

**Ecology and movements of the
Australian Bustard *Ardeotis australis*
in a dynamic landscape**



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References

- Aebischer N. J., Robertson P. A. & Kenward R. E. (1993) Compositional analysis of habitat use from animal radio-tracking data. *Ecology* **74**, 1313-25.
- Alerstam T. & Hedenstrom A. (1998) The development of bird migration theory. *Journal of Avian Biology* **29**, 343-69.
- Alerstam T., Hedenstrom A. & Akesson S. (2003) Long-distance migration: evolution and determinants. *Oikos* **103**, 247-60.
- Allan D. G. (1994) The abundance and movements of Ludwig's Bustard *Neotis ludwigii*. *Ostrich* **65**, 95-105.
- Alonso J. A., Martin C. A., Alonso J. C., Morales J. M. & Lane S. J. (2001) Seasonal movements of male great bustards in central Spain. *Journal of Field Ornithology* **72**, 504-11.
- Alonso J. C. & Alonso J. A. (1990) *Parámetros demográficos, selección de hábitat y distribución de la avutarda (Otis tarda) en tres regiones españolas*. ICONA, Madrid.
- Alonso J. C. & Alonso J. A. (1992) Male-biased dispersal in the great bustard *Otis tarda*. *Ornis Scandinavica* **23**, 81-8.
- Alonso J. C. & Alonso J. A. (1996) The great bustard *Otis tarda* in Spain: present status, recent trends and an evaluation of earlier censuses. *Biological Conservation* **77**, 79-86.
- Alonso J. C., Alonso J. A., Martin E. & Morales M. (1995) Range and patterns of great bustard movements at Villafafila. *Ardeola* **42**, 69-76.
- Alonso J. C., Martín C. A., Alonso J. A., Palacín C., Magaña M. & Lane S. J. (2004) Distribution dynamics of a great bustard metapopulation throughout a decade: influence of conspecific attraction and recruitment. *Biodiversity and Conservation* **13**, 1659-74.
- Alonso J. C., Morales M. B. & Alonso J. A. (2000) Partial migration, lek fidelity and nesting area fidelity in female great bustards *Otis tarda*. *Condor* **102**, 127-36.
- Alonso J. C., Palacín C. & Martín C. A. (2003) Status and recent trends of the great bustard (*Otis tarda*) population in the Iberian peninsula. *Biological Conservation* **110**, 185-95.
- Altmann J. (1974) Observational study of behaviour: Sampling methods. *Behaviour* **49**, 227-67.
- Andersen A. N., Cook G. D. & Williams R. J. (2003) *Fire in Tropical Savannas: The Kapalga Experiment*. Springer-Verlag, New York, NY, USA.
- Andersen A. N. & Müller W. J. (2000) Arthropod response to experimental fire regimes in an Australian tropical savanna: ordinal-level analysis. *Austral Ecology* **25**, 199-209.
- Badman F. J. (1979) Birds of the southern and western Lake Eyre drainage. *South Australian Ornithologist* **28**, 29-55.
- Baker-Gabb D. (1987) BOP Watch update No. 4. *Royal Australasian Ornithologists Union Newsletter* **74**, 4-5.
- Baker B., Price O., Woinarski J., Gold S., Connors G., Fisher A. & Hempel C. (2005) *Northern Territory Bioregions - assessment of key biodiversity values and threats*. Biodiversity Conservation, Department of Natural Resources, Environment and the Arts, Darwin.
- Baker R. R. (1978) *The Evolution and Ecology of Animal Migration*. Holmes and Meier Publishers, New York.

- Barker R. D. & Vestjens W. J. M. (1989) *The Food of Australian Birds. I. Non-passerines*. CSIRO Division of Wildlife and Ecology, Lyneham.
- Barrett G. & Davidson I. (1999) Community Monitoring of Woodland Habitats - the Birds on Farms Survey. In: *Temperate Eucalypt Woodlands in Australia: Biology, Conservation, Management and Restoration* (eds R. Hobbs and C. J. Yates) pp. 382-99. Surrey Beatty & Sons, Chipping Norton.
- Barrett G., Silcocks A., Barry S., Cunningham R. B. & Poulter R. (2003) *The New Atlas of Australian Birds*. Royal Australasian Ornithologists Union, Hawthorn East.
- Bennetts R. E. & Kitchens W. M. (2000) Factors influencing movement probabilities of a nomadic food specialist: proximate foraging benefits or ultimate gains from exploration? *Oikos* **91**, 459-67.
- Berney F. L. (1907) Field notes on the birds of the Richmond District, north Queensland. *Emu* **6**, 106-15.
- Berney F. L. (1936) The bustard in Queensland. *Emu* **36**, 4-9.
- Berry S., Mackey B. G. & Brown T. (2007) Potential applications of remotely sensed vegetation greenness to habitat analysis and the conservation of dispersive fauna. *Pacific Conservation Biology* **13**, 120-7.
- Berry S. L. & Roderick M. L. (2002) Estimating mixtures of leaf functional types using continental-scale satellite and climatic data. *Global Ecology and Biogeography* **11**, 23-39.
- Berthold P. (1991) Genetic control of migratory behaviour in birds. *Trends in Ecology and Evolution* **6**, 254-7.
- Berthold P. (1999) A comprehensive theory for the evolution, control and adaptability of avian migration. *Ostrich* **70**, 1-11.
- Berthold P. & Pulido F. (1994) Heritability of migratory activity in a natural bird population. *Proc R. Soc. Lond. B* **257**, 311-5.
- Beyer H. L. (2004) Hawth's Analysis Tools for ArcGIS. <http://www.spatial ecology.com/htools>.
- Blakers M., Davies S. J. J. F. & Reilly P. N. (1984) *The Atlas of Australian Birds*. RAOU/Melbourne University Press, Melbourne.
- Blanch S. (2007) *Action Plan to Conserve the Daly River as a Living River*. WWF-Australia, Darwin.
- Blanche K. R., Andersen A. N. & Ludwig J. A. (2001) Rainfall-contingent detection of fire impacts: responses of beetles to experimental fire regimes. *Ecological Applications* **11**, 86-96.
- Boehm E. F. (1947) The Australian bustard: with special reference to its past and present status in South Australia. *South Australian Ornithologist* **18**, 37-40.
- Bonter D. N., Gauthreaux S. A. & Donovan D. M. (2009) Characteristics of important stopover locations for migrating birds: remote sensing with radar in the Great Lakes Basin. *Conservation Biology* **23**, 440-8.
- Boone R. B., Thirgood S. J. & Hopcraft J. G. C. (2006) Serengeti wildebeest migratory patterns modeled from rainfall and new vegetation growth. *Ecology* **87**, 1987-94.
- Borger L., Franconi N., de Michele G., Gantz A., Meschi F., Manica A., Lovari S. & Coulson T. (2006) Effects of sampling regime on the mean and variance of home range size estimates. *Journal of Animal Ecology* **75**, 1393-405.
- Bourliere F. (1983) *Ecosystems of the World. 13. Tropical Savannas*. Elsevier, Amsterdam.
- Bowman D. M. J. S. (1998) The impact of aboriginal landscape burning on the Australian biota. *86th Tansley Review New Phytologist*.

- Bowman D. M. J. S. & Prior L. D. (2004) Impact of Aboriginal landscape burning on woody vegetation in *Eucalyptus tetrodonta* savanna in Arnhem Land, northern Australia. *Journal of Biogeography* **31**, 807-17.
- Bowman D. M. J. S., Walsh A. & Milne D. (2001) Forest expansion and grassland contraction within a Eucalyptus savanna matrix between 1941 and 1994 at Litchfield National Park in the Australian monsoon tropics. *Global Ecology & Biogeography* **10**, 535-48.
- Bradbury J., Vehrencamp S. & Gibson R. (1989a) Dispersion of displaying male sage grouse. 1. Patterns of temporal variation. *Behavioural Ecology and Sociobiology* **24**, 1-14.
- Bradbury J. W. (1981) The evolution of leks. In: *Natural Selection and Social Behaviour* (eds R. D. Alexander and D. W. Tinkle) pp. 138-69. Chiron., New York.
- Bradbury J. W., Gibson R. M., McCarthy C. E. & Vehrencamp S. L. (1989b) Dispersal of displaying male sage grouse 2. The role of female dispersion. *Behavioural Ecology and Sociobiology* **24**, 15-24.
- Brady C. J. & Noske R. (2006) Generalised regressions provide good estimates of insect and spider biomass in the monsoonal tropics of Australia. *Australian Journal of Entomology* **45**, 187-91.
- Bravery J. A. (1970) The birds of the Atherton Shire, Queensland. *Emu* **70**, 49-63.
- Britten M. W., Kennedy P. L. & Ambrose S. (1999) Performance and accuracy evaluation of small satellite transmitters. *Journal of Wildlife Management* **63**, 1349-58.
- Brock J. (1993) *Native Plants of Northern Australia*. Reed Books, Kew.
- Brooks T. M., Mittermeier R. A., Mittermeier C. G., da Fonseca G. A. B., Rylands A. B., Konstant W. R., Flick P., Pilgrim J., Oldfield S., Magin G. & Hilton-Taylor C. (2002) Habitat loss and extinction in the hotspots of biodiversity. *Conservation Biology* **16**, 909-23.
- Brown A. G. (1950) The birds of Turkeith, Victoria. *Emu* **50**, 105-13.
- Buckland S. T., Anderson D. R., Burnham B. K., Laake J. L., Borchers D. L. & Thomas L. (2001) *Introduction to Distance Sampling: Estimating Abundance of Biological Populations*. Oxford University Press, Oxford.
- Burgman M. A. & Fox J. C. (2003) Bias in species range estimates from minimum convex polygons: implications for conservation and options for improved planning. *Animal Conservation* **6**, 19-28.
- Burnham K. P. & Anderson D. R. (2002) *Model Selection and Multimodel Inference: a Practical Information*. Springer, New York.
- Butler M. J., Ballard W. B., Wallace M. C. & Demaso S. J. (2007) Road-based surveys for estimating Wild Turkey density in the Texas rolling plains. *Journal of Wildlife Management* **71**, 1646-53.
- Calver M. C. & Wooller R. D. (1982) A technique for assessing the taxa, length, dry weight and energy content of the arthropod prey of birds. *Australian Wildlife Research* **9**, 293-301.
- Carranza J., Hidalgo S. J. & Ena V. (1989) Mating system flexibility in the great bustard: a comparative study. *Bird Study* **36**, 192-8.
- Carstairs J. L. (1974) The distribution of *Rattus villosissimus* (Waite) during plague and non-plague years. *Australian Wildlife Research* **1**, 95-106.
- Carstairs J. L. (1976) Population dynamics and movements of *Rattus villosissimus* (Waite) during the 1966-69 plague at Brunette Downs, N.T. *Australian Wildlife Research* **3**, 1-9.
- Chan K. (2001) Partial migration in Australian landbirds: a review. *Emu* **101**, 281-92.
- Churchill S. K. (1994) Diet, prey selection and foraging behaviour of the Orange Horseshoe-bat, *Rhinonycteris aurantius*. *Wildlife Research* **21**, 115-30.

- Cole M. M. (1986) *The Savannas: Biogeography and Geobotany*. Academic Press, London.
- Collar N. J. (1996) Family Otidae (Bustards). In: *Handbook of the Birds of the World. Volume 3: Hoatzin to Auks* (eds J. del Hoyo, A. Elliott and J. Sargatal) pp. 240-61. Lynx Edicions, Barcelona.
- Combreau O., Gelinaud G. & Smith T. R. (2000) Home range and movements of houbara bustards introduced in the Najd Pediplain in Saudi Arabia. *Journal of Arid Environments* **44**, 229-40.
- Combreau O. & Launay F. (1996) Activity rhythms of houbara bustards (*Chlamydotis undulata macqueenii*) in relation to some abiotic factors. *Journal of Arid Environments* **33**, 463-72.
- Covacevich J. & Archer M. (1975) The distribution of the cane toad, *Bufo marinus*, in Australia and its effects on indigenous vertebrates. *Memoirs of the Queensland Museum* **17**, 305-10.
- Cowie I. D. (in prep) Malvaceae subfamily Grewioideae. In: *Flora of the Northern Territory* (ed P. S. Short).
- Cox G. W. (1968) The role of competition in the evolution of migration. *Evolution* **22**, 180-92.
- Crace B. (in prep) Cucurbitaceae. In: *Flora of the Northern Territory* (ed P. S. Short).
- Crowley G. & Garnett S. T. (1998) Vegetation change in the grasslands and grassy woodlands of central Cape York Peninsula. *Pacific Conservation Biology* **4**, 132-48.
- Crowley G. & Garnett S. T. (1999) Seeds of the annual grasses *Schizachyrium* spp. as a food resource for tropical granivorous birds. *Australian Journal of Ecology* **24**, 208-20.
- Davies N. B. (1991) Mating systems. In: *Behavioural Ecology. An Evolutionary Approach* (eds C. J. Krebs and N. B. Davies). Blackwell, Oxford.
- Davies S. J. J. F. (1976) Studies of the flowering season and fruit production of some arid zone shrubs and trees in Western Australia. *Journal of Ecology* **64**, 665-87.
- Davies S. J. J. F. (1978) The food of emus. *Australian Journal of Ecology* **3**, 411-22.
- Davies S. J. J. F. (1984) Nomadism as a response to desert conditions in Australia. *Journal of Arid Environments* **7**, 183-95.
- Dawson W. R. (1981) Adjustments of Australian birds to thermal conditions and water scarcity in arid zones. In: *Ecological Biogeography of Australia* (ed A. Keast). Dr. W. Junk, The Hague.
- De Solla S. R., Bonduriansky R. & Brooks R. J. (1999) Eliminating autocorrelation reduces biological relevance of home range estimates. *Journal of Animal Ecology* **68**, 221-34.
- Dean W. R. J. (1997) The Distribution and Biology of Nomadic Birds in the Karoo, South Africa. *Journal of Biogeography* **24**, 769-79.
- Dean W. R. J. (2004) *Nomadic Desert Birds*. Springer, Berlin.
- Dean W. R. J. & Siegfried W. R. (1997) The protection of endemic and nomadic avian diversity in the Karoo, South Africa. *South African Journal of Wildlife Research* **27**, 11-21.
- Deutsch J. C. (1994) Lekking by default: female habitat preferences and male strategies in Uganda kob. *Journal of Animal Ecology* **63**, 101-15.
- Dingle H. (1996) *Migration: the biology of life on the move*. Oxford University Press, New York.
- Dingle H. (2006) Animal migration: Is there a common migratory syndrome? *Journal of Ornithology* **147**, 212-22.
- Dingle H. (2008) Bird migration in the southern hemisphere: a review comparing continents. *Emu* **108**, 341-59.

- Dingle H. & Drake V. A. (2007) What is migration? *Bioscience* **57**, 113-21.
- Doerr E. D. & Doerr V. A. J. (2005) Dispersal range analysis: quantifying individual variation in dispersal behaviour. *Oecologia* **142**, 1-10.
- Dostine P. (2009) The ecology and conservation of the Flock Bronzewing Pigeon *Phaps histrionica*. PhD Thesis. Australian National University, Canberra.
- Dostine P., Johnson G. C., Franklin D. C., Zhang Y. & Hempel C. (2001) Seasonal use of savanna landscapes by the Gouldian finch, *Erythrura gouldiae*, in the Yinberrie Hills area, Northern Territory. *Wildlife Research* **28**, 445-58.
- Downes M. C. (1982a) *The Australian Bustard in the Barkly region of the Northern Territory*. Report to the Conservation Commission of the Northern Territory, Darwin.
- Downes M. C. (1982b) *A management programme for the Bustard in the Northern Territory*. Report to the Conservation Commission of the Northern Territory, Darwin.
- Downes M. C. (1984) *The Bustard in South Australia*. National Parks and Wildlife Service, Adelaide.
- Downes M. C. & Speedie C. (1982) *Classification of Bustard Habitat in the Northern Territory*. Report to the Conservation Commission of the Northern Territory, Darwin.
- Drake V. A., Gatehouse A. G. & Farrow R. A. (1995) Insect migration: a holistic approach to insect migration. In: *Insect migration: tracking resources through space and time*. Cambridge University Press, Cambridge.
- DSE. (2003) Advisory list of Threatened Vertebrate Fauna in Victoria - 2003. Threatened Species and Communities Section, Biodiversity and Natural Resources Division, Department of Sustainability and Environment, Melbourne.
- Dyer R., Jacklyn P., Partridge I., Russell-Smith J. & Williams D. (2001) *Savanna Burning: understanding and using fire in northern Australia*. Tropical Savannas CRC, Darwin.
- Dyer R. M. (2001) Fire and vegetation management in pasture lands of the Victoria River District, Northern Territory. Masters thesis p. 191. University of Queensland, Brisbane.
- Environment Australia. (2000) *Revision of the Interim Biogeographic Regionalisation of Australia (IBRA) and the Development of Version 5.1*. Summary Report. Department of Environment and Heritage, Canberra.
- Farrow R. A. (1979) Population dynamics of the Australian plague locust, *Chortoicetes terminifera* (Walker) in central western New South Wales. I: Reproduction and migration in relation to weather. *Australian Journal of Zoology* **27**, 717-45.
- Fensham R. J., Fauirfax R. J. & Archer S. R. (2005) Rainfall, land use and woody vegetation cover change in semi-arid Australian savanna. *Journal of Ecology* **93**, 596-606.
- Fisher A. (1999) *Conservation assessment of the Mitchell Grasslands in northern Australia*. Parks and Wildlife Commission of the Northern Territory, Darwin.
- Fitzherbert K. (1978) Observations on breeding and display in a colony of captive Australian Bustards (*Ardeotis australis*). BSc. (Hons) thesis. Monash University, Clayton.
- Fitzherbert K. (1982) Seasonal weight changes and display in captive Australian bustards (*Ardeotis australis*). In: *Bustards in decline*. (ed P. D. V. Goriup, H.). Tourism & Wildlife Society of India., Jaipur.
- Ford H. & Paton D. C. (1982) Partitioning of nectar sources in an Australian honeyeater community. *Australian Journal of Ecology* **7**, 149-59.
- Ford H. A. (1978) The Black Honeyeater: nomad or migrant? *South Australian Ornithologist* **27**, 263-9.
- Ford H. A. (1989) *Ecology of Birds: An Australian Perspective*. Surrey Beatty and Sons, Chipping Norton.

- Forsyth D. M. (1999) Long-term harvesting and male migration in a New Zealand population of Himalayan tahr *Hemitragus jemlahicus*. *Journal of Applied Ecology* **36**, 351-62.
- Fowler J. & Cohen L. (1990) *Practical Statistics for Field Biology*. John Wiley & Sons, Chichester.
- Fox I. D., Neldner V. J., Wilson G. W. & Bannink P. J. (2001) *The Vegetation of the Australian Tropical Savannas*. Environmental Protection Agency, Brisbane.
- Franklin D. C. (1999) Evidence of disarray amongst granivorous bird assemblages in the savannas of northern Australia, a region of sparse human settlement. *Biological Conservation* **90**, 53-68.
- Fraser F., Lawson V., Morrison S., Christophersen P., McGreggor S. & Rawlinson M. (2003) Fire management experiment for the declining Partridge Pigeon, Kakadu National Park. *Ecological Management & Restoration* **4**, 94-102.
- Frawley V. R., Oliver T. E. & Stewart C. A. (2004) *Ruffed grouse and American woodcock status in Michigan, 2004*. Michigan Department of Natural Resources, Detroit.
- Freeland W. J. (1984) Cane toads: a review of their biology and impact on Australia. In: *Technical Report* pp. (i-v) 1-67.
- Fretwell S. D. (1980) Evolution of migration in relation to factors regulating bird numbers. In: *Migrant birds in the Neotropics* (eds A. Keast and E. Morton). Smithsonian Institution Press, Washington, D.C.
- Friedel M. H. & Chewings V. H. (1988) Comparison of crown cover estimates for woody vegetation in arid rangelands. *Australian Journal of Ecology* **13**, 463-8.
- Friend G. R. & Williams M. R. (1996) Impact of fire on invertebrate communities in mallee-heath shrublands of south-western Australia. *Pacific Conservation Biology* **2**, 244-67.
- Frith H. J. (1962) Movements of the Grey Teal *Anas gibberifrons* Muller (Anatidae). *CSIRO Wildlife Research* **7**, 50-70.
- Frith H. J. (1967) *Waterfowl in Australia*. Angus and Robertson, Sydney.
- Frith H. J. (1982) *Pigeons and Doves of Australia*. Rigby, Adelaide.
- Froggatt W. W. (1921) Notes on the Spiny Green Phasma (*Extatosoma tiaratum*). *The Australian Naturalist* **4**, 235-7.
- Fullager P. J., Lowe K. W. & Davies S. J. J. F. (1986) Intracontinental migration of Australian birds. In: *Acta XIX Congressus Internationalis Ornithologici* (ed H. Ouellet) pp. 791-801. University of Ottawa Press, Ottawa.
- Gardener C. J., McIvor J. G. & Williams J. (1990) Dry tropical rangelands: solving one problem and creating another. *Proceedings of the Ecological Society of Australia* **16**, 279-86.
- Garnett S. T. & Crowley G. M. (2000) *The Action Plan for Australian Birds*. Environment Australia, Melbourne.
- Gaston K. J. (1991) How large is a species' geographic range? *Oikos* **61**, 434-8.
- Gatehouse A. G. (1987) Migration: a behavioural process with ecological consequences? *Antenna* **11**, 10-2.
- Gaucher P. (1995) Breeding biology of the houbara Bustard *Chlamydotis undulata undulata* in Algeria. *Alauda* **63**, 291-8.
- Gauthreaux S. A. (1978) The ecological significance of behavioural dominance. In: *Perspectives in Ethology* (eds P. P. G. Bateson and P. H. Klopfer) pp. 17-54. Plenum, New York.

- Gauthreaux S. A. (1982) The Ecology and Evolution of Avian Migration Systems. In: *Avian Biology* (eds D. S. Farner and J. R. King). Academic Press, New York.
- Geoscience Australia. (2004) Vegetation - Post-European Settlement (1988). Geoscience Australia, Canberra.
- Gibson D. B. (1986) A Biological Survey of the Tanami Desert. In: *Technical Report 30*. Conservation Commission of the Northern Territory., Alice Springs, Northern Territory.
- Gibson D. B. & Cole J. R. (1988) A Biological Survey of the Northern Simpson Desert. In: *Technical Report 40*. Conservation Commission of the Northern Territory., Alice Springs, Northern Territory.
- Gillon C. (1983) The fire problem in tropical savannas. In: *Tropical Savannas* (ed F. Bourliere). Elsevier, Amsterdam.
- Gilmore S., Mackey B. G. & Berry S. (2007) The extent of dispersive movement behaviour in Australian vertebrate animals, possible cause, and some implications for conservation. *Pacific Conservation Biology* **13**, 93-103.
- Girard I., Dussault C., Ouellet J.-P., Courtois R. & Caron A. (2006) Balancing number of locations with number of individuals in telemetry studies. *Journal of Wildlife Management* **70**, 1249-56.
- Girard I., Ouellet J.-P., Courtois R., Dussault C. & Breton L. (2002) Effects of sampling effort based on GPS telemetry on home-range size estimations. *Journal of Wildlife Management* **66**, 1290-300.
- Gitzen R. A., Millspaugh J. J. & Kernohan B. J. (2006) Bandwidth selection for fixed-kernel analysis of animal utilization distributions. *Journal of Wildlife Management* **70**, 1334-44.
- Glahder C. M. (1999) Spring staging areas of the Greenland white-fronted goose (*Anser albifrons flavirostris*) in West Greenland. *Arctic* **52**, 244-56.
- Goriup P. (1994) Little Bustard *Tetrax tetrax*. In: *Birds in Europe: Their Conservation Status* (eds G. M. Tucker and M. F. Heath) pp. 236-7. Birdlife International, Cambridge.
- Goriup P. D. & Vardhan H. (1980) *Bustards in decline*. Tourism and Wildlife Society of India, Jaipur.
- Gowing G. & Recher H. F. (1984) Length-weight relationships for invertebrates from forests in south-eastern New South Wales. *Australian Journal of Ecology* **9**, 5-8.
- Greenwood P. J. (1984) Mating systems and the evolutionary consequences of dispersal. In: *The ecology of animal movements* (eds I. R. Swingland and P. J. Greenwood). Clarendon Press, Oxford.
- Grice D., Caughley G. & Short J. (1986) Density and distribution of the Australian Bustard *Ardeotis australis*. *Biological Conservation* **35**, 259-67.
- Griffioen P. & Clarke M. F. (2002) Large-scale bird-movement patterns evident in eastern Australian atlas data. *Emu* **102**, 99-125.
- Grigg G. C., Pople A. R. & Beard L. A. (1995) Movements of feral camels in central Australia determined by satellite telemetry. *Journal of Arid Environments* **31**, 459-69.
- Hall L. S. (1969) The Letter-winged Kite and rats in the Northern Territory. *The Emu* **69**, 182.
- Hallager S. L. & Boylan J. (2004) *Kori Bustard Species Survival Plan (Ardeotis kori): Husbandry Manual*. American Zoo and Aquarium Association, Washington.
- Harris R. B. & Burnham K. P. (2002) On estimating wildlife densities from line transect data. *Acta Zoologica Sinica* **48**, 812-8.
- Harris S., Cresswell W. J., Forde P. G., Trehwella W. J., Woolard T. & Wray S. (1990) Home range analysis using radio-tracking data - a review of problems and techniques particularly as applied to the study of mammals. *Mammal Review* **20**, 97-123.

- Healy S. D. & Hurly A. T. (2004) Spatial learning and memory in birds. *Brain Behavior and Evolution* **63**, 211-20.
- Heywood M. R. & Pavey C. (2002) Relative importance of plague rodents and dasyurids as prey of barn owls in central Australia. *Wildlife Research* **29**, 203 - 7.
- Hidalgo De Trucios S. J. & Carranza J. (1991) Timing, structure and functions of the courtship display in male Great Bustard. *Ornis Scandinavica* **22**, 360-6.
- Higgins P. J. & Davies S. J. J. F. (1996) *Handbook of Australian, New Zealand and Antarctic Birds. Vol.3 Snipe to Pigeons*. Oxford University Press, Melbourne.
- Higgins P. J. & Peter J. M. (2002) *Handbook of Australian, New Zealand and Antarctic Birds. Vol.6: Pardalotes to Shrike-thrushes*. Oxford University Press, Melbourne.
- Higgins P. J., Peter J. M. & Steele W. K. (2001) *Handbook of Australian, New Zealand and Antarctic Birds. Vol.5: Tyrant-flycatchers to Chats*. Oxford University Press, Melbourne.
- Hingrat Y., Saint Jalme M., Ysnel F., Lacroix F., Seabury J. & Rautureau P. (2004) Relationships between home-range size, sex and season with reference to the mating system of the Houbara Bustard *Chlamydotis undulata undulata*. *Ibis* **146**, 314-22.
- Hingrat Y., Saint Jalme M., Ysnel F., Le Nuz E. & Lacroix F. (2007) Habitat use and mating system of the houbara bustard (*Chlamydotis undulata undulata*) in a semi-desertic area of North Africa: implication for conservation. *Journal of Ornithology* **148**, 39-52.
- Hobbs R. J. & Hopkins A. J. M. (1990) From frontier to fragments: European impact on Australia's vegetation. In: *Australian ecosystems: 200 years of utilization, degradation and reconstruction. Proceedings of the Ecological Society of Australia* (eds D. A. Saunders, A. J. M. Hopkins and R. A. How) pp. 93-114. Surrey Beatty and Sons, Chipping Norton.
- Hoffman B. D. (2000) Changes in ant species composition and community organisation along grazing gradients in semi-arid rangelands of the Northern Territory. *Rangelands Journal* **22**, 171-89.
- Hoffman B. D. (2003) Responses of ant communities to experimental fire regimes on rangelands in the Victoria River District of the Northern Territory. *Austral Ecology* **28**, 182-95.
- Hofle U., Millan J., Gortazar C., Buenestado F. J., Marco I. & Villafuerte R. (2004) Self-injury and capture myopathy in net-captured juvenile red-legged partridge with necklace radiotags. *Wildlife Society Bulletin* **32**, 344-50.
- Hoglund J. & Alatalo R. V. (1995) *Leks*. Princeton University Press, Princeton.
- Hoglund J. & Robertson J. G. M. (1990) Spacing of leks in relation to female home ranges, habitat requirements and male attractiveness in the great snipe (*Gallinago media*). *Behavioral Ecology and Sociobiology* **26**, 173-80.
- Horne J. S. & Garton E. O. (2006) Selecting the best home range model: an information-theoretic approach. *Ecology* **87**, 1146-52.
- Hosking E. J. (2002) *Land Clearing in the Northern Territory, Technical Report 24/2002*. Department of Infrastructure, Planning and Environment, Darwin.
- Hovi M., Alatalo R. V., Hoglund J., Lundberg A. & Rintamaki P. T. (1994) Lek centre attracts black grouse females. *Proceedings of the Royal Society of London B* **258**, 303-5.
- Hunter D. M. (1989) The response of Mitchell grasses (*Astrelba* spp.) and Button grass (*Dactyloctenium radulans*) to rainfall and their importance to the survival of the Australian plague locust, *Chortoicetes terminifera* (Walker), in the arid zone. *Journal of Applied Ecology* **14**, 467-71.
- Isakov Y. A. (1974) Present distribution and population status of the great bustard, *Otis tarda* Linnaeus. *Journal of the Bombay Natural History Society* **71**, 433-44.

- Jacquet J. M. & Launay F. (1997) Diurnal behavioural patterns in the houbara bustard (*Chlamydotis undulata*) in captivity: Effects of temperature and daylength. *Applied Animal Behaviour Science* **55**, 137-51.
- Jiguet F. (2002) Arthropods in diet of Little Bustards *Tetrax tetrax* during the breeding season in western France. *Bird Study* **49**, 105-9.
- Jiguet F., Arroyo B. & Bretagnolle V. (2000) Lek mating systems: A case study in the Little Bustard *Tetrax tetrax*. *Behavioural Processes* **51**, 63-82.
- Jiguet F. & Bretagnolle V. (2001) Courtship behaviour in a lekking species: individual variations and settlement tactics in male little bustard. *Behavioural Processes* **55**, 107-18.
- Jiguet F. & Villarubias S. (2004) Satellite tracking of breeding black storks *Ciconia nigra*: new incomes for spatial conservation issues. *Biological Conservation* **120**, 153-60.
- Johnsgard P. A. (1994) *Arena Birds: Sexual Selection and Behavior*. Smithsonian Institution Press, Washington.
- Johnson R. W. & Tothill J. C. (1985) Definition and broad geographic outline of savanna lands. In: *Ecology and Management of the world's savannas*. (ed J. J. Mott) pp. 1-13. Commonwealth Agricultural Bureau, St Lucia, Qld.
- Judas J., Combreau O., Lawrence M., Saleh M., Launay F. & Xingi G. (2006) Migration and range use of Asian Houbara Bustard *Chlamydotis macqueenii* breeding in the Gobi Desert, China, revealed by satellite tracking. *Ibis* **148**, 343-51.
- Keast A. (1959) Australian birds: their zoogeography and adaptations to an arid continent. In: *Biogeography and Ecology in Australia* (eds A. Keast, R. L. Crocker and C. S. Christian) pp. 89-114. Junk Publ., The Hague.
- Keast A. (1968) Seasonal movements in the Australian honeyeaters (Meliphagidae) and their ecological significance. *Emu* **67**, 159-209.
- Keast A. & Marshall A. J. (1954) The influence of drought and rainfall on reproduction in Australian desert birds. *Proceedings of the Zoological Society of London* **124**, 493-9.
- Kenward R. (1987) *Wildlife Radio Tagging: Field Equipment, Field Techniques, and Data Analysis*. Academic Press, Toronto.
- Kernohan B. J., Gitzen R. A. & Millspaugh J. J. (2001) Analysis of Animal Space Use and Movements. In: *Radio Tracking and Animal Populations* (eds J. J. Millspaugh and J. M. Marzluff). Academic Press, San Diego.
- Kerrigan R. A. & Dixon D. J. (unpublished) Lauraceae. In: *Flora of the Northern Territory* (ed P. S. Short), Darwin.
- Ketterson E. D. & Nolan V. (1983) The evolution of differential bird migration. *Current Ornithology* **1**, 357-402.
- Kie J. G., Evans C. J., Loft E. R. & Menke J. W. (1991) Foraging behaviour by mule deer: the influence of cattle grazing. *Journal of Wildlife Management* **55**, 665-74.
- Kingsford R. T. (1995) Occurrence of high concentrations of waterbirds in arid Australia. *Journal of Arid Environments* **29**, 421-5.
- Kingsford R. T., Curtin A. L. & Porter J. (1999) Water flows on Cooper Creek in arid Australia determine 'boom' and 'bust' periods for waterbirds. *Biological Conservation* **88**, 231-48.
- Kingsford R. T. & Norman F. I. (2002) Australian waterbirds - products of the continent's ecology. *Emu* **102**, 1-23.
- Lack D. (1954) *The Natural Regulation of Animal Numbers*. Oxford University Press, London.
- Lack D. (1968) Bird migration and natural selection. *Oikos* **19**, 1-9.

- Lanctot R. B. & Weatherhead P. J. (1997) Ephemeral lekking behaviour in the buff-breasted sandpiper, *Tryngites subruficollis*. *Behavioral Ecology* **8**, 268-78.
- Lane S. J., Alonso C. J. & Martin C. A. (2001) Habitat preferences of great bustard *Otis tarda* flocks in the arable steppes of central Spain: are potentially suitable areas occupied? *Journal of Applied Ecology* **38**, 193-203.
- Lane S. J. & Alonso J. C. (2001) Status and extinction probabilities of great bustard (*Otis tarda*) leks in Andalucia, southern Spain. *Biodiversity and Conservation* **10**, 893-910.
- Lane S. J., Alonso J. C., Alonso J. A. & Naveso M. A. (1999) Seasonal changes in diet and diet selection of great bustards (*Otis tarda*) in north-west Spain. *Journal of Zoology* **247**, 201-14.
- Larter N. C. & Gates C. C. (1994) Home range size of wood bison: effects of age, sex and forage availability. *Journal of Mammalogy* **75**, 142-9.
- Launay F., Roshier D., Loughland R. & Aspinall S. J. (1997) Habitat use by houbara bustard (*Chlamydotis undulata macqueenii*) in arid shrubland in the United Arab Emirates. *Journal of Arid Environments* **35**, 111-21.
- Lavee D. (1985) The influence of grazing and intensive cultivation on the population size of the houbara bustard in the northern Negev in Israel. *Bustard Studies* **3**, 103-7.
- Leban F. A. (1999) Resource Selection for Windows. Department of Fish and Wildlife Resources, University of Idaho, Moscow, ID.
- Lewis D. (2002) *Slower Than the Eye Can See: Environmental change in northern Australia's cattle lands*. Tropical Savannas CRC, Darwin.
- Ligon J. D. (1999) *The Evolution of Avian Breeding Systems*. Oxford University Press, Oxford.
- Lloyd P., Little R. M., Crowe T. M. & Simmons R. E. (2001) Rainfall and food availability as factors influencing the migration and breeding activity of Namaqua Sandgrouse, *Pterocles namaqua*. *Ostrich* **72**, 50-62.
- Lunney D., Esson C., Moon C., Ellis M. & Matthews A. (1997) A community-based survey of the koala, *Phascolarctos cinereus*, in the Eden region of south-eastern New South Wales. *Wildlife Research* **24**, 111-28.
- Mac Nally R., Ellis M. & Barrett G. (2004) Avian biodiversity monitoring in Australian rangelands. *Austral Ecology* **29**, 93-9.
- Maclean G. L. (1996) *Ecophysiology of Desert Birds*. Springer-Verlag, Berlin.
- Maher M. T. & Braithwaite L. W. (1992) Patterns of waterbird use in wetlands of the Paroo: a river system of inland Australia. *Rangelands Journal* **14**, 128-41.
- Malan G. & Little R. M. (1994) Temporal and spatial patterns of abundance and breeding activity of the Namaqua sandgrouse in South Africa. *South African Journal of Zoology* **29**, 162-7.
- Marchant S. & Higgins P. J. (1993) *Handbook of Australian, New Zealand and Antarctic Birds. Vol.2. Raptors to Lapwings*. Oxford University Press, Melbourne.
- Maroney R. L. (2005) Conservation of argali *Ovis ammon* in western Mongolia and the Altai-Sayan. *Biological Conservation* **121**, 231-41.
- Martin T. G., Kuhnert P. M., Mengersen K. & Possingham H. (2005) The power of expert opinion in ecological models using Bayesian methods: impact of grazing on birds. *Ecological Applications* **15**, 266-80.
- Martin T. G. & Possingham H. (2005) Predicting the impact of livestock grazing on birds using foraging height data. *Journal of Applied Ecology* **42**, 400-8.
- Martinez C. (1991) Patterns of distribution and habitat selection of a great bustard (*Otis tarda*) population in north-western Spain. *Ardeola* **38**, 137-47.

- Martinez C. (1992) Variation in flock size and flock type of great bustard (*Otis tarda*) according to habitat. *Miscellanea Zoologica* **16**, 161-70.
- Martinez C. (1994) Habitat selection by the little bustard *Tetrax tetrax* in cultivated areas of Central Spain. *Biological Conservation* **67**, 125-8.
- Martinez C. (2000) Daily activity patterns of the Great Bustard *Otis tarda*. *Ardeola* **47**, 57-68.
- Matheson W. E. (1978) A further irruption of Native Hens in 1965. *South Australian Ornithologist* **27**, 270-3.
- Mawson P. R. & Long J. L. (1996) Changes in the status and distribution of four species of parrot in the south of Western Australia during 1970-90. *Pacific Conservation Biology* **2**, 191-9.
- McLeod P. J. & Van Cuylenburg H. R. M. (in prep.) *Land Units of the Victoria River District, N.T.* Resource Capability Assessment Branch, Department of Lands, Planning & Environment, Darwin.
- McLeod R. (2004) *Counting the Cost: Impact of Invasive Animals in Australia*. Cooperative Research Centre for Pest Animal Control, Canberra.
- McMillan R. P. (1950) Food of the Bustard. *The Western Australian Naturalist* **2**.
- Meyburg B. U., Eichaker X., Meyburg C. & Paillat P. (1995) Migrations of an adult Spotted Eagle tracked by satellite. *British Birds* **88**, 357-61.
- Meyburg B. U. & Meyburg C. (1998a) Satellite tracking of Eurasian raptors. *Torgos* **28**, 33-48.
- Meyburg B. U. & Meyburg C. (1998b) The study of raptor migration using satellite telemetry: some goals, achievements and limitations. *Biotelemetry* **XIV**, 415-20.
- Montane J., Marco I., Manteca X., Lopez L. & Lavin S. (2002) Delayed acute capture myopathy in three Roe Deer. *J. Vet. Med.* **49**, 93-8.
- Morales M., Jiguet F. & Arroyo B. (2001) Exploded leks: what bustards can teach us. *Ardeola* **48**, 85-98.
- Morales M. B. (1999) *Ecología reproductiva y movimientos estacionales en la avutarda (Otis tarda)*. Tesis Doctoral. Universidad Complutense, Madrid.
- Morales M. B., Alonso J. C., Alonso J. A. & Martin E. (2000) Migration patterns in male great bustards. *Auk* **117**, 493-8.
- Morales M. B., Alonso J. C., Martin C., Martin E. & Alonso J. (2003) Male sexual display and attractiveness in the great bustard *Otis tarda*: the role of body condition. *Journal of Ethology* **21**, 51-6.
- Moreira F. (2004) Distribution patterns and conservation status of four bustard species (Family Otidae) in a montane grassland of South Africa. *Biological Conservation*, 1-10.
- Morgado R. & Moreira F. (2000) Seasonal population dynamics, nest site selection, sex-ratio and clutch size of the Great Bustard *Otis tarda* in two adjacent lekking areas. *Ardeola* **47**, 237-46.
- Morgan G. & Terrey J. (1992) *Nature conservation in western New South Wales*. National Parks Association, Sydney.
- Morton S. R., Short J. & Barker R. D. (2001) *Refugia for biological diversity in arid and semi-arid Australia*. Environment Australia, Canberra.
- Nadeem M. S., Ali F. & Akhtar M. S. (2004) Diet of the Houbara Bustard *Chlamydotis undulata* in Punjab, Pakistan. *Forktail* **20**, 91-3.

- Nilsson A., Lindstrom A., Jonzen N., Nilsson S. G. & Karlsson L. (2006) The effect of climate change on partial migration - the blue tit paradox. *Global Change Biology* **12**, 2014-22.
- Nix H. A. (1976) Environmental control of breeding, post-breeding dispersal and migration of birds in the Australian region. In: *Proceedings of the 16th International Ornithological Congress* (eds H. J. Frith and J. H. Calaby) pp. 272-305. Australian Academy of Sciences, Canberra.
- Noske R. A. & Franklin D. C. (1999) Breeding seasons of land birds in the Australian monsoonal tropics: diverse responses to a highly seasonal environment. *Australian Biologist* **12**, 72-90.
- Oindo B. O. & Skidmore A. K. (2002) Interannual variability of NDVI and species richness in Kenya. *International Journal of Remote Sensing* **23**, 285-98.
- Orgeas J. & Andersen A. N. (2001) Fire and biodiversity: responses of grass-layer beetles to experimental fire regimes in an Australian tropical savanna. *Journal of Applied Ecology* **38**, 49-62.
- Osborne P. E., Al Bowardi M. & Bailey T. A. (1997) Migration of the houbara bustard *Chlamydotis undulata* from Abu Dhabi to Turkmenistan: the first results from satellite tracking studies. *Ibis* **139**, 192-6.
- Osborne P. E. & Alonso J. C. (2000) Building models of avian habitat use at large spatial scales using GIS and remote sensing. In: *4th International Conference on Integrating GIS and Environmental Modelling*, Banff, Alberta, Canada.
- Osborne P. E., Alonso J. C. & Bryant R. G. (2001) Modelling landscape-scale habitat use using GIS and remote sensing: a case study with great bustards. *Journal of Applied Ecology* **38**, 458-71.
- Osborne P. E., Bryant R. G. & Alonso J. C. (1998) Application of a time-series of AVHRR data to mapping the habitat of great bustards in Spain. *Proceedings of the 24th Annual Conference of the Remote Sensing Society*, 136-42.
- Osborne T. & Osborne L. (2001) Ecology of the Kori bustard in Namibia. Annual report of the Ministry of Environment and Tourism Permit Office, Windhoek, Namibia.
- Palacios M., Garzon J. & Castroviejo J. (1975) La gestión en la Reserva de la avutarda (*Otis tarda*) en España, especialmente en primavera. *Ardeola* **21**, 347-406.
- Palmer C. & Woinarski J. C. Z. (1999) Seasonal roosts and foraging movements of the black flying fox (*Pteropus alecto*) in the Northern Territory: resource tracking in a landscape mosaic. *Wildlife Research* **26**, 823-38.
- Parker P. & Bucher D. J. (2000) Seasonal variation in abundance and sex ratio of Grey Nurse (Sand Tiger) Sharks *Carcharias taurus* in northern New South Wales, Australia: a survey based on observations of recreational scuba divers. *Pacific Conservation Biology* **5**, 336-46.
- Parr C. L. & Andersen A. N. (2008) Fire resilience of ant assemblages in long-unburnt savanna of northern Australia. *Austral Ecology* **33**, 830-8.
- Paruelo J. M. & Lauenroth W. K. (1995) Regional patterns of normalized difference vegetation index in North American shrublands and grasslands. *Ecology* **76**, 1888-98.
- Pickup G. (1995) A simple model for predicting herbage production from rainfall in rangelands and its calibration using remotely-sensed data. *Journal of Arid Environments* **30**, 227-45.
- Pickup G., Bastin G. N. & Chewings V. H. (1994) Remote-sensing-based condition assessment for nonequilibrium rangelands under large-scale commercial grazing. *Ecological Applications* **4**, 497-517.
- Pickup G., Chewings V. H. & Nelson D. J. (1993) Estimating changes in vegetation cover over time in arid rangelands using Landsat MSS data. *Remote Sensing of Environment* **43**, 243-64.
- Piersma T. & Lindstrom A. (1997) Rapid reversible changes in organ size as a component of adaptive behaviour. *Trends in Ecology and Evolution* **12**, 134-8.

- Pizzey G. & Knight F. (1997) *The Graham Pizzey and Frank Knight Field Guide to the Birds of Australia*. Harper Collins Publishers, Sydney.
- Ponjoan A., Botab G., García De La Morenac E. L., Morales M., Wolffe A., Marco I. & Manosa S. (2008) Adverse effects of capture and handling Little Bustard. *Journal of Wildlife Management* **72**, 315–9.
- Pope M. L., Lindenmayer D. & Cunningham R. B. (2004) Patch use by the greater glider (*Petauroides volans*) in a fragmented forest ecosystem. I. Home range size and movements. *Wildlife Research* **31**, 559–68.
- Price O. (2003) Draft Conservation Plan for the Daly Basin. Department of Infrastructure, Planning and the Environment, Darwin.
- Price O. & Bowman D. M. J. S. (1994) Fire-stick forestry: a matrix model in support of skilful fire management of *Callitris intratropica* R.T. Baker by north Australian Aborigines. *Journal of Biogeography* **21**, 573–80.
- Price O., Milne D., Connors G., Harwood B., Woinarski J. & Butler M. (2003) *A conservation plan for the Daly Basin Bioregion*. Parks and Wildlife Commission of the Northern Territory, Darwin.
- Price O. F., Woinarski J. C. Z. & Robinson D. (1999) Very large area requirements for frugivorous birds in monsoon rainforests of the Northern Territory, Australia. *Biological Conservation* **91**, 169–80.
- Pulido F. (2007) The genetics and evolution of avian migration. *Bioscience* **57**, 165–74.
- Rappole J. H. (1995) *The Ecology of Migrant Birds*. Washington, Smithsonian Institution Press.
- Recher H. F. (2007) Conservation challenge of dispersive fauna. *Pacific Conservation Biology* **13**, 81–3.
- Recher H. F. & Lim L. (1990) A review of current ideas of the extinction, conservation and management of Australia's terrestrial vertebrate fauna. *Proceedings of the Ecological Society of Australia* **16**, 287–301.
- Reynolds J. S., Schoech S. J. & Bowman R. (2003) Nutritional quality of prebreeding diet influences breeding performance of the Florida scrub-jay. *Oecologia* **134**, 308–16.
- Ridpath M. G. (1985) Ecology in the wet-dry tropics: how different? *Proceedings of the Ecological Society of Australia* **13**.
- Roberts T. J. (1992) *Birds of Pakistan*. Oxford University Press, Karachi.
- Roderick M. L., Farquhar G. D., Berry S. L. & Noble I. R. (2001) On the direct effect of clouds and atmospheric particles on the productivity and structure of vegetation. *Oecologia* **129**, 21–30.
- Roderick M. L., Noble I. R. & Cridland S. (1999) Estimating woody and herbaceous vegetation cover from time series satellite observations. *Global Ecology and Biogeography* **8**, 501–8.
- Rodgers A. R. (2001) Recent Telemetry Technology. In: *Radio Tracking and Animal Populations* (eds J. J. Millsbaugh and J. M. Marzluff). Academic Press, San Diego.
- Rodgers A. R. & Carr A. P. (1998) HRE: The Home Range Extension for ArcView. Ontario Ministry of Natural Resources, Centre for Northern Forest Ecosystem Research, Thunder Bay, Ontario, Canada.
- Rogers D. I., Battley P. F., Sparrow J., Koolhaas A. & Hassell C. J. (2004) Treatment of capture myopathy in shorebirds: a successful trial in northwestern Australia. *Journal of Field Ornithology* **75**, 157–64.
- Rolls E. (1969) *They all ran wild: the story of pests on the land in Australia*. Angus and Robinson, Sydney.
- Rosenstock S. S., Anderson D. R., Giesen K. M., Leukering T. & Carter M. F. (2002) Landbird counting techniques: current practices and an alternative. *Auk* **119**, 46–53.

- Roshier D., Asmus M. & Klaassen M. (2008a) What drives long-distance movements in the nomadic Grey Teal *Anas gracilis* in Australia? *Ibis* **150**, 474-84.
- Roshier D., Doerr V. A. J. & Doerr E. D. (2008b) Animal movement in dynamic landscapes: interaction between behavioural strategies and resource distributions. *Oecologia* **156**, 465-77.
- Roshier D., Klomp N. I. & Asmus M. (2006) Movements of a nomadic waterfowl, Grey Teal *Anas gracilis*, across inland Australia—results from satellite telemetry spanning 15 months. *Ardea* **94**, 461-75.
- Roshier D. & Reid J. (2003) On animal distributions in dynamic landscapes. *Ecography* **26**, 539-44.
- Roshier D., Robertson A., Kingsford R. T. & Green D. G. (2001a) Continental-scale interactions with temporary resources may explain the paradox of large populations of desert waterbirds in Australia. *Landscape Ecology* **16**, 547-56.
- Roshier D., Whetton P. H., Allan R. J. & Robertson A. I. (2001b) Distribution and persistence of temporary wetlands in arid Australia in relation to climate. *Austral Ecology* **26**, 371-84.
- Roshier D. A., Robertson A. I. & Kingsford R. T. (2002) Responses of waterbirds to flooding in an arid region of Australia and implications for conservation. *Biological Conservation* **106**, 399-411.
- Rowley I. (1975) *Bird life*. Collins, Sydney.
- Russell-Smith J. (1991) Classification, species richness, and environmental relations of monsoon rain forest in northern Australia. *Journal of Vegetation Science* **2**, 259-78.
- Russell-Smith J. & Bowman D. M. J. S. (1992) Conservation of monsoon rainforest isolates in the Northern Territory, Australia. *Biological Conservation* **59**, 51-63.
- Russell-Smith J., Ryan P. G. & Durieu R. (1997) A LANDSAT MSS-derived fire history of Kakadu National Park, monsoonal northern Australia, 1980-94: seasonal extent, frequency and patchiness. *Journal of Applied Ecology* **34**, 748-66.
- Russell-Smith J., Ryan P. G., Klessa D., Waight G. & Harwood R. (1998) Fire regimes, fire-sensitive vegetation and fire management of the sandstone Arnhem Plateau, monsoonal northern Australia. *Journal of Applied Ecology* **35**, 829-46.
- Salamolard M. & Moreau C. (1999) Habitat selection by Little Bustard *Tetrax tetrax* in a cultivated area of France. *Bird Study* **46**, 25-33.
- Saunders D. (1993) A community-based observer scheme to assess avian responses to habitat reduction and fragmentation in south-western Australia. *Biological Conservation* **64**, 203-18.
- Schulz H. (1985) A review of the world status and breeding distribution of the Little Bustard. *Bustard Studies* **2**, 131-52.
- Seddon P. J. & Van Heezik Y. (1996) Seasonal changes in Houbara bustard *Chlamydotis undulata macqueenii* numbers in Harrat al Harrah, Saudi Arabia: Implications for managing of remnant population. *Biological Conservation* **75**, 139-46.
- Serneels S. & Lambin E. F. (2001) Impact of land-use changes on the wildebeest migration in the northern part of the Serengeti-Mara ecosystem. *Journal of Biogeography* **28**, 391-407.
- Serventy D. L. (1971) Biology of desert birds. In: *Avian Biology* (eds D. S. Farner and J. R. King) pp. 287-339. Academic Press, New York.
- Serventy D. L. & Whittell H. M. (1976) *Birds of Western Australia*. University of Western Australia, Perth.
- Sharp B. R. & Bowman D. M. J. S. (2004) Net woody vegetation increase confined to seasonally inundated lowlands in an Australian tropical savanna, Victoria River District, Northern Territory. *Austral Ecology* **29**, 667-83.

- Sharp B. R. & Whittaker R. J. (2003) The irreversible cattle-driven transformation of a seasonally flooded Australian savanna. *Journal of Biogeography* **30**, 783-802.
- Shepherd N. C., Hopwood P. R. & Dostine P. L. (1988) Capture myopathy: two techniques for estimating its prevalence and severity in red kangaroos, *Macropus rufus*. *Australian Wildlife Research* **15**, 83-90.
- Sibley C. G. & Ahlquist J. E. (1990) *Phylogeny and Classification of Birds*. Yale University Press, New Haven.
- Silva J. P., Faria N. & Catry T. (2007) Summer habitat selection and abundance of the threatened little bustard in Iberian agricultural landscapes. *Biological Conservation* **139**, 186-94.
- Silva J. P., Pinto M. & Palmeirim J. M. (2004) Managing landscapes for the little bustard *Tetrax tetrax*: lessons from the study of winter habitat selection. *Biological Conservation* **117**, 521-8.
- Simmons R. E., Barnard P. & Jamieson I. G. (1998) What precipitates influxes of wetland birds to ephemeral pans in arid landscapes? Observations from Namibia. *Ostrich* **70**, 145-8.
- Sinclair A. R. E. (1984) The function of distance movements in vertebrates. In: *The Ecology of Animal Movement* (eds I. R. Swingland and P. J. Greenwood). Clarendon Press, Oxford.
- Snow D. W. (1985) Lek. In: *A dictionary of birds* (eds B. Campbell and E. Lack) pp. 326-8. T. & A.D. Poyser, Carlton, England.
- Soule M. E., Mackey B. G., Recher H. F., Williams J. E., Woinarski J. C. Z., Driscoll D., Dennison W. C. & Jones M. E. (2004) The role of connectivity in Australian conservation. *Pacific Conservation Biology* **10**, 266-79.
- Spraker T. R., Adrian W. J. & Lance W. R. (1987) Capture myopathy in wild turkeys (*Meleagris gallopavo*) following trapping, handling and transportation in Colorado. *Journal of Wildlife Diseases* **23**, 447-53.
- Stafford Smith D. M. & Morton S. R. (1990) A framework for the ecology of arid Australia. *Journal of Arid Environments* **18**, 255-78.
- Statsoft. (2003) STATISTICA v.6.1. Statsoft Inc., Tulsa.
- Stephens D. W. & Krebs J. R. (1986) *Foraging Theory*. Princeton University Press, Princeton, N.J.
- Stirrat S. C. (2002) Foraging ecology of the agile wallaby (*Macropus agilis*) in the wet-dry tropics. *Wildlife Research* **29**, 347-61.
- Stirrat S. C. (2004) Activity budgets of the agile wallaby, *Macropus agilis*. *Australian Journal of Zoology* **52**, 49-64.
- Stokes D. L. & Boersma P. D. (1998) Satellite tracking of Magellanic penguin migration. *Condor* **100**, 376-81.
- Storr G. M. (1967) List of Northern Territory Birds. *Special Publication of the West Australian Museum* **4**.
- Storr G. M. (1984) Revised list of Queensland birds. *Records of the Western Australian Museum Supplement* **19**, 1-189.
- Streich W. J., Litzbarski H., Ludwig B. & Ludwig S. (2005) What triggers facultative winter migration of Great Bustard (*Otis tarda*) in Central Europe? *European Journal of Wildlife Research* **52**, 48-53.
- Stutchbury B. J. M. & Morton E. S. (2001) *Behavioural Ecology of Tropical Birds*. Academic Press, London.
- Suarez-Seoane S., Osborne P. E. & Alonso J. C. (2002) Large-scale habitat selection by agricultural steppe birds in Spain: identifying species-habitat responses using generalized additive models. *Journal of Applied Ecology* **39**, 755-71.
- Szabo J., Astheimer L., Story P. & Buttemer B. (2003) An ephemeral feast: birds, locusts and pesticides. *Wingspan* **13**, 10-5.

- Tarboton W. R. (1989) Breeding behaviour of Denham's bustard *Bustard Studies* **4**, 160-9.
- Taylor J. A. & Tulloch D. (1985) Rainfall in the wet–dry tropics: extreme events at Darwin and similarities between years during the period 1870–1983 inclusive. *Australian Journal of Ecology* **10**, 281–95.
- Team R. D. C. (2003) *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria.
- Terrill S. B. & Able K. P. (1988) Bird migration terminology. *Auk* **105**, 205-6.
- Thomas L., Laake J. L., Strindberg S., Marques F. F. C., Buckland S. T., Borchers D. L., Anderson D. R., Burnham K. P., Hedley S. L., Pollard J. H., Bishop J. R. B. & Marques T. A. (2005) Distance 5.0. Release “x”1. Research Unit for Wildlife Population Assessment, University of St. Andrews, UK.
- Tigar B. J. & Osborne P. E. (2000) Invertebrate diet of the houbara bustard *Chlamydotis undulata macqueeni* in Abu Dhabi from calibrated faecal analysis. *Ibis* **142**, 466-75.
- Tourenq C., Combreau O., Lawrence M. & Launay F. (2004) Migration patterns of four Asian Houbara *Chlamydotis macqueeni* wintering in the Cholistan Desert, Punjab, Pakistan. *Bird Conservation International* **14**, 1-10.
- Tourenq C., Combreau O., Lawrence M., Pole S. B., Spalton A., Xinji G., Baidani M. A. & Launay F. (2005) Alarming houbara bustard population trends in Asia. *Biological Conservation* **121**, 1-8.
- Uttley J. D., Walton P., Monaghan P. & Austin G. (1994) The effects of food abundance on breeding performance and adult time budgets of Guillemots *Uria aalge*. *Ibis* **136**, 205-13.
- Van Dam R. A., Walden D. J. & Begg G. W. (2002) A preliminary risk assessment of cane toads in Kakadu National park. Supervising Scientist Report 164, Darwin.
- Van Heezik Y. & Seddon P. J. (1999) Seasonal changes in habitat use by Houbara Bustards *Chlamydotis (undulata) macqueeni* in northern Saudi Arabia. *Ibis* **141**, 208-15.
- Verlinden A. & Gavor I. K. N. (1998) Satellite Tracking of Elephants in Northern Botswana. *African Journal of Ecology* **36**, 105-16.
- Vigilante T. & Bowman D. M. J. S. (2004) Effects of individual fire events on the flower production of fruit-bearing tree species, with reference to Aboriginal people's management and use, at Kalumburu, North Kimberley, Australia. *Australian Journal of Botany* **52**, 405-15.
- Village A. (1982) The home range and density of kestrels in relation to vole abundance. *Journal of Animal Ecology* **51**, 413-28.
- Vines R. G., Noble J. C. & Marsden S. G. (2004) Australian rainfall patterns and the southern oscillation. 1. A continental perspective. *Pacific Conservation Biology* **10**, 28-48.
- Wallraff H. G. (2004) Avian olfactory navigation: its empirical foundation and conceptual state. *Animal Behaviour* **67**, 189-204.
- Ward D. (2008) *The Biology Of Deserts*. Oxford University Press, USA.
- Ward P. (1971) The migration patterns of *Quelea quelea* in Africa. *Ibis* **113**, 275-97.
- Webster M. S., Marra P. P., Haig S. M., Bensch S. & Holmes R. T. (2002) Links between worlds: unraveling migratory connectivity. *Trends in Ecology and Evolution* **17**, 76-83.
- Westcott D. A. (1993) Habitat characteristics of lek sites and their availability for the Ochre-Bellied Flycatcher, *Mionectes oleagineus*. *Biotropica* **25**, 444-51.
- White C. G. & Garrott R. A. (1990) *Analysis of wildlife radio-tracking data*. Academic Press, San Diego.

- Whitehead P. J. (1998) Dynamics of habitat use by the Magpie Goose *Anseranas semipalmata*: implications for conservation management. In: *School of Biological Sciences* p. 380. Northern Territory University, Darwin.
- Widemo F. (1997) The social implications of traditional use of lek sites in the ruff *Philomachus pugnax*. *Behavioral Ecology* **8**, 211-7.
- Williams R. J., Duff G. A., Bowman D. M. J. S. & Cook G. D. (1996) Variation in the composition and structure of tropical savannas as a function of rainfall and soil texture along a large-scale climatic gradient in the Northern Territory, Australia. *Journal of Biogeography* **23**, 747-56.
- Williams R. J., Griffiths A. D. & Allan G. E. (2002) Fire regimes and biodiversity in the savannas of northern Australia. In: *Flammable Australia* (eds R. A. Bradstock, J. E. Williams and A. M. Gill) pp. 281-304. Cambridge University Press, Cambridge.
- Williams R. J., Myers B. A., Eamus D. & Duff G. A. (1999) Reproductive phenology of woody species in a tropical savanna near Darwin, northern Australia. *Biotropica* **31**, 626-36.
- Wilson A. D. (1990) The effect of grazing on Australian ecosystems. *Proceedings of the Ecological Society of Australia* **16**, 235-44.
- Woinarski J. C. Z. (1990) Effects of fire on the bird communities of tropical woodlands and open forests in northern Australia. *Australian Journal of Ecology* **15**, 1-22.
- Woinarski J. C. Z. (1999) Fire and Australian birds: a review. In: *Australia's Biodiversity - Responses to Fire* (eds A. M. Gill, J. C. Z. Woinarski and A. York). Environment Australia, Canberra.
- Woinarski J. C. Z. (2006) Predictors of nomadism in Australian birds: a re-analysis of Allen and Saunders (2002). *Ecosystems* **9**, 689-93.
- Woinarski J. C. Z. (2008) Tropical Savannas. In: *10 key issues in Australia's biodiversity conservation* (eds D. Lindenmayer, S. Dovers, M. H. Olson and S. Morton). CSIRO, Melbourne.
- Woinarski J. C. Z., Andersen A. N., Churchill T. B. & Ash A. J. (2002) Response of ant and terrestrial spider assemblages to pastoral and military land use, and to landscape position, in a tropical savanna woodland in northern Australia. *Austral Ecology* **27**, 324-33.
- Woinarski J. C. Z., Brock C., Armstrong M., Hempel C., Cheal D. & Brennan K. (2000a) Bird distribution in riparian vegetation in the extensive natural landscape of Australia's tropical savanna: a broad-scale survey and analysis of a distributional data base. *Journal of Biogeography* **27**, 843-68.
- Woinarski J. C. Z., Brock C., Fisher A., Milne D. & Oliver B. (1999) Response of birds and reptiles to fire regimes on pastoral land in the Victoria River District, Northern Territory. *Rangeland Journal* **21**, 24-38.
- Woinarski J. C. Z., Connors G. & Franklin D. C. (2000b) Thinking honeyeater: nectar maps for the Northern Territory, Australia. *Pacific Conservation Biology* **6**, 61-80.
- Woinarski J. C. Z., Mackey B., Nix H. A. & Traill B. (2007a) *The Nature of Northern Australia: natural values, ecological processes and future prospects*. ANU e-press, Canberra.
- Woinarski J. C. Z., Pavey C., Kerrigan R., Cowie I. & Ward S. (2007b) *Lost from Our Landscape: Threatened Species of the Northern Territory*. Northern Territory Government, Darwin.
- Woinarski J. C. Z. & Recher H. F. (1997) Impact and response: A review of the effects of fire on the Australian avifauna. *Pacific Conservation Biology* **3**, 183-205.
- Woinarski J. C. Z. & Tidemann S. C. (1991) The bird fauna of deciduous woodland in the wet-dry tropics of Northern Australia. *Wildlife Research* **18**, 479-500.

- Woinarski J. C. Z., Whitehead P. J., Bowman D. M. J. S. & Russell-Smith J. (1992) Conservation of mobile species in a variable environment: the problem of reserve design in the Northern Territory, Australia. *Global Ecology and Biogeography Letters* **2**, 1-10.
- Woinarski J. C. Z., Williams R. J., Price O. & Rankmore B. (2005) Landscapes without boundaries: wildlife and their environments in northern Australia. *Wildlife Research* **32**, 377-88.
- Worton B. J. (1987) A review of models of home range for animal movement. *Ecological Modelling* **38**, 277-98.
- Wyndham E. (1978) Birds of the Milparinka District and Cooper Creek Basin. *Emu* **78**, 179-87.
- Wyndham E. (1983) Movements and breeding seasons of the budgerigar. *Emu* **82 (suppl.)**, 276-82.
- Yang W. K., Qiao J. F., Combreau O., Gao X. Y. & Zhong W. Q. (2002) Display-sites selection by houbara bustard (*Chlamydotis [undulata] macqueenii*) in Mori, Xinjiang, People's Republic of China. *Journal of Arid Environments* **51**, 625-31.
- Zeileis A., Kleiber C. & Jackman S. (2008) Regression models for count data in R. *Journal of Statistical Software* **27**, 1-25.
- Ziembicki M. (2007) Australian Bustard. In: *Lost from our Landscape: Threatened species of the Northern Territory* (eds J. Woinarski, C. R. Pavey, R. Kerrigan, I. Cowie and S. Ward) pp. 184-5. Northern Territory Department of Natural Resources, Environment and the Arts, Darwin.
- Ziembicki M. & Woinarski J. C. Z. (2007) Monitoring continental movement patterns of the Australian Bustard *Ardeotis australis* through community-based surveys and remote sensing. *Pacific Conservation Biology* **13**, 128-42.
- Zink R. M. (2003) Towards a framework for understanding the evolution of avian migration. *Journal of Avian Biology* **33**, 433 - 6.

Appendices



APPENDIX 1: Morphological measurements for selected features of bustards captured during the study. Note that number of measurements (n) differs between features because of variable handling times of individuals. Reference is made to satellite tracked individuals at the base of each table with the 5 digit number referring to transmitter unit number (see Chapter 8).

FEMALE	Weight (kg)	Head-Bill (mm)	Beak length (mm)	Wing length (mm)	Tail length (mm)	Tarsus with foot (mm)	Tarsus (mm)
1	2.4	142	58	430	200	151	
2	4.2	147	65	470	215		
3	3.9	145		475	221	160	
4	2.6	155		420	215	168	
5*	3.7	157	68	470	220	176	155
6				505		156	
7	3.4	145		440	228	161	146
8	3.1	147		490	221	158	143
9	2.6	154		458	224	162	145
10	3.1	138			224	153	136
11	3.2	145		450	230	153	144
12	3.8	160		460	225	165	148
13	3.3	152		510	228	170	154
14	2.9	145	54	440	230	175	156
15*	3.3	149	60	475	232	165	156
N	14	14	5	14	14	14	10
Mean	3.2	148.6	61.0	463.8	222.4	162.4	148.3
SE	0.1	1.6	2.5	7.1	2.2	2.1	2.1
Range	2.4 - 4.2	138 - 160	54 - 68	420 - 510	200 - 232	151 - 176	136 - 156

(*Female #5 = 47734; Female #15 = 42548; note that no measurements taken for Female 42546).

MALE	Weight (kg)	Head-Bill (mm)	Beak length (mm)	Wing length (mm)	Tail length (mm)	Tarsus with foot (mm)	Tarsus (mm)
1	4.3	170	75	512	245	191	
2*	6.7	190					
3	8.4	205	87	610	275	210	
4	4.9	175		583	259		
5	9.3	220	95	620	270	225	
6	8.9	210		580	280	223	
7	7.4	185		613	267	218	
8	6.1	187		595	258	223	
9		195		610	270	215	
10*		198			270		
11	4.9	181	80	640	279	218	
12	6.3	176		610	278	213	190
13	5.0	154		510	215	201	182
14	7.4	174		620	255	204	174
15	3.6	177	78	595	215	215	
16	5.5	192	80	550	282	204	186
17*	6.4	180		609	275	213	194
18	5.2	174		545	264	207	186
19	6.4	176		603	265	205	185
n	17	19	6	17	18	16	7
Mean	6.3	185.2	82.5	588.5	262.3	211.6	185.3
SE	0.4	3.6	3.0	9.2	4.6	2.3	2.4
Range	4.3 - 9.3	170 - 220	75 - 95	512 - 640	215 - 282	191 - 225	174 - 194

(*Male #2 = 42540; Male #10 = 42541; Male #17 = 42539; note that no measurements taken for Male 47735).

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