species were a mixture of high conservation value, CITES-listed, common and domestic species: chimpanzee, gorilla, duiker, bushbuck, porcupine, cane rat, pouched rat, bush pig, zebu, dwarf zebu, and African sheep and that the project used an assay designed for the Agilent BioAnalyzer. This employed a PCR-RFLP technique providing a RFLP profile. He described this technique as a cost effective, rapid and simple to employ, freely available to the scientific community and with Standard Operating Procedures available, with potential for the same method to be used in range states to address species-specific issues. He then went on to discuss the potential for UK/EU border control and highlighted that whilst the ability to identify all seized meat, the presence of illegal meat on most flights and a market for bushmeat in the UK had all been demonstrated, there are currently issues with insufficient resources to investigate large scale smuggling (requiring extensive intelligence work) and political sensitivity associated with the investigation of illegal meat entry via other EU states. However, he pointed out that the framework for EU-wide enforcement exists in northern Europe, but that resources need to be prioritised between human and animal health.

¹ McEwing and Ogden (2006) Imported bushmeat – species identification using DNA typing; Defra project WC05011. Wildlife DNA Services Ltd, University of Wales, Bangor.

² DNA was extracted at point of seizure prior to genetic identification in North Wales.

³ Of the wild meat samples, four were identified as belonging to CITES listed species.

Rob also discussed the potential for range-state genetic testing. He explained that suitable laboratories are being developed in Africa (e.g. South Africa and Kenya) and that it was technologically feasible. He recognised that the cost was an issue but argued that it was not prohibitive. In conclusion, Rob suggested that the key challenges were in the application of the techniques and approaches he had discussed, in terms of chain of custody, inter-agency / regional collaboration, legislation and prioritisation of conservation relative to health concerns.

Noëlle thanked **Rob** for his presentation and invited questions.

Anne-Lise Chaber asked about the costs involved with the techniques discussed. **Rob** replied that RFLP sequencing costs around £10 per sample. He noted that there were economies of scale involved and that if more samples were processed the procedures would become more cost-effective. He also commented that the major cost for the procedures was labour and that this could be significantly reduced if analysis was carried out in-country.

Rob Griffin commented that a lack of collaboration, and consequently communication, appeared to be a problem. **Rob Ogden** agreed and stated that someone needed to take the lead but that successful action would require the collaboration of 4 or 5 different organisations.

Edmund Kingcott asked whether or not the methods Rob had described were accredited in any way. **Rob** explained that the methods had been validated but currently would not stand up as evidence in court. He noted that whilst the method works well, there are caveats in the interpretation.

Marcus Rowcliffe enquired how bushmeat was likely to be being transported if it was not in suitcases. **Rob** suggested that the absence of bushmeat in suitcases may be specific to Heathrow. He also commented that he suspected large amounts may be transported in cargo shipments and via ports but explained that he did not know for sure as he was yet to be given the clearance to investigate.

Mark Baxter commented that Government action has to be evidence-based. He elaborated that whilst the findings of Rob's research may *indicate* a problem this must be irrefutably proved. He noted that based on current evidence matters relating to wildlife health would take priority over issues of conservation and also that government budgets were currently tight.

Anne-Lise asked if passengers found carrying meat were issued with a fine. **Rob** replied that the meat was confiscated and details of the flight the passenger was on were collected but no fine was issued nor personal details collected.

Mike Bruford, Cardiff University
Prospects for a primate bushmeat genetic identification tool

Mike Bruford began by highlighting that taxonomic diversity is a major conservation issue. He explained that this work was part of an EU project called inPRIMAT⁴ carried out a few years ago focusing on primate conservation and specifically on developing an easy tool for primate identification, recognising that one use of this tool would be in the investigation of bushmeat. **Mike** recognised that species of conservation concern are likely to be rare in bushmeat cargo but argued that when they are found, identifying them is a major issue and that a method is required to distinguish between and among taxa and that this requires

⁴ Funded by: EU QLRI-CT-2002-01325; DURSI of the Generalitat de Catalunya (to OA) and the Swedish Research Council for Science and Technology (to A-C.S)

genetic tools that can answer hierarchical questions (i.e. distinguishing between primates and non-primates, mandrills and drills and then where a particular mandrill came from). He noted that most bushmeat samples are smoked, which makes identification more difficult, but in principal short DNA sequences should survive smoking.

He explained that, to work further up the taxonomic tree than the level of species, analysis of nuclear DNA (nDNA) is required in addition to that of mtDNA and that this was why a mixed approach of the mitochondrial 12s ribosomal RNA gene and the nuclear epsilon globin and apolipoprotein B genes was used in his research. A hierarchical DNA sequencing method was used allowing separation at infraorder, subfamily and genus levels⁵.

A number of potential methods were identified and the team identified the most automated system that would allow for questions to be asked at each level as mini-sequencing in micro-arrays; a technique which allows for 16000 genotypes to be analysed simultaneously and for very degraded DNA to be read. The method was blind-tested on 70 primates (42 Catarrhini, 13 Platyrrhini, 14 Strepsirrhini, one Tarsier) and 5 non-primates. Sixty-eight experiments worked and 95% of orders, 85% of sub-families and 68% of genera were correctly attributed. From the sequence used it was not possible to identify non-primates, except one sheep, thereby identifying the need to carry out more work in developing appropriate markers at this taxonomic level. **Mike** also identified the level of correct genus assigned as a weakness and noted that most incorrect assignments came from the lorises and galagos. **Mike** recognised that the cost of the technique is relatively high (£100s per sample) but argued that in principle the cost can be brought down if there is a high flow of samples for analysis. He noted that the method is potentially much more efficient than DNA barcoding but currently not accurate enough.

Mike reminded the group that it is unknown if this technique will work on bushmeat. He noted that short DNA sequences should survive the smoking process and that the genetic data he tested his tools on was of poor quality (hair, faeces, etc.) but stressed the effectiveness of the tool on bushmeat was unknown. **Mike** also noted that when analysing bushmeat there might be more obvious tools for determining whether samples are primate or non-primate.

Noëlle thanked **Mike** for his presentation and invited questions.

Noëlle asked about the degree of taxonomic clarity in taxa other than the primates. **Mike** responded that the systematics of the primate order was patchy, and identified bush-babies and lorises as particularly weak areas, but probably the best understood of all taxonomic orders. He noted that the systematics of duikers is very poorly known.

Anne-Lise Chaber, Zoological Society of London/Royal Veterinary College
Investigation of the African bushmeat traffic in France: a threat to both biodiversity and public health

Anne-Lise Chaber began by setting out the questions her research aimed to answer:

- What is the scope of the illegal bushmeat traffic from West and Central Africa to France?
- Which species are involved?
- What is the sanitary risk linked to this trade?

Scope [scale]

Anne-Lise explained how she issued questionnaires to a number of airports but received no replies. Working with the Customs departments at Charles de Gaulle (CDG) and Toulouse-

⁵ Bosch M, Andres O, Domingo-Roura X (2006) *Folia Primatol*, **77**, 387-392

Blagnac airports, however, she sampled 134 passengers from 29 flights over 17 days in June 2008. Data was collected on the flight origin, the number of checked passengers, the number of passengers carrying meat/fish, the number of passengers carrying bushmeat and the frequency of the flight, and specimens were collected. Fifty-five passengers were found to be carrying fish or domestic meat and 9 carrying bushmeat and this equated to 446kg of fish, 158kg of domestic meat and 176kg of bushmeat. 8-16% of passengers were carrying bushmeat. These figures were used to project estimated kilograms of bushmeat carried in to CDG per week from four Africa countries: Central African Republic (CAR), Cameroon, Ivory Coast and Republic of Congo. She extrapolated her data to give quantities imported from these countries: per capita bushmeat imports were greatest for CAR (nearly 30kg per person per flight from Bangui), but due to the greater number of flights, overall bushmeat imports were greatest from Cameroon (nearly 3000kg per week, from Douala and Yaounde airports). **Anne-Lise** also explained she spent one day in the freight department but found no evidence of bushmeat. She suggested that this was a product of the short sampling period rather than a reality.

The scope of the trade was also investigated by visiting French markets where **Anne-Lise** posed as a customer to determine the cost of bushmeat and how it was brought into Paris. Bushmeat sold at the markets was found to be an expensive commodity (see table below) and considered a luxury item. **Anne-Lise** also commented that bushmeat could be found in certain restaurants in Paris.

Animal	Price in Euros
Antelopes	Unknown
Primates	~20 – 30 € / kg
Cane rat	~40 € / cane rat
Porcupines	~40 € / porcupine
Crocodiles	~20 - 30 € / kg
Smoked fish	~25 € / kg

Anne-Lise argued that four factors perpetuated international trade in bushmeat: a low search rate, a lack of punishment/fines (fines were set at only €150), high rewards and a lack of information from airline companies and misleading certification from African veterinary officials. One passenger was found carrying 55kg of bushmeat (and nothing else) in their luggage while travelling on a reduced price ticket as a relative of an employee of an airline.

Species Involved

Species assignment was determined by visual and skeletal examination, though x-ray and skeletal examination (flesh removed, boiled, degreased, bleached, and then bones re-assembled). Of the 99 species identified, most species were listed on CITES Annex I or II and in the IUCN Red List. 76 species were from the Central African Republic (CAR), and porcupines and duikers were prevalent. A high proportion of juveniles were also found.

Sanitary Risk

Anne-Lise explained that she investigated both the sanitary (bacteriology and virology in the form of poxviruses and filoviruses) and contaminant (polycyclic aromatic hydrocarbons - PAHs) risk of bushmeat. Twenty samples were subjected to bacteriological and virological examination. No endogenous bacteria were identified but there was some evidence of *Listeria monocytogenes*, *L. grayii*, *Streptococcus spp.* and *Staphylococcus*. No evidence of poxviridae was found but there was an unspecific filoviridae result (not Ebola). Levels of PAHs, which are carcinogenic, mutagenic and teratogenic, were found to be far above acceptable levels for foodstuffs as defined by the EU.

Anne-Lise concluded by highlighting the fact that in spite of the financial and temporal limitations of her work she had found considerable evidence of the bushmeat trade. She stated that action against the trade was the responsibility of all Governments in the EU and identified further research as a priority.

Noëlle thanked **Anne-Lise** for her presentation and invited questions.

Mike Bruford enquired if Paris might be acting as a 'clearing house' for other European cities. **Anne-Lise** responded that whilst this was possible, she had seen evidence of the trade in many other cities (Brussels was also likely to be a hub) and cited her experience of the trade in Wood Green, London. She suggested that in the UK people are much more cautious about discussing the trading of bushmeat.

Edmund Kingcott asked if any kind of warning or broadcast was made prior to the departure of flights similar to the customs announcements made in the EU. **Anne-Lise** commented that this was one of the questions posed to passengers found carrying illegal meat and they claimed there was no warning. There is some information available at some range state airports but airlines such as Air France do not question suspicious items of luggage such as ice-boxes.

Mike commented that the high level of bushmeat from the Central African Republic (CAR) to France was what he would expect given the poor governance there. He recognised that **Anne-Lise's** analysis provided a useful tool for predicting flights where bushmeat imports were likely to be found. **Matthew Hatchwell** added there are only two flights out of CAR each week and so **Anne-Lise's** results for overall imports from there are even more astounding. **Rob Ogden** was interested to learn that **Anne-Lise** had found evidence of a volume of bushmeat being carried that was 10 times what his team had found in the UK. He noted that a major leafleting campaign had been carried out shortly prior to his work and suggested that this may have resulted in a drop off.

Rob Griffin identified that the lack of deterrent was a major problem, particularly if the meat is only confiscated and no further action is taken. He also asked if the hygiene issues identified had been brought to the attention of the European Food Standards Agency (EFSA). **Anne-Lise** replied that she had sent a copy of her report to the EFSA but had not received a response.

Mike remarked that from his experience of places like Douala and Libreville the reality was anything could be brought through customs if one is prepared to pay a bribe.

Mark Baxter asked what percentage of the confiscated meat was intended for personal use and what percentage was intended for onward sale. **Anne-Lise** reported that of the 9 passengers carrying bushmeat, 2 claimed to be carrying it for personal consumption. She noted it was difficult to determine how truthful passengers were.

Discussion of conservation and health implications of illegal bushmeat imports to UK/Europe with respect to government policy

Noëlle Kümpel asked **Edmund Kingcott** to provide the group with an outline and update of the 2005 FSA commissioned study into the microbiological hazards of illegal bushmeat imports (he had been involved with the writing of this report, which was led by Roger Skinner). **Edmund** explained that a wide range of possible hazards were identified but that the risk of transmission from 'bushmeat stew' was low. He noted that the possible risk from cross-contamination and the handling of meat in relation to anthrax, monkeypox etc was much higher but explained that currently only monkeypox had been found to be a risk to human health.

Edmund explained that under the relevant EU veterinary legislation all products of animal origin (POAO) from third countries are banned unless (1) the Central Competent Authorities (CCA) in the country of origin have satisfied the EU Commission as to their ability and

capacity to approve the establishments supplying the products, as being in compliance with the relevant animal health and food hygiene legislation, (2) the establishments have been approved by the CCA and given an establishment number, (3) all packages bear the establishment number and (4) each consignment is accompanied by an original version of the signed health certificate. In addition, consignments can only enter a member state via an EU-approved Border Inspection Post (BIP) (of which there are around 50 in the UK) and a BIP is given advance notice when a consignment comes in (24 hours notice must be given for the arrival of a consignment by plane whilst a number of days notice must be given for the arrival of a boat). Each BIP is individually approved for accepting the entry of one or more categories of POAO. On arrival at a BIP document checks and physical checks of cargo occur. **Edmund** explained that if smuggling is suspected (which is more likely with commodities such as televisions than with legitimate meat cargo) then more extensive checks will be carried and on occasion a whole cargo may be checked. He stressed the importance of intelligence.

In 2003 the responsibility for anti-smuggling duties was transferred from the Port Health Authorities to HMRC. This resulted in a substantial increase in seizures between 2003 and 2005, but **Edmund** admitted he was unsure of the current situation. **Noëlle** commented that the early departure of **Colin Foster** of HMRC [who has been present at the meeting but had had to leave after the tea break] was unfortunate as he could have potentially provided an update. **Noëlle** pointed out that the transfer of responsibility for illegal meat imports to HMRC followed the 2001 foot and mouth outbreak and that this increase in seizures may have only been short term. She also mentioned that there had been a risk analysis carried out by the Veterinary Laboratories Agency in 2004⁶ to assess the risk of importing livestock diseases into the UK, concluding this was low but constant. **Edmund** added that these initiatives were more for animal health than human health reasons and concluded by reiterating the need for a co-ordination of efforts. [Another relevant report on tackling illegal imports of animal products from outside the EU following the transfer to HMRC of the responsibility for enforcement was published by the National Audit Office in 2005⁷.]

Rob Ogden explained that a major problem he encountered was that under EU regulations, hazardous consignments are immediately destroyed upon discovery thus making their testing difficult. **Anne-Lise** confirmed that this was still the case. This means that the samples must be analysed in situ as they did at Heathrow as they can't send them to laboratories. [**Colin Foster** of HMRC subsequently noted that seized meat is currently required to be incinerated without undue delay but has confirmed with the CITES team in Heathrow that freezer facilities that could be used for sample storage do exist at the terminals. He also mentioned that HMRC often sends samples elsewhere for expert opinion.]

Matthew Hatchwell asked the group about the potential for the detection of bushmeat at the check-in for flights rather than on arrival. He argued this would negate the complications caused by multiple transfers. **Edmund** re-highlighted the problem of corruption.

Anne-Lise asked whether an airline is legally responsible for the bushmeat carried on their flights. **Edmund** replied in the negative and suggested that bushmeat was probably not officially imported until it was on the ground and through border control.

Mark Baxter from Defra was able to offer little update as this was more the responsibility of HMRC. He stated, however, that HMRC officials would target their activities according to their own risk analysis and reports that have been concluded. He explained that as the McEwing and Ogden (2006) report had not demonstrated a high level of traffic of CITES listed species it has not been made a key priority by HMRC.

⁶ Veterinary Laboratories Agency (2004) Risk Assessment for the Import of Contaminated Meat and Meat Products into Great Britain and the Subsequent Exposure of GB Livestock.

⁷ National Audit Office (2005) HM Customs and Excise: Stopping illegal imports of animal products into Great Britain. Available from www.nao.org.uk.

Noëlle commented that the only means to address the fact that meat was destroyed on discovery was to develop simple tools that can be used in situ. She asked **Mike Bruford** if there were any tools that could be developed in the near future. **Mike** stated that the potential was there. **Noëlle** thought that the requirement for immediate incineration did not exist in the US but believed that there was a build up of samples in laboratories because of a lack of resources. She suggested this was another reason for developing simple, on-site tests.

Marcus Rowcliffe enquired whether the monitoring effort currently exerted by HMRC and was recorded; this is a cheap and relatively simple step that could improve sampling design. **Edmund** informed the group that customs did keep records of the meat they confiscated but that he did not know if it was analysed in any way. **Andrina Murrell** commented that there was no standardisation in the records that are kept. [**Colin Foster** later confirmed that this is only recorded as 'bushmeat' when it is described as such by the person importing the meat to the officer at the time of seizure, so records are unreliable. He reported that HMRC does not issue fines when making a seizure and they record full details including nominal information in a specific database for internal use.]

Christoph Schwitzer proposed working with air carriers (and asked if they could be responsible for testing). He suggested that if carriers were not independently keen to collaborate, studies such as **Anne-Lise's** could be used to 'name and shame' carriers and thereby coerce them into collaboration. **Anne-Lise** noted that she had attempted something similar with Air France and that this has resulted in very difficult working situation. She suggested it is much better to have the airlines 'on side'. [**Colin Foster** later reported that airlines and transport operators do have an obligation to draw attention to or publicise the rules under an EU regulation. HMRC have contacted airlines about this before to make them aware.]

Christoph also asked the group whether there was the potential to translate the technology, in particular x-raying, already in place for bomb checking to bushmeat monitoring. **Noëlle** informed the group that a presentation on this had been given at a previous UK Bushmeat Working Group Meeting. She was unsure why it had not been implemented (perhaps the cost was prohibitive). She added that some sniffer dogs specifically trained for recognising meat were also being used by HMRC which were 'low tech' but effective. **Noëlle** stressed that the cost and time incurred at exit and entry points would have to be considered before the implementation of any protocol, and this would require internal coordination between different departments. **Edmund** agreed that the scale of any activities would be huge due to the amount of human traffic through UK airports but **Mike** pointed out that there would be many commonalities with existing security checks. **Noëlle** re-emphasised that any procedure that resulted in increased delays at airports wouldn't be adopted lightly. She pointed out that implementation of these procedures may be more feasible at departure airports where there is likely to be less human traffic.

Mark Baxter remarked that the topic of bushmeat impinged on many departments. He mentioned that Defra were involved in monitoring of illegal timber exports and described how checks are made at the point of exit to verify that products are from a legal source. He restated that the problem must be proved before it will be focused on but conceded it is difficult to prove there is a problem without focusing on it.

Christoph suggested that representatives from carriers such as British Airways and P&O ferries should be invited to a future meeting to discuss options to increase checks.

Julio Benavides described his experience of the timber trade and the framework used to investigate and prevent illegal timber trade and certify legal and sustainable timber via the Forest Stewardship Council (FSC). He suggested that a similar certification system might be applicable to the bushmeat trade. **Noëlle** pointed out that there are some important differences between bushmeat and timber but agreed it was something to consider.

Mark Baxter, Defra
***Brief update on government response to the bushmeat report by Brown et al
commissioned for the IDMGb and published in 2007 (Assessment of recent
bushmeat research and recommendations to Her Majesty's Government)***⁸

Mark apologised for not being able to provide an update on the HMG response to the Brown et al bushmeat review and cited changes in personnel and departmental reorganisation as the cause. He also noted that the IDMGb (Inter-Departmental Ministerial Group on Biodiversity) had not met for a long time and there was now a focus on overseas territories. He stated that he hoped to be able to provide more of an update at the next meeting. **Noëlle** commented that the involvement of DFID in this response should be a priority.

AOB

Noëlle informed the group that she hoped the next meeting would be held on the 9th of June at ZSL to tie in with an evening ZSL Scientific Meeting on 'Bushmeat and fisheries within the livelihood context: what are the implications for conservation?'. She asked the group to inform her of any other issues they would like to discuss and agreed to follow up the issues discussed at this meeting with HM Revenue and Customs.

Many thanks to all who attended

⁸ This report has now been published as: Brown D, Fa J E & L Gordon (2008) 'Wild Meat in the Policy Process: A Study of the Potential for Inter-Departmental Collaboration in HMG, United Kingdom', *Durrell Conservation Monographs* No. 2, Jersey.