DST-NRF Centre of Excellence for Invasion Biology

DST/NRF Centre of Excellence
at the
Percy FitzPatrick Institute

The 2nd Biodiversity Conservation Academy, 21-25 January 2008

The 2nd Biodiversity and Conservation Academy, a joint venture between the DST/NRF Centres of Excellence in Invasion Biology (CIB) and Birds as Keys to Biodiversity Conservation at the Percy FitzPatrick Institute, was held at the Potberg Environmental Education Centre of De Hoop Nature Reserve on 21-25 January 2008.

The Academy was attended by 14 students selected through a competitive application process open to undergraduate students (2nd-4th year of B.Sc.) from all South African universities. They joined eight staff, postdocs and postgrads of the two Centres, including the directors, Profs Steven Chown and Phil Hockey. Ten of the students were from historically disadvantaged backgrounds. The 5-day programme of the Academy immersed students in an intensive series of theoretical, practical and philosophical discussion and field-work sessions on biodiversity conservation. The aim was to improve student appreciation for the complexity of biodiversity, sharpen their understanding of the skills required to assess it, and broaden their knowledge of the theory and practice of conservation in a South African context.

There were no formal lectures. Instead, after a brief introduction to a topic, Academy staff led an informal discussion, guiding the discussion with questions, and actively encouraging questions and answers from all participating students. Students were frequently split into three groups to work on specific problems, questions and field work activities. They subsequently convened again for a general report-back and further discussion. Students were also given a number of pertinent readings to help guide their thinking. Evenings were spent relaxing and chatting around a circular campfire seating area.

Day 1 - Monday

After travelling through from Cape Town and Stellenbosch, the programme kicked off mid-morning with a session on getting to know the various levels of biodiversity, from genes to ecosystems, to tackle the question "What is Biodiversity?". An introductory session on the factors that determine bird community diversity, structure and migration tendency then followed, to serve as a background for the early-morning bird surveys. The final session of the day focussed on approaches to measuring biodiversity, with the students prompted to think critically about the influence of scale and experimental design in measuring biodiversity. This set the foundation for the main activities of the second day.

Day 2 - Tuesday

Introduced to the field routine that was followed for the rest of the week, groups departed at 5:30am to conduct an hour-long survey of bird diversity and abundance in each of three habitats that differed in vegetation structural diversity.

After breakfast, students debated and finally settled on an appropriate experimental design for measuring the effects of alien plant invasion on plant diversity and evenness in such a way that it could also examine the influence of spatial scale of sampling on the measures of biodiversity. After a brief lunch, groups gathered together the equipment they thought they might need, before travelling into the field for the rest of the day to conduct their vegetation surveys. This involved identifying and counting all plants within a standardised series of sampling plots.

Day 3 – Wednesday

After the morning bird survey and a hearty breakfast, groups got together to work up their vegetation survey data in spreadsheets and summary graphics to address the various questions they had posed at the outset.

Towards the end of the day, each group presented their results to the Academy in a report-back session. A final discussion focussed on the lessons learned from the 2-day exercise. The day finished with a late afternoon excursion to limestone fynbos, to view the dramatic species turn-over between adjoining mountain and limestone fynbos types.

Day 4 – Thursday

After completing the last bird survey, staff and students convened to identify the questions to be addressed with the bird survey data. Groups then split up to work up their data independently in Excel spreadsheets and graphs. After an early lunch, we took a break to visit the coast in the early afternoon, to examine rocky-shore biodiversity and how best to survey it, and enjoy a refreshing swim. On our return, student groups outlined the key findings of their bird surveys as brief Powerpoint presentations.

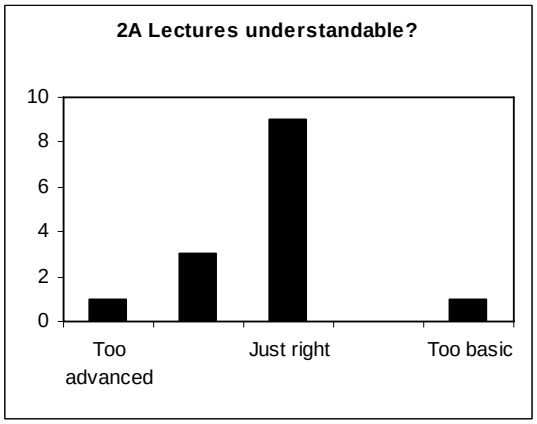
Day 5 – Friday

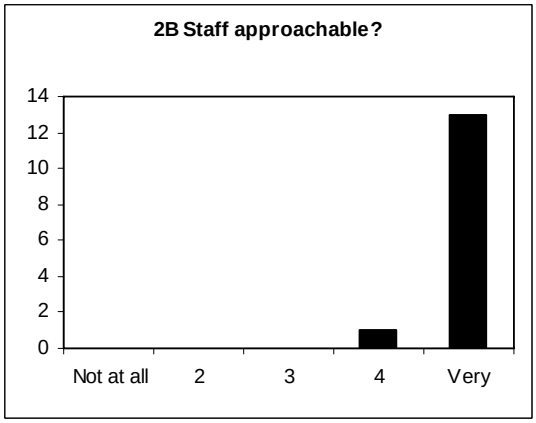
The last day of the Academy saw another early start, as we opened lines of mist-nets soon after 5am to capture birds around the education centre. This gave students hands-on experience with handling birds, as they learned to remove the birds from the nets, to measure and ring, and to take a blood sample before release.

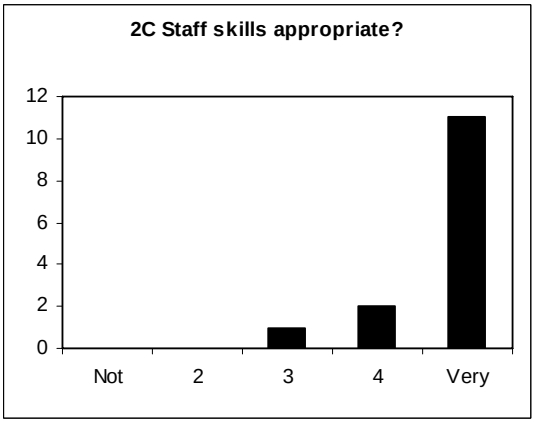
After a break for breakfast and reading time, we reconvened for a lively, student-led debate on whether Pleistocene re-wilding, the restoration of ecosystems outside Africa with African megafauna, posed a threat to African conservation. After another excellent lunch rustled up by CIB support staff, we bade farewell to new friends and a thoroughly stimulating teaching environment to journey back to our normal work and study routines.

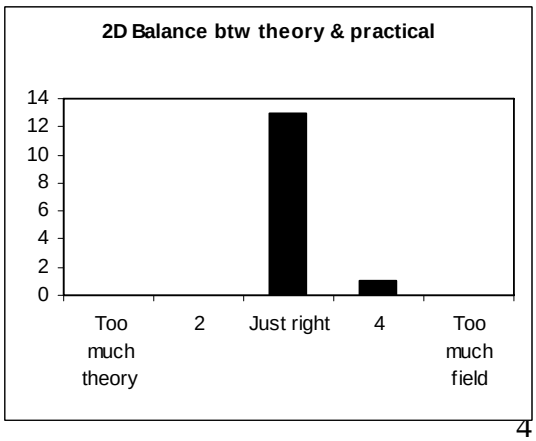
Student evaluation of the course

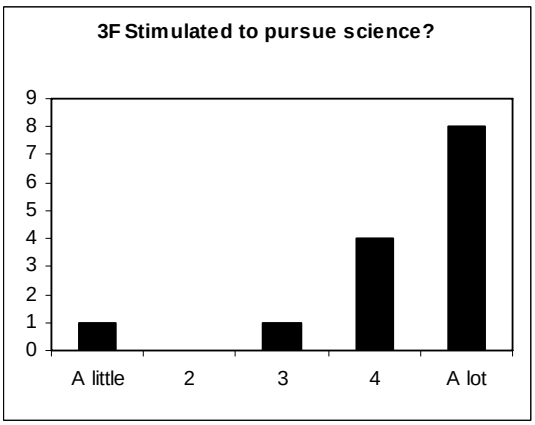
Before departure on the last day, all 14 student participants were asked to evaluate their experience of the Academy. The responses were overwhelmingly positive (see graphed responses to coded questions below). Students particularly enjoyed getting out into the field and interacting with a diverse group of peers. They also found their extensive interactions with Academy scientists especially stimulating.











Appendix 1: Biodiversity and Conservation Academy Student Participant Details

	First name	Surname	G/R	University
Ms.	Melissa	Boonzaaier	BF	U. Stellenbosch
Ms.	Sindiso	Chamane	BF	UKZN
Ms.	Cherie	Forbes	BF	UCT
Ms.	Anza	Mboyi	BF	U. Venda
Ms.	Nonkululeko	Mkhize	BF	UKZN
Ms.	Chimone	Scott	BF	U. Pretoria
Mr.	Seth	Hakazimana	BM	UKZN
Mr.	Sergio	Julane	BM	Eduardo Mondlane, Maputo
Mr.	Tlou Samuel	Mahesela	BM	U. Limpopo
Mr.	Tshilidzi	Muofhe	BM	U. Stellenbosch
Ms.	Kerry	Reid	WF	U. Pretoria
Mr.	Adam	Bannister	WM	U. Stellenbosch
Mr.	Dominic	Henry	WM	UCT
Mr.	James	Robey	WM	UCT

Appendix 2: Biodiversity and Conservation Academy Programme

Introduction

Welcome to the Biodiversity and Conservation Academy. You have been selected to join the Academy for an intensive series of theoretical, practical and philosophical sessions on biodiversity and conservation. The major aim of these sessions is to improve your appreciation for the complexity of biodiversity, your scientific knowledge and skills required to assess it, and your knowledge of the theory and practice of conservation in a South African context.

Modern science can be done in several ways, but all of them require careful thought by individuals, clear communication between them, and a willingness to participate, at least occasionally, in team-based research. Modern conservation biology and biodiversity science are no exceptions. In consequence, we will be expecting you to undertake work in groups, discuss matters based on your own, informed views, influence group decision-making by clear and quiet argument, and present your views or those of your group to the Academy as a whole.

The Academy does not operate in the same, formal way as a University. You will be expected to deliver excellent quality work and to be diligent about the tasks you have. However, you will have virtually round-the-clock guidance and mentoring and on-going interactions with a unique group of skilled scientists. In addition, you will have the opportunity to raise questions about any aspects of biology and conservation in South Africa and elsewhere in the informal setting. What you gain from the Academy will depend as much on how you make use of this unique opportunity as it will on the theoretical and practical work you will be doing.

An important point that we must make from the beginning is that this course is not about hands-on conservation management. That is, we are not going to teach you how to mend fences, capture game for auction, or clear an area for a tourist camp. Rather, this course is about the science of biodiversity and the science that underpins sound conservation management. Therefore, the emphasis is on the science and how that science can inform conservation planning and implementation. It is this scientific understanding that is in such short supply in South Africa. The Centres of Excellence Programme is about improving the pool of skilled scientists in South Africa, and of the seven Centres of Excellence that have been established and funded by the Department of Science and Technology, with management help from the National Research Foundation, four are concerned with biodiversity and the scientific basis for its management. This Academy is a joint venture between two of them: the Centre of Excellence in Birds as Keys to Biodiversity Conservation (University of Cape Town), and the Centre of Excellence for Invasion Biology (Stellenbosch University).

Academy Staff

Steven Chown works in the fields of macroecology, community ecology, biogeography, conservation ecology, evolutionary physiology, invasion biology and global change biology. Much of his work has been on insects and plants on Southern Ocean Islands and in South Africa, but he has also worked on marine and terrestrial vertebrates, and at global scales.

Susana Clusella-Trullas's research focuses on how animals cope with their environment and its variation. For example temperature, gas content and humidity can affect importantly physiological responses of organisms and ultimately their fitness. Susana's has tackled such questions while studying a variety of organisms from diverse environments: marine turtles, tortoises, lizards and invertebrates.

Mirijam Gaertner is interested in vegetation ecology and restoration. Her current research focuses on restoration of fynbos ecosystems after alien invasion and on restoration of old fields. Her work aims to develop predictions of which plant invaders are likely to influence nutrient dynamics and to devise effective techniques to minimize the influence of invasive aliens on restored ecosystems.

Phil Hockey works in the fields of general ornithology, coastal and estuarine bird ecology, bird migration, life history evolution, and conservation biology. Much of his work has focused on coastal waders and their interactions with food supplies at scales from the local to the global. He also runs the highly successful Oystercatcher Conservation Programme.

Penn Lloyd is the Manager of the DST/NRF Centre of Excellence at the Percy FitzPatrick Institute. He works in the fields of evolutionary ecology, population biology, and conservation biology. His work focuses on how the environment and interactions with other species influence phenotypic variation at both the proximate (within species) and evolutionary (between species) levels, and how the influence of environment on demography can be applied to issues in conservation biology.

Mawethu Nyakatya is a Research Management Intern for the C·I·B and has a Master of Science in sub-Antarctic ecology. He provides assistance with management of the CIB business from field sampling to reporting and funding.

Ethel Phiri is currently completing her MSc in Botany. The focus of her thesis is the macroecological patterns of plants and the invasion biology (plants and mice) of sub-Antarctic Marion Island.

Justine Shaw works on plant ecology and conservation. She has studied plants across a range of ecosystems, from tree climbing in sub tropical rainforests, to temperate forests of southern Australia, to arctic tundra of Alaska and sub Antarctic islands. Justine has worked as a field researcher, lecturer and conservation officer. She now works at the CIB as a post doctoral fellow researching how aliens and native species function in the sub Antarctic.

Academy Session Layout

Day 1

10:30: Arrive at Potberg Education Centre (breakfast on the road); settle in to accommodation; tea/coffee will be available

11:30: Short discussion of house rules and expectations (30 minutes)

Session 1

A. Getting to know biodiversity

12:00: Concepts

1. Biodiversity – a biology of numbers and difference.
2. The genealogical (information) and ecological (energy) hierarchies.
3. Surrogacy and complementarity.
4. Threats to biodiversity.

13:00 -14:00: Lunch break (1 hour)

14:00: Questions

1. What levels to focus on and why?
2. What is an individual, a population, a species, and a family?
3. Make a list of 10 species in the immediate (c. 250 m radius) vicinity of the Centre.

15:00: Report-back

Each group to select one rapporteur for each of the questions. Five minutes initial report-back each and then open discussion.

16:00: Tea/coffee break for 30 minutes

16:30: Introduction to bird diversity and community structure

Session 2

B. Getting the measure of biodiversity

17:30: Concepts

1. Thinking about scale in ecology and conservation biology.
2. What you do determines what you get – scale again.
3. Pilot studies, sampling and replication.
4. Quantifying biodiversity – pitfalls and procedures.

18:00: Questions

1. Design a sampling programme to asses the influence of alien vegetation on plant diversity at several scales at Potberg.

To answer this question the groups will drive out to view the sampling areas that will be used.

19:00: Dinner break

20:00: Backgrounds and interests – an informal discussion

Day 2

Session 1

D. Bird diversity and community structure field trip 1

05:30 – 08:00: 1-hour sampling of bird diversity in three habitats in the western section

08:00: Breakfast (1 hour)

Session 2

E. Measuring diversity

09:00: In conjunction with academy staff, reach a final design for the alien vegetation programme. Make sure that data sheets have been finalized.

12:00: Lunch break (1 hour)

13:00: Collect and curate the data according to final design (snacks in the field)

17:30: Return to Centre; break / completion of data curation

19:00: Dinner break (1 hour)

Session 3

F. Invasive alien plants, climate change and conservation

20:00: Informal discussion

Day 3

Session 1

G. Bird diversity and community structure field trip 2

05:30 – 08:00: 1-hour sampling of bird diversity in three habitats in the western section

08:00: Breakfast (1 hour)

Session 2

H. Quantifying diversity and difference

09h00: Continue field sampling if this is not complete.

11:00: Data analysis and questions (coffee and tea available)

1. List the species for each habitat by families.
2. Produce accumulation curves for each habitat.
3. Compare the diversity of the habitats.
4. What effect does scale have?
5. What were the problems?

13:00: Lunch break (1 hour)

Session 3

14:00: Report-back

Each group to select one rapporteur for each question. Five minutes per rapporteur and then general discussion

I. Field-discussion on Limestone Fynbos
16:00: Depart for limestone site (snacks in field)
1. How close did we get to estimating biodiversity?
2. Structure, function and identity – where to start?
3. What are impacts of the alien plants on other species?
4. What other aspects of biodiversity quantification exist?
5. What would you do to census birds in the same environments?

18:00: Return to Centre

19:00: Dinner break (1 hour)

Session 4
J. Conservation in South Africa: Science, policy and opportunities
20:00: Informal discussion

Day 4

Session 1
K. Bird diversity and community structure field trip 3
05:30 – 08:00: 1-hour sampling of bird diversity in three habitats in the western section

08:00: Breakfast (1 hour)

Session 2
L. Analysis and discussion of the bird/habitat data with respect to the following broad questions (09:00-13:00):
1. Do bird communities differ between habitats, and if so how?
2. Is bird diversity linked to floristic or structural habitat diversity?
3. Do migrant and resident birds differ ecologically, and if so how (and why)?

13:00: Lunch break (1 hour)

Session 3
14:00: Continuation of bird diversity discussion. Thereafter, informal discussion - students choose a topic and lead the discussion.

19:00: Dinner

Day 5

Session 1
06:00: Mist-netting and ringing of birds.

08:00 Breakfast (1 hour)

Session 2
09:00: **Pleistocene re-wilding: Is re-wilding sound conservation? Is the restoration of ecosystems outside Africa with African megafauna a threat to African conservation?**

Students split into two groups, one supporting Pleistocene re-wilding and the other opposing, to debate these issues.

12:00: Early lunch

13:00: Pack and depart for Stellenbosch/Cape Town

Further Reading Provided

Primary Literature

Chown, S.L., Sinclair, B.J., Leinaas, H.P. & Gaston, K.J. 2004. Hemispheric asymmetries in biodiversity – a serious matter for ecology. *PLoS Biology* 2, e406, 1701-1707.

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Gewin, V. 2005. Eco-defense against invasions. *PLoS Biology* 3, 2055-2071.

Gotelli, J.N. & Colwell, R.K. 2001. Quantifying biodiversity: procedures and pitfalls in the measurement and comparison of species richness. *Ecology Letters* 4, 379 - 391.

Hockey, P.A.R. 2000. Patterns and correlates of bird migrations in sub-Saharan Africa. *Emu* 100, 401-417.

Hockey, P.A.R. 2005. Predicting migratory behaviour in landbirds. Pp 53-62 in: Greenberg, R. & Marra, P. (Eds). Birds of Two Worlds: the Ecology and Evolution of Migration. John Hopkins University Press, Baltimore.

Naeem, S. & Wright, J.P. 2003. Disentangling biodiversity effects on ecosystem functioning: deriving solutions to a seemingly insurmountable problem. *Ecology Letters* 6, 567-579.

Palmer, T.M. et al. 2008. Breakdown of an ant-plant mutualism follows the loss of large herbivores from an African savanna. *Science* 319, 192-195.

Purvis, A. & Hector, A. 2000. Getting the measures of biodiversity. *Nature* 405, 212-219.

Rubenstein, D.R. et al. 2006. Pleistocene Park: Does re-wilding North America represent sound conservation for the 21st century? *Biological Conservation* 132, 232-238.

Zimov, S.A., 2005. Pleistocene park: return of the mammoth's ecosystem. *Science* 308, 796–798.

Popular Literature

Hockey, P.A.R. 2002. Incredible journeys: unravelling the mysteries of bird migration. *Africa Birds and Birding* 7(4), 32-39.

Hockey, P.A.R. 2002. Incredible journeys: making the trip. *Africa Birds and Birding* 7(5), 62-69.

Hockey, P.A.R. 2002. Incredible journeys: navigation and the migratory blueprint. *Africa Birds and Birding* 7(6), 46-51.