DAVIS EXPEDITION FUND

REPORT ON EXPEDITION / PROJECT

Expedition/Project Title: Tropical Biology Association Field Course

Travel Dates: September 29th – November 10th 2018

Location: Danum Valley Field Centre, Malaysia

Group Members: Anna Jonsson Sundberg

Aims: Tropical biology research training

Outcome (a minimum of 500 words):-

TROPICAL BIOLOGY ASSOCIATION FIELD COURSE 2018

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Background

Ecosystem functioning depends on the identities, densities and interactions of populations. The current rate of habitat loss therefore not only threatens to remove individual species but to disrupt ecosystems and their services on regional and global scales. Additionally, the remaining biodiversity tends to be segregated from the areas where people live, accentuating the gap between people and wildlife. For example, tropical forests contain more than half of the world's biota but cover only 7% of its total land surface (reviewed in: Wilson et. al, 1988). Myers et. al. (2000) further estimate that 44% of the Earth's plant species and 35% of its vertebrate species are confined to biodiversity hotspots which cover only 1.4% of the global land surface. Still, many high biodiversity areas experience exceptional rates of habitat loss. Their protection is therefore not only important to maintain ecosystem services but provides the greatest payoff in terms of preserved endemic biodiversity. Ecological research is crucial to develop sustainable conservation strategies in these areas of especially high conservation concern.

The Tropical Biology Association (TBA) provides a field course in Borneo to train scientists in tropical biodiversity research during their early academic careers. Borneo belongs to one of the world's top biodiversity hotspots (Myers et. al, 2000) but its geographic location and geology favours both a great endemic biodiversity and the agriculture which drives its decline. The ability to experience and understand Bornean ecosystems and their conservation is therefore not only an increasingly rare opportunity but a crucial skill for preserving similar habitats worldwide. Through their field course, the TBA aims to increase the capacity of the global scientific community. The course offers not only high-end teaching in project skills, but a unique opportunity to generate relevant and powerful research for someone at my stage of their career.

Aims

General scientific objectives of the course:

- Gaining fieldwork experience and confidence in project design and presentation for a future scientific career.
- Obtaining a better understanding of conservation issues, approaches and successes in high biodiversity areas.
- Improving collaborative fieldwork skills and gaining a global network of future collaborators.

Activities & Outcomes

Study site

The TBA field course was based at the Danum Valley Field Centre in Sabah (Malaysia). The centre is located within the Danum Valley Conservation Area, a 438 km^2 protected forest reserve which comprises primary and selectively logged mixed Dipterocarp forest. Characterised by an equatorial aseasonal climate, the area has a mean annual temperature of 26.8^oC and receives rainfall year-round. It is one of the largest protected expanses of pristine lowland forest in South East Asia and supports a diverse fauna containing many endemic Bornean species, making it an ideal study site for tropical biodiversity research. The field station has a long history of research and is host to many training courses each year.

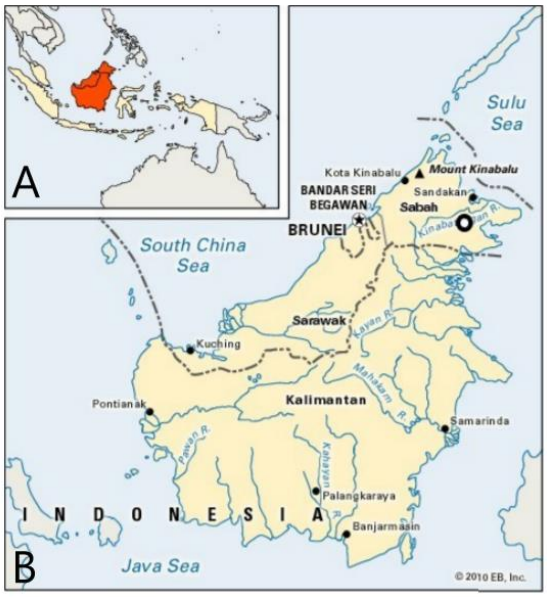

Fig. 1. Map displaying (a) the location of Borneo within South East Asia, (b) the location of the Danum Valley Field Centre (○) within Borneo (edited image from: https://www.britannica.com/place/Borneo-island-Pacific-Ocean, accessed 2018-11-14). I was unable to find a topographic site map of the Danum Valley Conservation Area.

Field training

The field exercises taught during the TBA course provided me with a wide range of skills and tools for answering my own research questions. I was trained in both project planning and data collection through a series of mini projects which aimed to introduce the students to different field techniques and topics within tropical biology (Table 1, Table 2). For example, I measured primary productivity within small to medium-sized streams, estimated forest carbon content using simple DBH and height measurements and was constantly encouraged to develop research questions and hypotheses based on simple observations in the field. I also gained experience of handling birds, bats, snails and frogs under the supervision of experienced teachers.

Table 1. Timetable during a typical day at the TBA field course in Borneo 2018.

Time (hrs)	**Activity**
07.00 - 08.00	Breakfast.
08.00 - 12.00	Morning lecture introducing today's exercises, followed by 3-4 hrs data collection in the field.
12.00 - 13.00	Lunch.
13.00 - 17.00	Completing this morning's data collection or starting a new field project. Data entry.
17.00 - 18.30	Evening lecture/seminar followed by night time frog surveys (approx. 18.00 - 22.00) by a subgroup of the class.
19.00 -	Dinner, followed by free time or data entry and analysis.

Seminars & insights

The continuous field work during the course was interspersed with seminars and talks by both resident and visiting lecturers (Table 1, Table 2). Students were also trained in communicating findings and opinions to the rest of the class and prepared a short

presentation about conservation issues and successes in their respective home countries. Together, the students and lecturers represented a diversity of professions and research topics within biological conservation. In addition to enhancing my understanding of conservation efforts around the world, our discussions therefore provided me with both inspiration for my future career and contacts within many fields of ecological research.

Group project
During the last two weeks of the course, each student designed and carried out a field study within the Danum Valley Conservation Area together with one or more colleagues (Table 2). Together with two other students, I investigated the home ranges and microhabitat preferences of the Fanged Frog (*Limonectes kuhlii*) using radio tracking. Despite high Bornean amphibian declines (IUCN Red List, 2018) and a need for information about their spatial distributions to develop appropriate conservation strategies, only two previous studies have attempted to assess frog habitat ranges within Borneo (Grafe et al., 2011; Sheridan et. al, 2018) and neither recorded their movements between night and day. Under the supervision of Dr. Jennifer Sheridan, we attached radio transmitters to 15 frogs and attempted to localise each individual once daily during either morning (09.00 – 15.00 h) or evening (18.30 – 23.00 h) for 5 – 9 days. When detected, we recorded their GPS coordinates, substrate use and distance to their closest water body.

We analysed the spatial information on frog distributions using QGIS 2.18 (QGIS Development Team, 2018) and found that the habitat range of an individual frog ranged between 24.08 m^2 and 79.71 m^2. This is smaller than previous estimates in tropical Ranids and may imply that the area needed to preserve this species' natural behaviour is smaller than expected. Considering our short study period, however, behavioural restrictions during the initial period after radio transmitter attachment may confound our results. Besides, frogs tend to make longer journeys in rare bouts which can only be fully understood through a long-term study.

We tested the impact of time of day on frog microhabitat preferences using generalised linear models in RStudio (RStudio Team, 2015) and found that frogs were more likely to burrow or submerge themselves in water during the day. This apparent variation in microhabitat preferences may be caused by desiccation and/or predator avoidance during daylight hours when temperatures and frog conspicuousness is higher. A frog's distance from their closest water body was however unaffected by the time of day, implying that their distance from a stream is independent of their microhabitat preferences.

Itinerary

Table 2. Schedule for the 2018 TBA field course in Borneo.

Date	**Main activities**
Sept 29th – 30th	Travel to Kota Kinabalu, Sabah.
Oct 1st	Introduction: meeting fellow participants and course staff.
Oct 2nd	Internal travel to the Danum Valley Field Centre.
Oct 3rd	Orientation walks: tours and talks about the field site and health and safety.
Oct 4th - 6th	Half-day workshops during both morning and afternoon followed by evening seminars, all taught by core teachers Dr. Jennifer A. Sheridan, Dr. Christopher Philipson and Dr. Mike Booth. Field exercise and talk on terrestrial snail conservation by guest lecturer Dr. Thor Seng Liew.

Oct 7th	Asking scientific questions: mini group projects aiming to train the students in project planning and presentation.
Oct 8th - 9th	Measuring aquatic primary productivity and forest carbon content: two mini projects, each carried out by one half of the class. Evening seminar by Henry Barlow, representing New Britain Palm Oil Limited.
Oct 10th	Project presentations. Familiarising with data analysis and the R software. Evening talk by Isham Azhar on bat conservation.
Oct 11th -12th	Accounting for buttress roots in forest carbon measurement: a mini project planned and analysed by the students. Night time bat surveys led by Isham Azhar.
Oct 13th	Excursion to the Sabah Biodiversity Experiment, including a talk and tour by resident researcher Dr. Michael O'Brien.
Oct 14th - 15th	Trip to Sepilok. Visit to the Borneo Sunbear Conservation Centre, including a talk and tour by CEO Dr. Wong Siew Te, and to the Rainforest Discovery Centre.
Oct 16th -17th	Project planning and pilot studies.
Oct 18th - 24th	Project field work: investigating the home range and microhabitat use of the Fanged Frog (*L. kuhlii*) by radio tracking.
Oct 25th - 26th	Data analysis and project write-up.
Oct 27th	Project presentations and feedback.
Oct 28th	Internal travel to Kota Kinabalu.
Oct 29th - Nov 9th	Rest. Independent travel to Singapore.
Nov 10th	Travel to Edinburgh, Scotland.

Expenditure

My expedition costed £1,663 (Table 3) of which £1,600 was kindly provided by the Davis Expedition Fund.

Table 3. TBA field course 2018 detailed cost. Permanent equipment provided by the applicant and living expenses outside the field course period are not included.

Item	**Description**	**Total (£)**
Flight tickets Edinburgh - Kota Kinabalu & Singapore - Edinburgh		657
Course fee	Teaching, accommodation, food and internal travel Oct 1st – 28th.	900
Malaria prophylactics		106
Travel insurance		-
Vaccinations		-
Total		1,663

References

Grafe, T. U. (2011). Beyond taxonomy: radiotelemetry of the giant river frog Limnonectes leporinus in the Ulu Temburong National Park, Brunei Darussalam*. Biology and conservation of tropical Asian amphibians. Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak, Kota Samarahan*. 50-60.

IUCN Red List (2018). http://www.iucnredlist.org. [Accessed: 21st September 2018]

Myers, N., Mittermeier, R. A., Mittermeier, C. G., Da Fonseca, G. A., & Kent, J. (2000). Biodiversity hotspots for conservation priorities. Nature, 403(6772), 853.

QGIS Development Team (YEAR). QGIS Geographic Information System. Open Source Geospatial Foundation Project. http://qgis.osgeo.org [Accessed: 1st October 2018]

RStudio Team (2015). RStudio: Integrated Development for R. RStudio, Inc., Boston, MA. Available at: http://www.rstudio.com/. [Accessed: 20th September 2017]

Sheridan, J, A., Rakotopare, N. and Mebberson, R. (2017). Preliminary estimation of home Preliminary estimation of home range size for Meristogenys orphnocnemis, a common Bornean Ranid, in an altered forest ecosystem using radiotelemetry. *Raffles Bulletin of Zoology*. 65: 539–544.

Wilson, E., Peter, F., National Academy of Sciences, & Smithsonian Institution. (1988). Biodiversity. Washington, D.C.: National Academy Press.