

28. Sugioka Y. and Suzuki M. (1991). The chemical basis for the ferriprotoporphyrin IX-chloroquine complex induced lipid peroxidation. *Biochim. Biophys. Acta* **1074**, 19–24.
29. Hong Y-L, Yang Y-Z and Meshnick S.R. (1994). The interaction of artemesinin with malarial hemozoin. *Molec. Biochem. Parasitol.* **63**, 121–128.
30. Adams P.A. and Berman P.A.M. (in press). Reaction between ferriprotoporphyrin IX and the anti-malarial endoperoxide artesunate gives an intermediate species with enhanced redox catalytic activity. *J. Pharmacy Pharmacol.*
31. Orjih A.U., Banyal H.S., Chevli R. and Fitch C.D. (1981). Hemin lyses malaria parasites. *Science* **214**, 667–669.
32. Fitch C.D., Chevli R., Banyal H.S., Phillips G., Pfaller M.A. and Krogstad D.J. (1982). Lysis of *Plasmodium falciparum* by ferriprotoporphyrin IX complex. *Antimicrob. Agents Chemother.* **21**, 819–822.
33. Chou A.C. and Fitch C.D. (1981). Mechanism of hemolysis induced by ferriprotoporphyrin IX. *J. clin. Invest.* **68**, 672–677.
34. Sugioka Y., Suzuki M. and Nakano M. (1987). A ferriprotoporphyrin IX – chloroquine complex promotes membrane phospholipid peroxidation. A possible mechanism for antimalarial action. *FEBS Lett.* **223**, 251–254.
35. Simplicio J. (1972). Hemin monomers in micellar sodium lauryl sulfate. Spectral and equilibrium study with cyanide. *Biochemistry* **11**, 2525–2528.
36. Smith A.B., Esko J.D. and Hajduk S.L. (1995). Killing of trypanosomes by the human haptoglobin-related protein. *Science* **268**, 284–286.
37. Orjih A.U., Ryerse J.S. and Fitch C.D. (1994). Hemoglobin catabolism and the killing of intra-erythrocytic *Plasmodium falciparum* by chloroquine. *Experientia* **50**, 34–39.
38. Wellem's T.E., Panton L.J., Gluzman I.Y., do Rosario V.E., Gwadz R.W., Walker-Jonah A. and Krogstad D.J. (1990). Chloroquine resistance not linked to mdr-like genes in a *Plasmodium falciparum* cross. *Nature* **345**, 253–255.

## The Avian Demography Unit: tracking bird populations in a changing South Africa

J.A. Harrison, D.G. Allan, L.G. Underhill and T.B. Oatley

*The Avian Demography Unit has extended the scope of its operations with several new projects focused on bird population studies. These projects draw on the expertise and enthusiasm of amateur ornithologists.*

Building on the nucleus of the South African Bird Ringing Unit (SAFRING) and the Southern African Bird Atlas Project (SABAP), the Avian Demography Unit (ADU) was established in the Department of Statistical Sciences, University of Cape Town, in December 1991.<sup>1</sup> The mission of the ADU is to improve our understanding of avian population dynamics, and make a contribution to bird conservation by providing a scientific basis for conservation action. The unit aims to achieve this through mass-participation projects, long-term monitoring, innovative statistical modelling and population-level interpretation of results. The focus of the unit's work is on the collection, curation, analysis, publication and dissemination of data.

The ADU, always closely associated with the Southern African Ornithological Society (SAOS), entered into a formal partnership with that organization during 1993, to foster the development of further ornithological projects.<sup>2</sup> This close association is appropriate because the research of the ADU continues to focus on large-scale demographic studies in which participation by amateurs is a vital element. Mass-participation projects yield quantities of data not available to professional ornithologists working alone. Comparable projects such as the fish tagging programme<sup>3</sup> and the Protea Atlas Project<sup>4</sup> draw on the same human resources. We believe that the spin-off of environmental education for participants is considerable.

*Postgraduate studies.* The ADU is led from a Chair of Avian Demography and is

in a position to supervise postgraduates in studies of avian demography and biostatistical modelling. The unit has a contribution to make to capacity-building in these fields, which are directly related to conservation biology. Presently the unit has one M.Sc. and three Ph.D. students, and welcomes enquiries from graduates in the biological and mathematical sciences.

*Waterbird census.* The Coordinated Waterbird Counts (CWAC) programme was launched in 1992. Its objective is to monitor South Africa's waterbird populations and the condition of the wetlands which are important for waterbirds. This is being done by means of a programme of regular mid-summer and mid-winter censuses at over 100 South African wetlands and estuaries, at regular six-monthly intervals. This project was initiated by the Ramsar Working Group of the Department of Environmental Affairs and Tourism in part-fulfilment of South Africa's commitment to the Ramsar Convention. CWAC also contributes its data to the African Waterfowl Census<sup>5</sup> of the International Wetlands and Waterfowl Bureau (IWRB), based in the United Kingdom. In February this year a workshop was held in Wakkerstroom in the Eastern Transvaal, at which professional conservators from the conservation agencies and dedicated amateurs from the ranks of the SAOS came together to plan the future direction and expansion of the CWAC programme. One of the consequences of this valuable collaboration is a list of priority wetlands which CWAC will aim to survey.

*Bird atlasing.* SABAP<sup>6</sup> is nearing completion with preparation of the manuscript of *The Atlas of Southern African Birds*. At the time of writing, 600 species accounts by about 50 different authors had been written and reviewed, and editing of these texts has begun.

The compiling of checklists is a perennially popular activity amongst birders and can be scientifically valuable as demonstrated by the atlas project. It was decided to follow up on SABAP with a similar project which would produce a database complementary to that of the atlas. The Birds in Reserves Project (BIRP), launched in December 1994, is similar in design to SABAP but the geographical sampling units are protected areas rather than quarter-degree grid cells.<sup>7</sup>

The atlas database provides a snapshot of bird distributions in southern Africa in the late twentieth century and describes the status of species in the region, but it does not provide information specifically on the status of species within protected areas. This is a vital element to attempt to assess the conservation status of each species and to identify gaps in the existing reserve network as it pertains to birds. The complementary nature of the SABAP and BIRP databases will create a firm empirical basis for planning the conservation of avian biodiversity in South Africa. Knowledge of the avifauna of protected areas is scant,<sup>8</sup> and particularly so with regard to relative abundance, breeding status and seasonal movements of species. As BIRP will be addressing these aspects in addition to compiling basic lists of species occurring within reserves, it is anticipated that the information will also be useful in designing management strategies for protected areas.

The authors are in the Avian Demography Unit, Department of Statistical Sciences, University of Cape Town, Rondebosch, 7700.

South Africa has more than 700 publicly owned protected areas. Add to these at least an equal number of privately owned protected areas and one has some idea of the magnitude of the task which BIRP has set out to achieve. A positive spin-off from BIRP will be an increase in awareness amongst the public and decision-makers of many of the lesser-known protected areas and their value to conservation. BIRP will also contribute to the Important Bird Areas Project, described below.

The expertise and software systems developed for the processing of SABAP data remain available within the ADU and are currently being adapted for BIRP and for a new bird atlas project in Mozambique. This last exercise, although not an ADU project as such, is closely affiliated to the unit through Vincent Parker (his *The Atlas of the Birds of Swaziland* is now in press), an M.Sc. student and a prime contributor to SABAP, who has initiated the Mozambique Bird Atlas Project. The ADU will provide the data-processing facilities. The advantages of an 'up-and-running' system could be made available to any other comparable project which aims to map the distributions of, for example, frogs, butterflies or trees, etc. The software is flexible enough to be adapted for use at different geographical scales or different parts of the world.

**Important bird areas.** This project is affiliated to the continent-wide African Important Bird Area programme coordinated by BirdLife International, a world-wide conservation NGO based in the United Kingdom. That organization's successful IBA programmes in Europe<sup>9</sup> and the Middle East<sup>10</sup> have proved invaluable in providing planners and decision-makers with a clear, explicit and scientifically based statement on the priority areas for the protection of birds. The South African IBA programme is being organized from the ADU; work was begun in February 1995. The objective is to produce an IBA publication for this country and to provide South Africa's contribution to a BirdLife publication for Africa. Both publications will offer a synthesis of all relevant research and fieldwork, aimed specifically at promoting appropriate conservation action. In Europe, the designation of a locality as an IBA means that it satisfies at least one of a set of strict criteria that define it as a site of importance for birds, thus providing scientific backing for the conservation argument and facilitating legal protection.

**Nest records.** Apart from the importance of breeding biology to academic ornithology, breeding success is a vital measure of the health of biological populations. Declines in population can be due either to increased adult mortality or to decreased breeding success or some combination of the two. It is therefore integral to the ADU's population-monitoring objectives to focus on nest records.

The Nest Record Card Scheme (NERCS) is a long-standing project of the SAOS and has accumulated more than 100 000 nest record cards since the 1950s.<sup>11</sup> None of these are computerized, however, and this poses major difficulties for the analysis of trends, as does the rather low rate of returns for most species. The ADU is presently redesigning the nest record card so that appropriate information is gathered and is compatible with computerized data capture. A goal of NERCS is to provide annual measures of productivity for selected species.

**Measured-effort bird ringing.** SAFRING provides an ongoing service to bird-ringing in southern Africa.<sup>12</sup> An approach which improves the scientific return while kindling the enthusiasm of the amateur is to establish 'measured-effort' sites.<sup>13</sup> At these locations mist-netting is conducted at regular intervals and for measured periods of time. This allows useful information to be derived not only from the recovery of ringed birds but also from the actual numbers of each species trapped and their sex and age ratios. The seasonal and longer-term patterns built up in this manner can be used to describe seasonal patterns of migration and dispersal — particularly when there is an extensive network of sites — and also to detect trends in population size. The higher rate of retraps with this technique also provides additional information on residency and longevity. In short, measured-effort sites greatly increase the rate at which useful information is accumulated for a given amount of ringing effort.

**Publication of Southern Birds.** This is a series of publications on the avifaunas of specific localities and regions, initiated by the SAOS in 1975. Most of these publications have emanated from the efforts of skilled amateur ornithologists with a specific interest in, and knowledge of, areas of special ornithological interest. In recent years the rate of publication of this series has slowed. In partnership with the SAOS, the ADU has taken on an editorial and publication role for *Southern Birds*. The data contained in these periodicals have scientific importance as benchmarks

against which future avifaunal changes, resulting from altered land-use patterns and broader environmental changes, can be measured.

**Population studies of large birds.** Large and conspicuous birds offer the opportunity to monitor various population parameters by means of relatively simple techniques. These methods can be based on observations from vehicles covering designated road routes, that is, 'road counts'. This approach has been pioneered in a joint Cape Bird Club/ADU project to study the threatened Blue Crane, *Anthropoides paradiseus*, and Stanley's Bustard, *Neotis denhami*, in the agricultural areas of the southern Cape.<sup>14</sup> This study makes use of 15 predetermined routes; the details of observations of these two species are recorded both while driving and during stops at regular two-kilometre intervals. The study reveals details of group sizes, breeding, habitat-use and the relationship of the population to the agricultural practices in the area, and monitors the ongoing population sizes of these two species in the area.<sup>15</sup> The scope of this study is being expanded to other large, ground-dwelling birds, and to other areas of the country, under the banner of coordinated Avifaunal Roadcounts (CAR).

The Blue Crane, Stanley's Bustard, the White Stork, *Ciconia ciconia*, and many other large birds are threatened species in South Africa. Projects specifically designed to monitor their populations can make a major contribution to strategies aimed at their conservation and management.

**Contracts.** In addition to its core projects, the ADU has undertaken a variety of short-term contracts. These have called for expertise in field ornithology, and in data analysis and interpretation. Several have called for the use of the data sets which the unit curates. Some examples are:

- an analysis of the geographical distribution of the diversity of species sensitive to overhead power transmission structures, for Eskom, the electricity supply utility;<sup>16,17</sup>
- an investigation of the probable impacts on birds of the Katse Dam in Lesotho, for the Lesotho Highlands Development Corporation;<sup>18</sup>
- an analysis of waterbird census data from the Somerset Levels and Moors, for the UK's Royal Society for the Preservation of Birds (in preparation);
- an analysis of bird atlas data to provide insight into the problem species *Que-*

*lea quelea* and to highlight areas of non-target species sensitivity to *Quelea* control operations, for the Department of Agriculture;<sup>19</sup>

- an investigation of the effects of vanadium mining on the avifauna of the surrounding area, also for the Department of Agriculture.<sup>20</sup>

The ADU has also serviced approximately 170 requests for atlas data which have been used for a wide variety of ornithological, conservation, environmental impact assessment and ecotourism-related purposes.

The core projects of the ADU demonstrate unequivocally that the potential exists to assemble important data sets with the aid of an increasingly well-informed and enthusiastic workforce of amateur naturalists. It is central to the philosophy of the ADU that more can be achieved by cooperation between professional and amateur than by either working in isolation.

It is the contributions of data by volunteers which make the core projects of the ADU possible. The success of ADU activities owes much to the cooperation and collaboration of the Southern African Ornithological Society and its branches. The projects of the ADU have been fortunate to enjoy the support of several sponsors. They are, in alphabetical order: De Beers Chairman's Fund, Department of Envi-

ronmental Affairs and Tourism, Distillers Corporation, Endangered Wildlife Trust, Gold Fields Foundation, Mazda Wildlife Fund, Natal Bird Club, Natural History Society of Swaziland, Southern African Ornithological Society, Teal's Whisky, University of Cape Town, Wildlife Society of Southern Africa and the World Wide Fund for Nature South Africa. Several private individuals have also made generous donations.

1. Underhill L.G. (1993). A department for all seasons: Statistical Sciences at the University of Cape Town. *S. Afr. J. Sci.* **89**, 466–468.
2. Underhill L.G. and Marx A. (1993). Research and conservation: the Society and the Avian Demography Unit. *Birding in Southern Africa* **45**, 93–94.
3. Van der Elst R. (May 1993). Let's play tag (and release). *Our Living World*, pp. 10–11.
4. Rebelo A.G. (Dec 1986–Jan 1987). An atlas of the Proteaceae — your help required! *Veld & Flora*, pp. 101–106.
5. Taylor V. and Rose P.M. (1994). *African Waterfowl Census 1994*. IWRB, Slimbridge, Glos.
6. Harrison J.A. (1992). The Southern African Bird Atlas Project databank: five years of growth. *S. Afr. J. Sci.* **88**, 410–413.
7. Harrison J.A. (1994). *Birds in Reserves Project: Instructions*. ADU Guide No. 1. Avian Demography Unit, Cape Town.
8. Siegfried W.R. (1989). Preservation of species in southern African nature reserves. In *Biotic Diversity in Southern Africa: Concepts and Conservation*, ed. B.J. Huntley, chap. 12, pp. 186–201. Oxford University Press, Cape Town.
9. Grimmett R.F.A. and Jones T.A. (1989). *Important Bird Areas in Europe*. ICBP Technical Publications 9. ICBP, Cambridge.
10. Evans M.I. (1994). *Important Bird Areas in the Middle East*. BirdLife Conservation Series 4. BirdLife International, Cambridge.

11. Underhill L.G., Oatley T.B. and Harrison J.A. (1991). The role of large-scale data collection projects in the study of southern African birds. *Ostrich* **62**, 124–148.
12. Underhill L.G. and Oatley T.B. (1994). The South African Bird Ringing Unit: 21 years of service and research. *S. Afr. J. Sci.* **90**, 61–64.
13. Underhill L.G. and Oatley T.B. (1989). Measured effort sites — a potential SAFRING project. *Saf-ring News* **18**, 47–48.
14. Allan D.G. (1994). Haven for Blue Cranes. *Afr. Wildl.* **48**, 8–14.
15. Allan D.G. (1995). Cape Bird Club Blue Crane and Stanley's Bustard counts. *Promerops* **217**, 13–14.
16. Allan D.G. and Harrison J.A. (1994). *Report on potential avian sensitivity to powerline construction in an area of Natal*. ADU Research Report no. 4. Avian Demography Unit, University of Cape Town.
17. Allan D.G. and Harrison J.A. (1994). *Report on potential avian sensitivity to the construction of a powerline between De Aar and Beaufort West*. ADU Research Report no. 7. Avian Demography Unit, University of Cape Town.
18. Loxton, Venn and Associates (1993). *Final Report: Baseline Biological Survey, Fauna and Flora Lesotho Highlands Water Project Phase 1A Contract no. 75, vol. 7: Birds*. Loxton, Venn and Associates for Lesotho Highlands Development Authority, Johannesburg.
19. Allan D.G., Harrison J.A., Navarro R. and Martinez P. (1995). *The Redbilled Quelea and non-target birds — insights from bird atlas data*. ADU Research Report no. 9. Avian Demography Unit, University of Cape Town.
20. Allan D.G. (1995). *An investigation of the impact of potential vanadium contamination on bird populations at the Wapadskloof vanadium processing plant*. ADU Research Report no. 8. Avian Demography Unit, University of Cape Town.

## Meeting report

# Future research directions in Eastern Cape geography

Evan Dollar and Kate Rowntree

Reorientation, relevance and public perception were three recurrent themes discussed at a symposium on 'Future directions in East Cape geography'. Organized by Evan Dollar (Rhodes University, East London), this was the first meeting of the Eastern Cape branch of the newly constituted Society of South African Geographers. For the first time in many years, the society was fully represented by all Eastern Cape tertiary education institutions: the universities of Fort Hare, Vista, Port Elizabeth, and Rhodes (East London and Grahamstown), as well as the Transkei and Butterworth colleges of education.

Although the discipline of geography is to a large degree divided into physical and human subdisciplines, the strength to be gained from integrating the two components was apparent. Relevance and applicability were recurring themes in many of the 18 papers presented, and were the

focus of the presentation by Kevin Phillips-Howard\* (University of Transkei), who explained UNITRA's reorientation towards becoming an institution committed to the principles of the RDP. UNITRA is actively promoting and engaging in community and participatory research in poverty-stricken rural Transkei. Central to Phillips-Howard's presentation was the argument that there is no point in being an island of knowledge surrounded by a sea of illiteracy and poverty. His research team is involved in capacity building, tourism, and development through participatory research and tapping indigenous knowledge.

Vista was represented by Des Kopke, who urged geographers to engage in developing the province's tourism potential by incorporating sites relating to local

Xhosa heroes into tourist itineraries. Trevor Hill (Rhodes) outlined the importance of technology in geography, emphasized the scope of geographic information systems, and referred to his colleagues' interests in catchment management issues and development programmes. Adele Kudelasz (UPE) argued that although it is the current fashion to concentrate on the rural areas and the informal sector, geographers should not neglect the formal sector, especially in regard to retail geography. Simphiwe Mini and colleagues (Fort Hare) dealt with the burning issues of South Africa's land redistribution programme, land reform, land degradation and soil erosion in the Eastern Cape.

During an open discussion, there was unanimous agreement that geography was in a unique position, at the interface of the natural sciences and humanities, to contribute towards the reconstruction and development of the province. The importance of redefining the role of geographers in the new South Africa was stressed, as was the perception that geography is alive and well in the Eastern Cape.

The authors are in the Department of Geography, Rhodes University, P.O. Box 7426, 5200 East London. E-mail: edollar@lark.ru.ac.za.

\*Professor Phillips-Howard died tragically in a car accident in Umtata in October 1995.