

2011 Centres of Excellence Biodiversity Conservation Academy 17 - 21 January

Overview

The Centres of Excellence for Birds as Keys to Biodiversity (University of Cape Town) and Invasion Biology (Stellenbosch University) together held the 5th in its series of Biodiversity Conservation Academies that have as their main aim redress of the poor representation of previously disadvantaged persons in the South African conservation and natural science sectors and in higher education institutions. The Academy is directed at undergraduate life science students, especially those from previously disadvantaged backgrounds, with the aim of broadening their understanding and appreciation of biodiversity and conservation issues and encouraging them to pursue their studies beyond the undergraduate level. The Academy was held first in January 2006, and has been held annually since 2008 at the De Hoop Nature Reserve in the Western Cape.



Some of the participants in the 5th Biodiversity Conservation Academy, De Hoop Nature Reserve, January 2011.

Participants

The Academy attracted participants from across the country. Ten students from seven universities and three interns from the South African National Biodiversity Institute and SANParks participated in the programme (Table 1). Students interacted with two Directors and five other staff from the Centres. All the students and interns were from previously disadvantaged backgrounds and 70% were women.

Table 1. Participants in the 2011 Biodiversity Conservation Academy

Title	First name	Surname	Race/Gender	Institution	Level
Title	Name	Surname		Affiliation	Level
Ms.	Zoleka	Filander	BF	WSU	BSc 3 rd year
Ms.	Ayanda	Khumalo	BF	UKZN	BSc 3 rd year
Ms.	Faatima	Laher	BF	UKZN	BSc 2 nd year
Mr.	Mashudu	Mashau	BM	UniVen	Honours
Ms.	Zimasi	Mei	BF	Rhodes	BSc 2 nd year
Mr.	Serero Abiot	Modise	BM	UFS	BSc 3 rd year
Mr.	Moleseng Claude	Moshobane	BM	U. Limpopo	BSc Honours
Ms.	Apelele	Nkonki	BF	Rhodes	BSc 2 nd year
Ms.	Nerissa	Pillay	BF	UKZN	BSc 3 rd year
Ms.	Sivuyisiwe	Situngu	BF	Rhodes	BSc 2 nd year
Ms.	Dewidine	Van de Colff	BF	SU	BSc 3 rd year
Ms.	Nashreen	Williams	BF	SANParks/CREW	Junior Plant Ecologist
Ms.	Lameez	Eksteen	BF	SANBI	Intern
Mr.	Curswan	Andrews	BM	SANBI	Intern

Academy Content

The theoretical content of the Academy covered several aspects of biodiversity estimation and commenced with surveying of biodiversity and the statistical methods required to verify that surveys are adequate. Particular attention was also paid to the impacts of spatial scale on assessing abundance and occupancy and the relationships among them. Students were expected to use the theoretical work in these sections to design field surveys and to identify problematic areas in such surveys. These included taxon identification, estimation of a realistic sample unit size, and techniques to test theoretical concepts using the field surveys. The second theoretical section included the assessment of bird populations and the relationships between population viability and the numbers of breeding pairs versus birds not holding territories. African Black Oystercatchers *Haematopus moquini* were used as the exemplar taxon, and long-term data collection methods were discussed. The latter was supplemented by a talk on bird atlassing and the value of good curation of data and long-term data sets. This talk meshed nicely with a second session on the environmental change drivers that are influencing southern African systems and the extent of change being wrought to biodiversity.

The practical field work took two forms. The first part of the field work concerned biodiversity assessment to understand the impacts of invasive alien species on plant richness and abundance and to understand scaling effects on abundance-occupancy relationships. The second part concerned estimation of bird population parameters (numbers, numbers of chicks, food resources) in oystercatchers. In addition, students were shown the basics of bird ringing and morphometric measurement and were also introduced to aspects of invertebrate sampling.

In the evenings, ample opportunity was provided to students to enquire about the conservation science system in South Africa, career choices and the requirements for becoming a successful researcher both locally and abroad.

Detailed Programme

Day 1 – Monday

After travelling from Cape Town and Stellenbosch, the programme started mid-morning with a session on getting to know the various levels of biodiversity, to tackle the question “What is Biodiversity”. An introductory session on issues surrounding the conservation of long-lived, K-selected species followed. The final session of the day focused on approaches to measuring biodiversity, with the students prompted to think critically about the influence of scale and experimental design on measuring biodiversity. These sessions laid a foundation for the main activities of the next two days.

Day 2 – Tuesday

After breakfast, half the students (Group A) departed for the oystercatcher field surveys. These activities included a) a survey of the breeding and non-breeding oystercatcher population in De Hoop Nature Reserve (for comparison with historical data going back to 1980); b) collection of mussels from the shore and the driftline (to assess the extent of invasion by the alien species *Mytilus galloprovincialis*); and c) collection of chick feeding middens (shells that accumulate where adults feed their chicks) – these could also be compared with historical diet. Students were also exposed to the art of locating and capturing oystercatcher chicks, which were subsequently measured, ringed and bled for genetic analyses.



Bird ringing and sampling in the early hours.

The other half of the group (Group B) discussed and settled on an appropriate sampling design for measuring the influence of alien vegetation on plant diversity at several spatial scales in Potberg. In particular, attention was given to complete sampling (rarefaction and accumulation curves), the need to ensure that the experimental design and statistics are appropriate for the question being posed, and the way in which compromises must be sought in biodiversity surveys between the goals of and resources available for a given project. After a short lunch, the group gathered the required equipment and went to 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. The evening was spent identifying samples from the plant surveys and entering data into a computer spreadsheet.



Field experiments on invasion ecology

Day 3 – Wednesday

On this day the two groups switched roles. In the late afternoon, back at the centre, lines of mist-nets, which had been set up to capture birds around the education centre, were opened. Students were given hands-on experience of handling birds, as they learned how to remove the birds from the nets, measure and ring the birds, record their moult status and take a blood sample before release. The evening was again spent processing samples and entering data from the plant surveys. The students were also given a talk on environmental change in southern Africa.

Day 4 – Thursday

After completion of the field sampling by both groups, staff and students convened to discuss lessons learnt from the two-day field exercises and to identify questions to be addressed with the data. The groups then split up to analyse their data independently using Excel spreadsheets and graphs, and to prepare Powerpoint presentations. After an early lunch, the students and staff visited the limestone fynbos to view and discuss the dramatic species turnover between the adjoining mountain fynbos and limestone fynbos areas. The trip was cut short by a rainstorm that departed almost as quickly as it arrived. On return to the centre, the students continued working on their presentations and the rest of the evening was spent relaxing around the camp fire.

Day 5 – Friday

The last day of the Academy started with early morning bird ringing and final preparations for the Powerpoint presentations. A pause was made for breakfast and thereafter everyone reconvened for lively student presentations of the key findings of the bird and vegetation surveys. Students were also provided with a detailed explanation of and practise in bird atlassing. The South African Bird Atlas Project II (SABAP II) is currently underway and the students were provided with background knowledge of the project and shown how atlassing is undertaken.

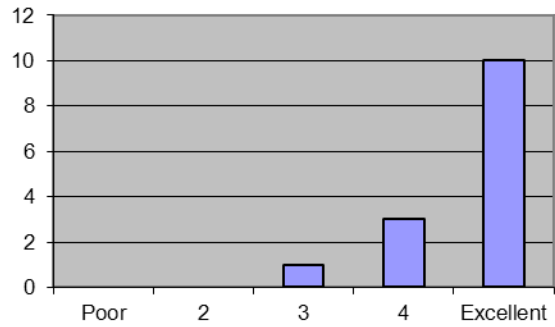
Participant Evaluations

Before departure on the last day, the students were provided with an opportunity to evaluate and comment on the structure, content and running of the Academy and to suggest improvements where necessary. The response was overwhelmingly positive to both the structure and the content of the course. The students enjoyed learning about project planning, design, and reporting/presentation skills, but most important they felt motivated to pursue science further as a field of study or career.

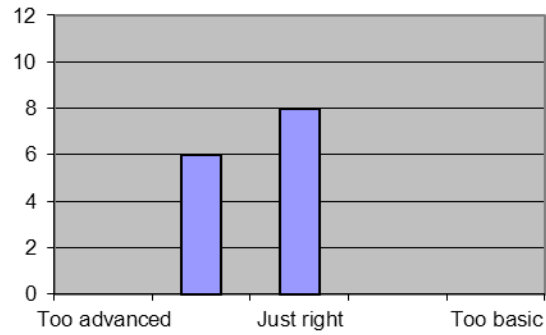


A classroom session in which the participants presented the results of their field studies (left); plant identification with the aid of field guides and local plant collections (right).

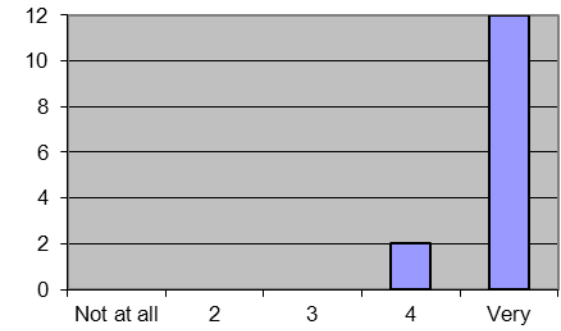
1A Quality of organisation



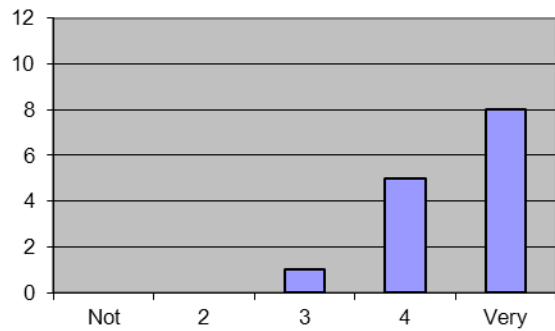
2A Lectures understandable?



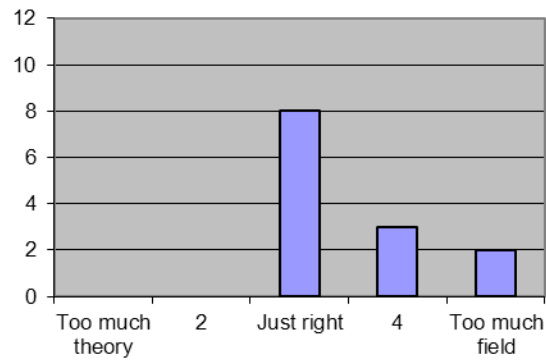
2B Staff approachable?



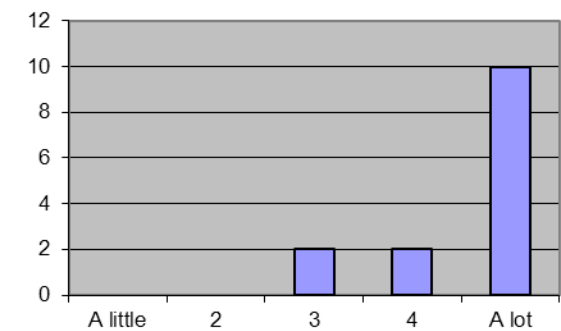
2C Staff skills appropriate?



2D Balance btw theory & practical



3F Stimulated to pursue science?



Appendix 1: Methods used to recruit students

Applications received for the Academy, as well as short essays, were used to assess the applicants. The evaluation panel consisted of Dr. Rob Little (Fitz CoE), Dr. Cang Hui (C•I•B), DR, Jaco Le Roux (C•I•B) and Ms. Sarah Davies (C•I•B), with oversight from the Directors of both Centres. In all, 28 applications were received, and 14 accepted.

The advertisement below was circulated to all life science departments in South Africa and to the team members of both CoEs.

Biodiversity Conservation Academy 17-21 January 2011

The Biodiversity Conservation Academy is a joint venture between the Centre of Excellence at the Percy FitzPatrick Institute at the University of Cape Town and the Centre of Excellence for Invasion Biology at the University of Stellenbosch. Each year it gives talented undergraduate students the opportunity to learn more about research and career opportunities in biodiversity conservation and to experience the dynamic postgraduate research and teaching environments at our Centres of Excellence.

We invite undergraduate students who are currently completing their second or third year Bachelor of Science studies to participate in the 2011 Biodiversity Conservation Academy, which will be held from 17 to 21 January 2011 at the Potberg Environmental Education Centre in the Western Cape. The Academy will include five days of coursework with a strong fieldwork component, jointly presented by the staff of the two Centres. The course will focus on linking biological theory with practical application, with a particular reference to designing and conducting biodiversity research projects. Topics to be covered include the philosophy of science, understanding and applying the scientific method, how to set about identifying a research question, developing a set of hypotheses and designing an experimental approach to test the hypotheses. A report on the 2010 Academy can be found at the web addresses: <http://www.fitzpatrick.uct.ac.za/pdf/bioacad10.pdf> and http://www.sun.ac.za/cib/events/Academy_report_2010.pdf.

Up to fifteen students will be selected to attend the Academy. The Academy will cover transport costs between Cape Town and the field site as well as accommodation costs and transport costs between your home town and Cape Town if you are unable to finance your own transport to Cape Town.

To apply, please send a one-page covering letter explaining why you would like to attend the Academy, your CV including personal details, a certified copy of your academic record and a short essay (max 2 pages) on a topic relevant to biological conservation. Send your application to either of the contact people below. Please also include your home contact details (telephone number or regularly checked email address) so that you can be contacted during December. **Applications close on 23 September 2010.**

Contact persons:

Ms Sarah Davies DST-NRF Centre of Excellence for Invasion Biology University of Stellenbosch Private Bag X1 Matieland 7602 E-mail: sdavies@sun.ac.za Tel: 021 808-3922	Mrs Tania Jansen DST-NRF Centre of Excellence at the Percy FitzPatrick Institute University of Cape Town Private Bag X3 Rondebosch 7701 E-mail: Tania.Jansen@uct.ac.za Tel: 021 650-2896
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The Centres reserve the right not to hold the Academy in 2011 if an insufficient number of suitable applications are received.

Appendix 2: Biodiversity and Conservation Academy Programme



BIODIVERSITY CONSERVATION ACADEMY

Potberg Environmental Education Centre

17 – 21 January 2011

Participant:

The Centres of Excellence Biodiversity Conservation Academy is a joint venture between:

Centre of Excellence for Invasion Biology
Stellenbosch University
Private Bag X1
Matieland, 7602
www.sun.ac.za/cib

Centre of Excellence at the Percy FitzPatrick
Institute
University of Cape Town
Rondebosch, 7701
<http://www.fitzpatrick.uct.ac.za/coe/index.html>

Contact: 021 808 2832 Contact: 021 650 3290/1

Biodiversity and Conservation Academy

2011

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 practise 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 perform. 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. 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 eight 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.

Phil Hockey works in the fields of general ornithology, bird migration, life-history evolution, global change biology and conservation biology. Much of his work has focused on coastal shorebirds and their interactions with food supplies at scales from the local to the global. He also runs the highly successful Oystercatcher Conservation Programme, developing a conservation strategy for the African Black Oystercatcher and other coastal species.

Peter Ryan works in the fields of avian biology, island conservation and marine pollution. Much of his work has focused on seabird ecology and conservation.

Douglas Loewenthal is a postdoctoral fellow at the CoE at the FitzPatrick Institute. Doug coordinates the Oystercatcher Conservation Programme, and examines how the interaction between life history and the environment influences oystercatcher survival, breeding success and dispersal under differing conditions around the coast of southern Africa.

Mduduzi Ndlovu is a PhD student at the Centre of Excellence at the Percy FitzPatrick Institute. His research project is on the moult and movement ecology of Southern African waterfowl, with a particular emphasis on Egyptian Geese.

Mawethu Nyakatya is coordinator of research partnerships and communication at Stellenbosch University. This job entails the promotion of research as a career opportunity, fostering existing research partnerships and publicizing research outputs as relevant to society and policy formulation.

Suzaan Kritzinger has managed several Working for Water programmes responsible for removal of invasive alien vegetation on private land and in provincial parks and national reserves. She is responsible for the management of field surveys and field work for the C-I-B. Her main area of interest is in fynbos botanical diversity.

Charlene Janion is a Technical Officer and PhD student at the C-I-B. She coordinates the “Soil Biodiversity in the Fynbos” project investigating the molecular diversity, ecology and taxonomy of the Collembola (springtails) in the Fynbos Biome.

Academy Sessions

Day 1, Monday 17th

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

11:30: Assemble in main discussion area for a short discussion of house rules and expectations (30 minutes); division into study groups

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 issues surrounding the conservation of long-lived species: background to the oystercatcher project.

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

Bird ringing nets will also be set up during this period.

19:00: Dinner break

20:00: Backgrounds and interests – an informal discussion.

Day 2, Tuesday 18th

Session 1

C. Avian population dynamics: oystercatcher field trip 1 (50% of students – Group A)

06:00: Breakfast (1 hour)

07:00 – 15:00: Oystercatcher population structure surveys, hopefully including ringing demonstration (packed lunches)

D. Measuring diversity (other 50% - Group B)

07:00 – 08:30: Bird catching, ringing and processing.

08:30 – 13h00: In conjunction with academy staff, design a sampling programme to assess the influence of alien vegetation on plant diversity at several scales at Potberg. To answer this question the group will drive out to view the sampling areas that will be used.

14:00: Lunch break (1 hour)

Session 2

E. Invasive alien plants, climate change and conservation

15:00: Groups to prepare positions for and against non-indigenous species use

17:30: Bird catching, ringing and processing.

19:00: Dinner

Day 3, Wednesday 19th

Session 1

F. Avian population dynamics: oystercatcher field trip 2 (Group B)

06:00: Breakfast (1 hour)

07:00 – 13:00: Oystercatcher chick ringing, and assessment of diet as a function of food availability

G. Measuring diversity (50% of students – Group A)

07:00 – 08:30: Bird catching, ringing and processing.

08:30 – 13h00: In conjunction with academy staff, design a sampling programme to assess the influence of alien vegetation on plant diversity at several scales at Potberg. To answer this question the group will drive out to view the sampling areas that will be used.

13:00: Lunch break (1.5 hour)

Session 2

H. Quantifying diversity and difference (Groups A & B)

14h00: Commence alien plant field sampling.

18h00: Return and start sample processing

19h00: Dinner

Day 4, Thursday 20th

Session 1

I. Quantifying diversity and difference II (Groups A & B)

06:00: Breakfast (1 hour)

07:00 – 08:30: Bird catching, ringing and processing.

08:30: Return to field for sampling if necessary (both groups)

Or continue identifications

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 2

14:00: Report-back

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

Session 3

J. 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. How would you census birds in the same environments?

18:00: Return to Centre

19:00: Dinner break (1 hour)

Session 4

K. Conservation in South Africa: Science, policy and opportunities

20:00: Informal discussion

Day 5, Friday 21st

Session 1 Avian population work

06:00: Bird catching, ringing and processing.

07:00: Breakfast (1 hour)

08:00: Analysis and discussion of oystercatcher population dynamics study

11:00: Early lunch

12:00: Pack and depart for Stellenbosch/Cape Town

Further Reading Provided

Primary Literature

Butchart, S.H.M. *et al.* 2010. Global biodiversity: indicators of recent declines. *Science* **328**, 1164-1168.

Chown, S.L. 2010. Temporal biodiversity change in transformed landscapes: a southern African perspective. *Philosophical Transactions of the Royal Society B* **365**, 3729-3742.

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.

Gaston, K. J. 2000. Global patterns in biodiversity. *Nature* **405**, 220-227.

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.

He, F. & Gaston, K.J. 2000. Occupancy-abundance relationships and sampling scales. *Ecography* **23**, 503-511.

Hockey, P.A.R. 1996. *Haematopus ostralegus* in perspective: comparisons with other oystercatchers. pp. 251-285 in: Goss-Custard, J.D. (Ed.). *The Oystercatcher: from Individuals to Populations*. Oxford: Oxford University Press.

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

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