

**BRYAN F.J. MANLY, Senior Biometrician**



## EDUCATION

BSc DSc City University, London, Chartered Statistician (Royal Statistical Society, London).

## PROFESSIONAL EXPERIENCE

2000-Present *Senior Biometrician*, Western EcoSystems Technology, Inc., Cheyenne, Wyoming  
 1988 *Visiting Professor*, University of Wyoming, Laramie, Wyoming  
 1987-2000 *Chair of Statistics*, University of Otago, Dunedin, New Zealand  
 1983-1986 *Associate Professor*, University of Otago, Dunedin, New Zealand  
 1981 *Visiting Associate Professor*, Louisiana State University, Baton Rouge, Louisiana  
 1973-1982 *Senior Lecturer*, University of Otago, Dunedin, New Zealand  
 1971-1973 *Lecturer in Statistics*, University of Papua New Guinea  
 1967-1970 *UK Assistant Lecturer in Mathematics*, University of Salford, Salford, United Kingdom  
 1966-1967 *Statistician*, Fisons Ltd., Felixstowe, Suffolk, England

## DISTINCTIONS

Awarded the title *Distinguished Statistical Ecologist* at the 6th International Congress of Ecology, Manchester, 1994, for 'outstanding contributions to the development of basic concepts and applications of statistical ecology'.  
 Elected *Fellow of the Royal Society of New Zealand* (the equivalent of a national academy of science), 1994.  
 Included in *Men of Achievement, Who's Who in New Zealand, Who's Who in Asia and the Pacific Nations, The Dictionary of International Biography, Who's Who in the World, Who's Who in Science and Engineering, Who's Who in America*, and *Strathmore's Who's Who*.  
 Appointed Adjunct Professor of Statistics, University of Wyoming, Laramie, Wyoming (2001-Present).

## PROFESSIONAL SUMMARY

### **Administrative Experience:**

University of Papua and New Guinea: Faculty of Arts Standing Committee, 1972-3.  
 University of Otago: Computer Committee, 1979-81; Science Faculty Committee on the Future of Computer Science, 1980; Chairman of the Lecture Theatres and Timetables Committee, 1990-2; Division of Academic Services, Management Committee member and Board Member, 1990-2; Convener of the Economics Department Review Committee, 1994; Science Division representative to the Senate, 1995-; Science Division Working Party on an MSc in environmental science (1995-); Committee on Personal Chairs (1995); Appointment Committee, Director of Sensory Science (1995); Director of the Centre for Applications of Statistics and Mathematics (1986-present); Head of Department of Mathematics and Statistics (July 1995-January 1996), and Acting Head for numerous shorter periods; Science Division Staffing Committee (1997-2000); Convener of the Botany Department Review Committee (1999).  
 International Biometric Society: Council Member, 1980-83; Secretary for the Australasian region, 1984-5; Committee Member for Australasian region, 1986-7; Committee on Print and Electronic Publication of *Biometrics*, 2002.  
 New Zealand Statistical Association: Survey Appraisal and Public Questions Committee, 1986-7; Executive Committee, 1986-8.  
 Otago Branch of the Royal Society of New Zealand: Council Member, 1991; Treasurer, 1992-5.  
 Conference organization: Secretary, First Pacific Statistical Congress, Auckland, 1985; Local Organizer, 3rd International Conference on Teaching Statistics, Dunedin, 1990; Chairman, Conference on Statistics in Ecology and Environmental Monitoring, Dunedin, 1993, 1996, 1999; Chairman of Programme Committee, A.C. Aitken Centenary Conference, Dunedin, 1995; Chairman, Conference on Statistical Aspects of Risk Assessment, Dunedin, 1996; Session Organizer, 20th International Congress on Entomology, Florence, 1996; Convener, New Zealand Vice-Chancellors' Subject Conference in Statistics, Wellington, 1996; Programme Committee, Statistical Ecology Sessions, 7th International Congress of Ecology, Italy, 1998; Session Organizer, WNAR Biometric Society meeting, Seattle, 1999; Programme Committee Member, International Biometric Conference, Germany, 2002; Programme Committee, First International Conference on Resource Selection by Animals, University of Wyoming, January 2003; Programme Committee, Computational Environmetrics Workshop, Chicago, October 2004; Programme Committee, 9th School of Regression Models, Sao Pedro, Brazil, 2005..  
 Consulting: Recent projects include work for the New Zealand Department of Conservation and the US National Marine Fisheries Service on the design and analysis of observer programs to monitor the bycatch of bird and mammal species during commercial fishing operations, for the New Zealand Ministry of Fisheries on the design and analysis of shellfish surveys, for the Interagency Environmental Program, Sacramento, California, on data related to the recent apparent decline in pelagic fish in the Sacramento-San Joaquin delta, and for the San Luis and Delta-Mendoza Water Authority, California, on numerous issues related to their operations.

**Consulting Experience:** My consulting experience is very extensive, covering a period of over 30 years. It includes the management of the University of Otago Centre for Applications of Statistics and Mathematics for 10 years. This Centre provides assistance to staff and students from all departments in the university and also contracts to do work for government departments and other outside organizations. More recently I have been a full time consultant working on a wide variety of projects in the environmental and ecological area, particularly in relationship to the bycatch or marine mammals and birds during commercial fisheries operations, and river management issues in California, USA.

**Editorial Work:**

Editor, *Journal of Agricultural, Biological and Environmental Statistics* (1999-2002, Associate Editor, 1996-8). This is one of the major international statistical journals owned by the American Statistical Association and the International Biometrics Society. As Editor I had full responsibility for the content of the journal, aided by a team of Associate Editors.

Editor, Population and Community Biology Series, Chapman and Hall, London (1993-2000). This series published several books each year, with an emphasis on quantitative approaches to problems.

Edited Conference Proceedings: *Proceedings of the First Pacific Statistical Congress*, North-Holland, with I. Francis and F. Lam (1985); *Estimation and Analysis of Insect Populations*, Springer-Verlag, with L.L. McDonald, J. Lockwood and J. Logan (1989); *Statistics in Ecology and Environmental Monitoring*, University of Otago Press, with D. Fletcher (1994); *Population and Community Ecology for Insect Management and Conservation*. Balkema, Rotterdam, with J. Baumgärtner, J. and P. Brandmayr (1998); *Statistics in Ecology and Environmental Monitoring 2: Decision Making and Risk Assessment in Biology*, University of Otago Press, with D. Fletcher and L. Kavalieris, (1998); *Marine Mammal Survey and Assessment Methods*, Balkema, Rotterdam, with Garner, G.W., Amstrup, S.C., Laake, J.L., Manly, B.F.J., McDonald, L.L. and Robertson, D.G. (1999).

Other: Editorial Board Member, *Environmental and Ecological Statistics* (1991-), *Journal of Animal Ecology* (1999-2005), *Population Ecology* (1999-); Associate Editor, *Environmetrics* (1996-), *Australian and New Zealand Journal of Statistics* (2004-), *Journal of Animal Ecology* (2005-).

*The Handbook of Capture-Recapture Methods edited with S.C. Amstrup and T.L. McDonald (Princeton University Press, 2005) received the Wildlife Society's award in the Outstanding Edited Book category in 2007.*

**Examining:**

BSc External examiner for the BSc honours programme, Institute of Statistics and Operational research, Victoria University, Wellington, New Zealand.

MSc University of Otago Internal Examiner for the Department of Marine Science (1995); University of Auckland, New Zealand (1998).

PhD University of Waterloo, Canada (1988); Lincoln University, New Zealand (1993, 1999); University of Otago Internal Examiner for the Department of Botany (1993, 1996) and Clothing and Textile Centre (1995, 1999); Banares Hindu University, India (1994, 1995, 2003, 2006); Massey University, New Zealand (1995); University of Canterbury, New Zealand (1996); University of British Columbia, Canada (1996); University of Sydney, Australia (1998); Macquarie University, Australia (2003); University of Alberta, Canada (2004); University of Otago, New Zealand (2004, 2006).

**Government Representation:** From 1996-2000 I was a representative for the New Zealand government at meetings of the *Commission for the Conservation of Antarctic Marine Living Resources* (CCAMLR), an international organization involving 28 countries that is charged with monitoring and managing the Antarctic marine ecosystem. The meetings attended so far have been: the Statistics Subgroup of the Working Group on Ecosystem Monitoring and Management, Cambridge, UK, 8-10 May 1996, and La Jolla, California, 14-18 July, 1997; and the Workshop on Acoustics, Geostatistics and Survey Design, Bergen, Norway, 23-24 August 1996. Involvement with CCAMLR has led to joint work with Drs Judy Clarke and Knowles Kerry of the Australian Antarctic Division, Tasmania, on foraging strategies of Adélie penguins on Bechervaise Island and Edmonson Point, and with Mr Alistair Murray of the British Antarctic Survey, Cambridge, U.K. on alternative designs for krill surveys.

**Research Interests:** My current research interests are primarily in the areas of ecological and environmental statistics and computer-intensive methods. In particular these interests cover (i) the analysis of data on resource selection by animals; (ii) computer-intensive methods for detecting and describing structure in ecological communities; (iii) the development of randomization tests for analysis of variance situations where variances change; (iv) cumulative sum (CUSUM) methods for environmental monitoring; (v) the development of methods for analysing data on the incidental bycatch of marine mammals and birds during fisheries operations, and management procedures to ensure that bycatch levels are low enough to have negligible effects on the mammal and bird populations; and (vi) the sample design and analysis of ecological studies.

**Teaching Experience:** I have taught most topics in statistics and probability at all undergraduate levels, and also first year algebra and calculus. I have very considerable experience at course design and the development of new courses. The books *Multivariate Statistical Methods: a Primer*, *The Design and Analysis of Research Studies*, and *Statistics for Environmental Science and Management* (see below) are all based on my course notes. In addition, I have spent a good deal of time on the design and presentation of courses for practicing scientists (see the section on Workshops, below). Internet Courses: Two internet courses are run for Statistics.Com. A course on environmental statistics covering the material in *Statistics for Environmental Science and Management* was started in 2004, and repeated in 2005 and 2006. A course on ecological sampling was started in 2007.

**RESEARCH STUDENTS**

- S.F. Crosbie, *Mathematical Modelling of Capture-Mark-Recapture Data*, PhD awarded 1979.
- C. Chatterjee, *Mark-Recapture Analysis Allowing for Animal Movement*, PhD started 1985, Still incomplete due to illness.
- J. Brown, *Adaptive Sampling in Ecology*, PhD awarded 1996.
- R.J. Barker, *Analysis of Mark-Recapture Data with Population Modelling*, PhD (Massey University) awarded 1996.
- J. Alsop, *Stability of Ecological Time Series*, PhD awarded 1998.
- C. Lamon, *Quantitative Assembly Rules for Plant Communities*, PhD started 1995.
- J. McKenzie, *The Power of Tests of Species Association*, MSc awarded 1999.
- K. A. Walshe, *The Fisheries Individual Transferable Quota System*, PhD (University of Auckland) started 1998.
- J. Navarone, *Statistical Problems in Community Ecology*, PhD started 1998.
- J.M. Akroyd, *Investigation into Enhancement of Toheroa Populations on a North Island West Coast Beach, New Zealand*, MSc (University of Auckland) started 1999.
- S.E. Nielsen, *From Individual Bears to Populations: the Spatio-Temporal Selection of Resources by Grizzly Bears and a Habitat Based Spatially Explicit Population Viability Model*, PhD (University of Alberta), awarded 2004.
- E. Regehr, *Polar Bears in the Beaufort Sea*, PhD (University of Wyoming), started 2002.

**BOOKS**

- Randomization, Bootstrap and Monte Carlo Methods in Biology*, Chapman and Hall, London (1st edition 1991, 2nd edition 1997, 3rd edition 2006), 300 pages, was the first introduction to this developing area for biologists.
- "... an excellent introduction ...", D.J. Balding, *International Statistical Institute Short Book Reviews*, 1991; "... I recommend this book to all consulting statisticians ...", R.V. Foutz, *Journal of the American Statistical Association*, 1992; "... an exciting text full of surprises ...", A. Pewsey, *The Statistician*, 1992; "... biologists who use statistics in their research should clearly read and consult this book ...", R.R. Sokal, *Quarterly Review of Biology*, 1992; "... it deserves a wide readership ...", O. Mayo, *Biometrics*.
- Multivariate Statistical Methods: a Primer*, Chapman and Hall, London (1st edition 1986, 2nd edition 1994, 3rd Edition 2004), 225 pages., Japanese edition (1992).
- "... it is a pleasure to recommend the book ...", F. Critchley, *International Statistical Institute Short Book Reviews*, 1987; "... a good, well-written summary ...", P.A. Lachenbruch, *Biometrics*, 1987; "... would make an admirable addition to the personal library ...", R.G. Brereton, *Chemometrics and Intelligent Laboratory Systems*, 1987; "... the best overall treatment ... that I recall ...", L.M. Van Valen, *Evolutionary Theory*, 1988.
- Resource Selection by Animals: Statistical Design and Analysis for Field Studies*, Chapman and Hall, London (1st Edition 1993, 2nd Edition 2002), written with L.L. McDonald and others, provides a general framework for the study of how animals select their resources.
- "... if resource selection is the mainstay of your work then you should put this book near the top of your list ...", A.J. Davis, *Journal of Animal Ecology*, 1994.
- Statistics for Environmental Science and Management*, Chapman and Hall/CRC, Boca Raton, Florida (2001), 326 pages.
- "This book will do much to promote good statistical practice in environmental matters, an area of worldwide concern", J.M. Juritz, *International Statistical Institute Short Book Reviews*, 2001.
- The Design and Analysis of Research Studies*, Cambridge University Press, Cambridge (1992), 350 pages., is a general introduction to statistics in research for biologists and social scientists. Japanese edition 1995.
- "... an excellent introductory source of information on a large number of subjects ...", T. Sherratt, *Journal of Experimental Botany*, 1992; "... a stimulating book that can be recommended to graduate students and scientists ...", H. Bjorsson, *Biometrics*, 1993; "... a clearly written practical guide on how to design research studies, analyse quantitative data, and interpret the results", S.P. Ferraro, *Quarterly Review of Biology*, 1993; "... a valuable review and introduction to novel analytical approaches finding increasing use ...", J.A. Rosenheim, *Mathematical Biosciences*, 1994.
- Stage-Structured Populations: Sampling, Analysis and Simulation*, Chapman and Hall, London (1990), 200 pages, is a summary of research over a 10 year period.
- "... all the chapters are excellent ...", *British Ecological Society Bulletin*, 1990; "... a valuable source of techniques ...", H.C.J. Godfray, *Bulletin of Ecological Research*, 1990; "... a must for all libraries serving strong graduate ecology programs ...", R.E. Thibault, *Choice*, 1990; "... anyone seriously interested in estimating population parameters should consult this book ...", W.J.A. Volley, *Bulletin of the Entomological Society of Canada*, 1992; "... very rewarding for graduate students and senior investigators ...", Meagher, *Ecology*, 1992.
- The Statistics of Natural Selection on Animal Populations*, Chapman and Hall, London (hardback 1985, paperback 1987), 500 pages, is a summary of research over a 15 year period on this topic.
- "... a book of great importance to research workers at all levels ...", R.M. Cormack, *British Book News*, 1986; "... invaluable to any student of natural selection ...", S.J. Arnold, *Science*, 1986; "... highly recommended to researchers ...", D. Schluter, *Ecology*, 1987; "... an essential bargain ...", J. Travis, *Quarterly Review of Biology*, 1986; "... I can enthusiastically recommend it to statisticians ...", R.D. Cook, *Journal of the American Statistical Association*, 1987;

"... should certainly be read by all interested in ecological genetics ...", J.N. Elliot, *Journal of Animal Ecology*, 1987.

### JOURNAL ARTICLES, REFEREED PROCEEDINGS AND BOOKS

- Manly, B.F.J.** (1967). An approximate method for calculating the average sample number in certain sequential tests. *Journal of the Royal Statistical Society A130*: 239-43.
- Manly, B.F.J.** and Parr, M.J. (1968). A new method for estimating population size, survivorship, and birth rate from capture-recapture data. *Transactions of the Society for British Entomology* 18: 81-9.
- Manly, B.F.J.** (1969). Approximations to the characteristics of some sequential tests. *Biometrika* 56: 203-6.
- Manly, B.F.J.** (1969). On a method of estimation using capture-recapture data. *Entomologist* 102: 117-20.
- Manly, B.F.J.** (1969). Some properties of a method for estimating the size of an animal population. *Biometrika* 56: 407-10.
- Popham, E.J. and **Manly, B.F.J.** (1969). Geographical distribution of the Dermoptera and the continental drift hypothesis. *Nature* 222: 981-2.
- Manly, B.F.J.** (1970). The choice of a Wald test on the mean of a normal distribution. *Biometrika* 57: 91-5.
- Manly, B.F.J.** (1970). On the distribution of the decisive sample number of certain sequential tests. *Biometrika* 57: 367-76.
- Manly, B.F.J.** (1970). A simulation study of animal population estimation using the capture-recapture method. *Journal of Applied Ecology* 7: 13-39.
- Manly, B.F.J.** (1971). Estimates of a marking effect with capture-recapture sampling. *Journal of Applied Ecology* 8: 181-9.
- Manly, B.F.J.** (1971). A simulation study of Jolly's method for analysing capture-recapture data. *Biometrics* 27: 415-24.
- Manly, B.F.J.** (1972). The application of a Wald-type sequential test with particular reference to acceptance sampling situations. *New Journal of Statistics and Operational Research* 7: 1-12.
- Manly, B.F.J.** (1972). Tables for the analysis of selective predation experiments. *Researches on Population Ecology* 14: 74-81.
- Manly, B.F.J.**, Miller, P. and Cook, L.M. (1972). Analysis of a selective predation experiment. *American Naturalist* 106: 719-36.
- Manly, B.F.J.** (1972). Estimating selective values from field data. *Biometrics* 28: 1115-25.
- Manly, B.F.J.** (1973). A computer program for the method of successive intervals. *Educational and Psychological Measurement* 33: 171-3.
- Manly, B.F.J.** and G.A.F. Seber (1973). Animal life tables from capture-recapture data. *Biometrics* 29: 487-500.
- Manly, B.F.J.** (1973). Estimating survivorship from the recaptures of animals first released at age zero. *Biometrie Praximetrie* 13: 1-14.
- Manly, B.F.J.** (1973). Validity of the quadratic fitness function. *Nature New Biology* 242: 128.
- Manly, B.F.J.** (1973). A linear model for frequency-dependent selection by predators. *Researches on Population Ecology* 14: 137-50.
- Manly, B.F.J.** (1973). A note on the estimation of selective values from recaptures of marked animals when selection pressures remain constant over time. *Researches on Population Ecology* 14: 151-8.
- Cummings, L.P., Weinand, H.C. and **Manly, B.F.J.** (1973). Measuring association with link-node problems. *Geoforum* 13: 43-51.
- Lawson, R. and **Manly, B.F.J.** (1973). Tooth growth and replacement in *Ctenolucius huieta*, a neotropical Characoid fish. *Journal of Morphology* 141: 383-94.
- Manly, B.F.J.** (1974). Estimating survival from a multi-sample single recapture census where recaptures are not made at release times. *Biometrical Journal* 16: 185-90.
- Manly, B.F.J.** (1974). A discrete analogue of the gamma distribution applied to data on the survival of birds. *Biometrie Praximetrie* 14: 1-14.
- Manly, B.F.J.** (1974). A model for certain types of selection experiment. *Biometrics* 30: 282-94.
- Manly, B.F.J.** (1974). Estimation of stage-specific survival rates and other parameters for insect populations developing through stages. *Oecologia* 15: 277-85.
- Manly, B.F.J.** (1974). A comparison of methods for the analysis of insect stage-frequency data. *Oecologia* 17: 335-48.
- Cummings, L.P., Weinand, H.C. and **Manly, B.F.J.** (1974). Measuring association with link-node problems: a reply. *Geoforum* 17: 92-3.
- Manly, B.F.J.**, Shannon, A.G. and Allen A. (1974). An analogical replication of a Piagetian experiment on New Guineans. *Malaysian Journal of Education* 11: 77-82.
- Manly, B.F.J.** (1975). Simulation of an agricultural field experiment: a teaching aid. *New Zealand Statistician* 10: 7-8.
- Manly, B.F.J.** (1975). The TINI-TAB programs for the analysis of surveys. *New Zealand Statistician* 10: 72-3.
- Manly, B.F.J.** (1975). Estimating survival from a multi-sample single recapture census - the case of constant survival and recapture probabilities. *Biometrical Journal* 17: 431-5.
- Manly, B.F.J.** (1975). The estimation of a fitness function from two samples taken from a population. *Researches on Population Ecology* 16: 219-30.
- Manly, B.F.J.** (1975). A second look at some data on a cline. *Heredity* 34: 423-6.
- Manly, B.F.J.** (1975). The measurement of the characteristics of natural selection. *Theoretical Population Biology* 7: 288-305.

- Manly, B.F.J.** (1975). A note on the Richards, Waloff and Spradbery method for estimating stage-specific mortality rates for insect populations. *Biometrical Journal* 17: 77-83.
- Manly, B.F.J.** (1976). Exponential data transformations. *Statistician* 25: 37-42.
- Manly, B.F.J.** (1976). Some examples of double exponential fitness functions. *Heredity* 36: 229-34.
- Manly, B.F.J.** (1976). Extensions to Kiritani and Nakasuji's method for the analysis of insect stage-frequency data. *Researches on Population Ecology* 17: 191-9.
- Manly, B.F.J.** (1976). The estimation of a bivariate fitness function from two samples taken from a population. *Researches on Population Ecology* 18: 105-17.
- Manly, B.F.J.** (1977). A further note on Kiritani and Nakasuji's model for stage-frequency data including comments on Tukey's jackknife technique for estimating variances. *Researches on Population Ecology* 18: 177-86.
- Manly, B.F.J.** (1977). Examples of the use of GLIM. *New Zealand Statistician* 12: 26-42.
- Manly, B.F.J.** (1977). A simulation study of the application of the jackknife with Jolly's method for the analysis of capture-recapture data. *Acta Theriologica* 22: 215-23.
- Manly, B.F.J.** (1977). The analysis of trapping records for birds trapped in mist nets. *Biometrics* 33: 404-10.
- Manly, B.F.J.** (1977). The determination of key factors from life table data. *Oecologia* 31: 111-7.
- Manly, B.F.J.** (1977). A model for dispersion experiments. *Oecologia* 31: 119-30.
- Manly, B.F.J.** (1977). The estimation of the fitness function from several samples taken from a population. *Biometrical Journal* 19: 391-401.
- Manly, B.F.J.** (1977). A note on the design of experiments to estimate survival and relative survival. *Biometrical Journal* 19: 687-92.
- Manly, B.F.J.** (1977). A new index for the intensity of natural selection. *Heredity* 38: 321-8.
- Manly, B.F.J.** (1977). A further note on the estimation of a fitness function from two samples from a population. *Researches on Population Ecology* 19: 1-9.
- Manly, B.F.J.** (1978). Regression models for proportions with extraneous variance. *Biometrie Praximetrie* 18: 1-18.
- Manly, B.F.J.** (1978). Comparison of marks on several examination papers. *New Zealand Statistician* 13: 11-20.
- Manly, B.F.J.** (1978). Analysis of differential predation. *Heredity* 40: 315-6.
- Manly, B.F.J.** (1978). A simulation study of three methods for estimating selective values and survival rates from recapture data. *Researches on Population Ecology* 20: 15-22.
- Manly, B.F.J.** (1978). Some examples of a method for determining key factors from life table data. *Oecologia* 35: 119-22.
- Hogg, S.E., Murray, D.L. and **Manly, B.F.J.** (1978). Methods of estimating throughfall under a forest. *New Zealand Journal of Science* 21: 129-36.
- Manly, B.F.J.** (1979). Survival sequences of infants: a factorial analysis. *Journal of Biosocial Science* 11: 105-7.
- Manly, B.F.J.** (1979). A note on key factor analysis. *Researches on Population Ecology* 21: 30-9.
- Bardsley, W.E. and **Manly, B.F.J.** (1979). Note on the distribution of flood maxima for random sample sizes. *Journal of Hydrology* 42: 187-93.
- Foster, L. and **Manly, B.F.J.** (1979). A stochastic model for the predatory behaviour of naive spiderlings. *Biometrical Journal* 21: 115-22.
- Manly, B.F.J.** (1980). A note on the analysis of selection experiments. *Biometrics* 36: 9-18.
- Higham, C.F.W., Kijngam, A. and **Manly, B.F.J.** (1980). An analysis of prehistoric canid remains from Thailand. *Journal of Archaeological Science* 7: 149-65.
- Manly, B.F.J.** (1981). Estimation of absolute and relative survival rates from the recoveries of dead animals. *New Zealand Journal of Ecology* 4: 78-88.
- Manly, B.F.J.** (1981). The estimation of a multivariate fitness function from several samples taken from a population. *Biometrical Journal* 23: 267-81.
- Higham, C.F.W., Kijngam, A., Moore, S.J.E. and **Manly, B.F.J.** (1981). The bovid third phalanx and prehistoric ploughing. *Journal of Archaeological Science* 8: 353-65.
- Higham, C.F.W., Kijngam, A. and **Manly, B.F.J.** (1982). Site location and site hierarchy in prehistoric Thailand. *Proceedings of the Prehistory Society* 48: 1-27.
- Leach, F. and **Manly, B.F.J.** (1982). Minimum Mahalanobis distance functions and lithic source characterisations by multi-element analysis. *New Zealand Journal of Archaeology* 4: 77-109.
- Bardsley, W.E. and **Manly, B.F.J.** (1983). Regression-based estimation of long-term mean and variance of wind speed at potential aerogenerator sites. *Journal of Climate and Applied Meteorology* 22: 323-7.
- Manly, B.F.J.** (1983). Analysis of polymorphic variation in different types of habitat. *Biometrics* 39: 13-27.
- Patterson, G.B. and **Manly, B.F.J.** (1984). The use of Weibull curves to measure niche overlap. *New Zealand Journal of Zoology* 11: 337-42.
- Manly, B.F.J.** (1984). Obtaining confidence limits on parameters of the Jolly-Seber model for capture-recapture data. *Biometrics* 40: 749-58.
- Bardsley, W.E. and **Manly, B.F.J.** (1985). Note on selecting an optimum raingauge subset. *Journal of Hydrology* 76: 197-201.
- Manly, B.F.J.** (1985). Manly-Parr estimators. *Encyclopaedia of Statistical Science* 5: 201-2.

- Seber, G.A.F. and **Manly, B.F.J.** (1985). Approximately unbiased variance estimation for the Jolly-Seber mark-recapture model: population size. In *Statistics in Ornithology* (eds. B.J.T. Morgan and P.M. North), pp. 363-71. Springer-Verlag, Berlin.
- Manly, B.F.J.** (1985). Multivariate fitness functions. *Encyclopaedia of Statistical Science* 6: 62-3.
- Manly, B.F.J.** (1985). A test of Jackson's method for separating death and emigration with capture-recapture data. *Researches on Population Ecology* 27: 99-110.
- Manly, B.F.J.** (1985). *The Statistics of Natural Selection on Animal Populations*. Chapman and Hall, London, 500 pp.
- Crosbie, S.F. and **Manly, B.F.J.** (1985). Parsimonious modelling of capture-mark-recapture studies. *Biometrics* 41: 385-99.
- Manly, B.F.J.** (1985). Tests of the theory of natural selection: an overview. *Journal of the Royal Society of New Zealand* 15: 411-32.
- Manly, B.F.J.** (1985). Further improvements to a method for analysing stage-frequency data. *Researches on Population Ecology* 27: 325-32.
- Manly, B.F.J.** (1986). The survival of the fittest. In *The Fascination of Statistics* (eds. D. Brook, G. Arnold, T. Hassard and R. Pringle), pp. 331-50. Marcel Dekker, New York.
- Manly, B.F.J.** (1986). Testing for stabilizing selection. In *Pacific Statistical Congress* (eds. I.S. Francis, B.F.J. Manly and F.C. Lam), pp. 339-44. North-Holland, Amsterdam.
- Manly, B.F.J.** (1986). Detecting and measuring stabilizing selection. *Evolutionary Theory* 7: 207-17.
- Manly, B.F.J.** (1986). The point evaluation method for approximating function means, variances and covariances. *Biometrical Journal* 8: 949-56.
- Manly, B.F.J.** (1986). The CUSUM method for comparing assessment marks in several subjects. *New Zealand Mathematics Magazine* 23: 15-23.
- Manly, B.F.J.** (1986). *Multivariate Statistical Methods: a Primer*. Chapman and Hall, London, 160 pp.
- Manly, B.F.J.** (1986). Randomization and regression methods for testing for association with geographical, environmental and biological distances between populations. *Researches on Population Ecology* 28: 201-18.
- Manly, B.F.J., McAleve, L. and Stevens, D.** (1986). A randomization procedure for comparing group means on multiple measurements. *British Journal of Mathematical and Statistical Psychology* 39: 183-9.
- Bardsley, W.E. and **Manly, B.F.J.** (1987). Transformations for improving convergence of distributions of flood maxima to a Gumbel limit. *Journal of Hydrology* 91: 137-52.
- Manly, B.F.J.** (1987). A multiple regression method for analysing stage-frequency data. *Researches on Population Ecology* 29: 119-27.
- Manly, B.F.J. and Rayner, J.C.W.** (1987). The comparison of sample covariance matrices using likelihood ratio tests. *Biometrika* 74: 841-7.
- Manly, B.F.J. and McAleve, L.** (1987). A randomization alternative to the Bonferroni inequality with multiple F tests. In *Proceedings of the 2nd Tampere Conference in Statistics* (eds. T. Pukkila and S. Puntanen), pp. 567-73. University of Tampere, Finland.
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- Manly, B.F.J.** (1999). Review of *Experiments in Ecology* by A.J. Underwood. *Journal of Experimental Marine Biology and Ecology* 238: 154-5.
- Manly, B.F.J.** (1999). Editorial. *Journal of Agricultural, Biological and Environmental Statistics* 4: 77.
- Boyce, M.S., McDonald, L.L. and **Manly, B.F.J.** (1999). Relating populations to habitats: reply. *Trends in Ecology and Evolution* 14: 490.
- Manly, B.F.J.** (2000). Editorial. *Journal of Agricultural, Biological and Environmental Statistics* 5: 00.
- Manly, B.F.J.** (2000). Review of *Resampling Methods: a Practical Guide to Data Analysis*, by P.I. Good. *Biometrics* 56: 965.
- Manly, B.F.J.**, Seyb, A. and Fletcher, D.J. (2002). *Bycatch of Fur Seals (Arctocephalus forsteri) in New Zealand Fisheries, 1990/91 to 1995/95, and Observer Coverage*. Department of Conservation Internal series 41, Wellington, New Zealand.
- Manly, B.F.J.**, Seyb, A. and Fletcher, D.J. (2002). *Bycatch of Sea Lions (Phocarcos hookeri) in New Zealand Fisheries, 1987/88 to 1995/95, and Observer Coverage*. Department of Conservation Internal series 42, Wellington, New Zealand.
- Manly, B.F.J.**, Cameron, C. and Fletcher, D.J. (2002). *Bycatch of Birds and Mammals in New Zealand Fisheries, 1990/91 to 1995/95, and Observer Coverage*. Department of Conservation Internal Series 43, Wellington, New Zealand.

**NEWSPAPER ARTICLES**

- Manly, B.F.J.** (1989). Getting good results from opinion polling. *Otago Daily Times*, 3 October, 1989.
- Manly, B.F.J.** (1993). Opinion polls and the general election. *Otago Daily Times*, 13 November, 1993.

**OTHER MAJOR REPORTS**

- Manly, B.F.J.** (1996). *Report on a Meeting of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) Working Group on Ecosystem Monitoring and Management, Subgroup on Statistics, Cambridge U.K., 7-9 May 1996*. Prepared for the New Zealand Ministry of Research, Science and Technology.
- Manly, B.F.J.** (1996). *The First Inter-University Subject Conference in Statistics, 17-19 June 1996*. Prepared for the New Zealand Vice-Chancellors' Committee on University Academic Programmes.

- Manly, B.F.J.** (1996). *Report on a Workshop on Acoustics, Geostatistics, and Survey Design, Bergen, Norway, 23-24 August 1996*. Prepared for the New Zealand Ministry of Research, Science and Technology.
- Manly, B.F.J.** and MacKenzie, D. (1997). *Tests for Anomalous Years in the CCAMLR Index Series*. Paper WG-EMM-STATS-97/6 prepared for the meeting of the Subgroup in Statistics of the CCAMLR Working Group on Ecosystem Monitoring and Management, La Jolla, California, July 1997.
- Manly, B.F.J.** (1997). *Report on a Meeting of the Subgroup on Statistics for the Working Group on Ecosystem Monitoring and Management (WG-EMM) of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)*. Prepared for the New Zealand Ministry of Foreign Affairs and Trade.
- Manly, B.F.J.** (1997). Statistics. In *The New Zealand Knowledge Base: Mathematical Sciences* (compiler, M. Conder), pp. 33-7. Ministry of Research, Science and Technology, Wellington.
- Manly, B.F.J.** (1998). Statistics. In *Mathematics in New Zealand: Past, Present and Future* (compiler, J.J. Hunter), pp. 84-6. Ministry of Research, Science and Technology, Wellington.
- Manly, B.F.J.**, McDonald, L.L. and McDonald, T.L. (2000). *Review of Demographic Studies of the Californian Spotted Owl (Strix Occidentalis Occidentalis)*. Prepared for the California Forestry Association.
- Akroyd, J.M., **Manly, B.F.J.** and Walshe, K.A.R. (2000). *Distribution, Abundance and Size Frequency of Pipis (Paphies australis), Cockles (Austrovenus strutchburyi) and Tuatua (Paphies subtriangulata) at Eleven Beaches During the 1999/2000 Fishing Year*. Report to the Ministry of Fisheries, Wellington, New Zealand.
- Manly, B.F.J.** (2001). *Report on the Estimation of a Resource Selection Probability Function for Spotted Owls in the Plum Creek Cascades HCP Project Area*. Prepared for the Plum Creek Timber Company, Seattle.
- Manly, B.F.J.**, McDonald, L.L. and McDonald, T.L. (2001). *Review of Studies on the Fisher Relevant to the Status of the Species in Sierra Nevada*. Prepared for the California Forestry Association.
- Akroyd, J.M., **Manly, B.F.J.** and Walshe, K.A.R. (2001). *Distribution and Abundance of Toheroa (Paphies ventricosa) at Muriwai Beach, Auckland*. Prepared for the Ministry of Fisheries, Wellington, New Zealand.
- Walshe, K.A.R., Akroyd, J.M. and **Manly, B.F.J.** (2001). *Distribution, Abundance and Size Frequency of Pipis (Paphies australis), Cockles (Austrovenus strutchburyi) and Tuatua (Paphies subtriangulata) at Twelve Beaches During the 2000/2001 Fishing Year*. Report to the Ministry of Fisheries, Wellington, New Zealand.
- Manly, B.F.J.** (2001). *Presence and Absence of the Columbia Torrent Salamander in the Southwest of Washington State*. Prepared for the Weyerhaeuser Timber Company, Washington.
- Manly, B.F.J.**, Seyb, A. and Fletcher, D.J. (2002). *Bycatch of Fur Seals (Arctocephalus Forsteri) in New Zealand Fisheries, 1990/91-1995/96, and Observer Coverage*. Department of Conservation Science Internal Series 41, Wellington, New Zealand.
- Manly, B.F.J.**, Seyb, A. and Fletcher, D.J. (2002). *Bycatch of Sea Lions (Phocarcos hookeri) in New Zealand Fisheries, 1987/88-1995/96, and Observer Coverage*. Department of Conservation Science Internal Series 42, Wellington, New Zealand.
- Manly, B.F.J.**, Cameron, C. and Fletcher, D.J. (2002). *Longline Bycatch of Birds and Mammals in New Zealand Fisheries, 1990/91-1995/96, and Observer Coverage*. Department of Conservation Science Internal Series 43, Wellington, New Zealand.
- Manly, B.F.J.**, Van Atten, A.S., Kuletz, K.J. and Nations, C. (2003). *Incidental Catch of Marine Mammals and Birds in the Kodiak Island Set Gillnet Fishery in 2002*. Prepared for the Protected Resources Division, National Marine Fisheries Service, Juneau, Alaska.
- Manly, B.F.J.**, Moulton, V.D., Elliott, R.E., Miller, G.W. and Richardson, W.J. (2004). *Analysis of Covariance for Fall Migration of Bowhead Whales in Relation to Human Activities and Environmental Factors, Alaskan Beaufort Sea: Phase 1, 1996-1998*. Report for the Minerals Management Service, Herndon, Virginia, USA.

## CITATIONS

Citations for books and papers as given by the *Science Citation Index*, excluding self-citations: 1975, 15; 1980, 31; 1985, 51; 1990, 68; 1991, 81; 1992, 112; 1993, 101; 1994, 163; 1995, 187; 1996, 286; 1997, 246.

## RESEARCH GRANTS

Louisiana State University: travel grant \$US4,500 (1981).

University of Otago: \$5,000 for portable computer (1987); \$25,000 for a Research Assistant (1988); \$19,000 for a workstation (1990); \$7,500 for a Research Assistant (1991); \$7,000 for general research expenses (1992); \$5,000 for general research expenses (1993); \$12,000 for computing equipment (1994); \$5,400 for general research expenses (1995).

United States-New Zealand Cooperative Science Programme: \$3,500 travel grant to visit the United States (1988).

Ministry of Agriculture and Fisheries: \$49,586 for a project on *Sampling Problems in Fisheries Biomass Estimation* (1989).

Not taken up because an appropriate student could not be found.

New Zealand Lottery Board: \$4,000 for software (1990).

- Marsden Fund: \$288,000 over three years (Associate Investigator with C.F.W. Higham) on *The Origins of Angkor* (1995); \$281,000 over three years (Associate Investigator with J.B. Wilson) on *The Existence and Nature of Quantitative Assembly Rules for Plant Communities* (1995).
- New Zealand Public Good Science Fund: *Improved Statistical Methods for Environmental Research* subcontract to the National Institute for Water and Atmospheric Research, \$66,000 1997-98, extended to \$128,000 for 1999-2003.
- Funding from the National Center for Ecological Analysis and Synthesis to take part in a working group on *Integrating the Statistical Modelling of Spatial Data in Ecology*, approximately \$US50,000 for the full project for 1999-2000 (see Research Collaboration above, 1999-2000).
- New Zealand Department of Conservation, \$15,000 for preparation of a Biostatistics Manual for use in workshops for staff (1999).

### REFEREEING OF RESEARCH GRANTS, PRIZES AND OTHER AWARDS AND REALTED SERVICE

- Panel Member, Mathematical and Information Sciences, for assessing applications to the Marsden Fund for Pure Research (1995-7, 2000-).
- Reviewer for: the Australian Research Grants Committee, the Health Research Council of New Zealand, the International Foundation for Science (Sweden), the John Simon Guggenheim Memorial Foundation (USA), the Lottery Grants Board of New Zealand, the Marsden Fund (New Zealand), the National Science and Engineering Research Council of Australia, the National Science Foundation (USA), the New Zealand Foundation for Research, Science and Technology, and the University of Queensland.
- Hamilton Prize Committee, Royal Society of New Zealand (1995-7). Bryan Manly Curriculum Vitae Page 6 of 19 March 13, 2008 Fellowship Selection Committee, Mathematics and Information Sciences Panel, Royal Society of New Zealand (1995-98).
- Author of the Ministry of Research, Science and Technology *Area Profile in Statistics* for the *Profile of New Zealand Science* to be used in making decisions on priorities in science funding (1996), and the *Statistics* section of the Ministry's report on the *New Zealand Knowledge Base for Mathematical Sciences* (1997).
- Assessments of individuals for promotions and tenure: Biotechnology and Biological Sciences Research Council, UK (1996); McGill University, Canada (1997); Universiti Sains Malaysia (1997); Oregon State University, USA (1997); University of Alaska, Fairbanks (1998); Australian National University, Canberra (1999); University of Massachusetts Boston (1999), Wageningen University, The Netherlands (2004), University of Rhode Island (2004), University of Otago (2004, 2005).
- Distinguished Statistical Ecologist Award Committee, Statistical Ecology Group, International Association for Ecology (1997-8).

### REFEREEING FOR JOURNALS

- Anthropology:** *American Journal of Physical Anthropology*, *New Zealand Journal of Archaeology*.
- Biology:** *Agricultural Systems*, *American Journal of Physical Anthropology*, *American Naturalist*, *Aquaculture*, *Australian Journal of Ecology*, *Biological Journal of the Linnean Society*, *Canadian Journal of Fisheries and Aquatic Science*, *Ecography*, *Ecological Entomology*, *Ecological Modelling*, *Ecological Applications*, *Ecological Research*, *Ecology*, *Ecology Letters*, *Entomological Society of America*, *Hydrobiologia*, *Journal of Animal Ecology*, *Journal of Biogeography*, *Journal of Experimental Marine Biology and Ecology*, *Journal of Insect Behaviour*, *Journal of Vegetation Science*, *Journal of Wildlife Management*, *Limnology and Oceanography*, *Marine Biology*, *Marine Mammal Science*, *New Zealand Population Ecology*, *Journal of Ecology*, *New Zealand Journal of Marine and Freshwater Research*, *New Zealand Journal of Zoology*, *Oecologia*, *Oikos*, *San Francisco Estuary and Watershed Science*, *Scientia Agricola*, *Theoretical Population Biology*, *The Wilson Bulletin*, *The Wilson Journal of Ornithology*, *Transactions of the American Fisheries Society*, *Trends in Ecology and Evolution*, *Wildlife Research*.
- Environmental:** *Archives of Environmental Contamination and Toxicology*, *CCAMLR Science*, *Environmental Conservation*, *Environmental Engineering Science*, *Environmetrics*, *Waste Management and Research*.
- Medical:** *Australian and New Zealand Journal of Surgery*, *Clinical and Experimental Pharmacology and Physiology*, *American Journal of Epidemiology*.
- Physical Sciences:** *Applied Meteorology*.
- Psychology:** *Psychological Bulletin*, *Psychological Reports*, *Perceptual and Motor Skills*.
- Statistics:** *Australian Journal of Statistics*, *Biometrics*, *Environmental and Ecological Statistics*, *Journal of the American Statistical Association*, *Journal of Classification*, *Journal of Agricultural, Biological and Environmental Statistics*, *Journal of Statistical Education*, *Journal of Statistical Computation and Simulation*, *Statistical Papers*, *Statistics and Computing*, *The Statistician*.

### INVITED PRESENTATIONS

- 1980 New Zealand Ecological Society Conference.
- 1981 American Statistical Association Conference, Detroit, USA; London Universities Joint Statistics Seminars, University College, London, UK.
- 1986 Advanced Research Seminar on Weighted Distributions, Indian Statistical Institute, New Delhi, India.

- 1988 University of Wyoming, USA; Ohio State University, USA; Colorado State University, USA; University of California at Riverside, USA; Montana State University, USA; University of Waterloo, Canada.
- 1992 Euring 92, Montpelier, France; 7th International Conference on Multivariate Analysis, Pennsylvania State University, USA; 3rd Statistical Congress, National University, Colombia, South America.
- 1993 University of Montana at Missoula; Savanaha River Ecology Laboratory, Georgia, USA; Indian Statistical Institute, Calcutta, India; Banares Hindu University, India.
- 1994 University of Wisconsin at Stevens Point, USA; Environmetric Conference, Burlington, Canada; International Ecology Congress, Manchester, UK
- 1995 Environmetrics Society Conference, Kuala Lumpur, Malaysia; University of Malaysia at Sarawak, Kuchin, Malaysia.
- 1996 Ecological Society of America Annual Meeting, Rhode Island, USA; 20th International Congress of Entomology, Florence, Italy (also Session Organizer); University of Nordeste, Corrientes, Argentina.
- 1997 Aquatic Sciences Meeting, Sante Fe, New Mexico; New Mexico State University, Albuquerque, New Mexico; Department of Statistics, University of Wyoming, Laramie, Wyoming.
- 1998 Conference on Status and Trends of Marine Mammal Populations, Seattle, USA; Environmental Statistics Group of the Royal Statistical Society at Lancaster University, UK; Department of Medical Statistics, De Montfort University, Leicestershire, UK; Society for Environmental Toxicology and Chemistry meeting on Time-to-Event Analyses, Horticulture Research International, Wellesbourne, UK.; Seminar on Advances in Inference Based on Randomization, American Statistical Association Joint Statistical Meetings, Dallas, USA; Statistics Department, University of Waikato, NZ; Workshop on Exposure Assessment Methodologies, Spatial Information Research Centre, University of Otago, NZ; Department of Statistics, University of Pune, Pune, India; Department of Zoology, Banaras Hindu University, Varanasi, India.
- 1999 National Institute of Water and Atmospheric Research Workshop on Statistical Methods for Water Quality Studies, Hamilton, NZ; Kansas State University Conference on Applied Statistics in Agriculture (Keynote Speaker), Manhattan, Kansas, USA; Western North American Meeting of the International Biometric Society, Seattle, USA. (Session Organizer).
- 2000 University of Denver Medical School, Denver, USA; Department of Zoology, University of Toronto, Canada; Department of Zoology, University of Oslo, Finland; Joint Statistical Meetings, Indianapolis, USA (Session Organizer).
- 2001 The First International Distance Sampling Conference, St Andrews, Scotland; Joint Statistical Meetings, Atlanta, Georgia (Session Organizer); Environmetrics Society Conference, Portland, Oregon, USA; Department of Statistics, North Carolina State University, Raleigh, North Carolina, USA.; Australasian Meeting of the International Biometric Society, Christchurch, New Zealand.
- 2002 University of Florence, Italy; University of Naples, Italy; Colorado State University, Fort Collins, USA.; Western North American meeting of the International Biometric Society; Conference on Statistical Methods for Environmental Surveys, University of Sienna, Italy; Meeting of the Colombian Statistical Society, Bogota.
- 2003 Waikato University, Hamilton, New Zealand; Auckland University, New Zealand; California Water and Environmental Modelling Forum, Asilomar, Monterey; British Regional Meeting of the International Biometric Society, University of Reading, United Kingdom.
- 2004 Mathematical Institute, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil; 49th Annual Regional Meeting of the International Biometrics Society, Uberlandia, Brazil (opening talk), 9th Meeting of the Argentinian Scientific Group in Biometry, National University of La Rioja, La Rioja, Argentina (opening talk plus one other), City University of Buenos Aires (two talks).
- 2005 ComFish conference, Kodiak, Alaska, USA (talk on the assessment of fisheries bycatch of birds and marine mammals). The 11th Symposium on Statistics Applied to Experimental Agronomy, Londrina, Brazil.
- 2006 Annual meeting of the Ecological Society of America, Memphis, Tennessee; International Conference on Teaching Statistics, Salvador, Brazil; International Workshop on Advances in Statistical Modelling of Faulan Distributions: Global and Local Applications, Castle of Rauschholzhausen, Germany.

### **WORKSHOPS AS A PRINCIPAL OR SOLE PRESENTER**

- Four day workshop on Ecological Sampling, Autonomous University of Yucatan, Merida, Mexico (August, 2006).
- Three to five day workshop on *Computer Intensive Methods in Biology*: National University, Colombia, South America (May, 1992); Denver, Colorado (May, 1993 and January, 1995); Los Alamos, New Mexico (January, 1994); MAFFish Research, Wellington, New Zealand (May, 1994); CONICET, Corrientes, Argentina (November, 1996); University of Wyoming (February, 1997); North-East Fisheries Science Center, Woods Hole, Massachusetts, USA (August, 1998); Federal University of Rio Grande do Sol, Popto Alegre, Brazil (April, 2005).
- Two day workshop on *Computer Intensive Statistics*, Annual Meeting of the Alaska Chapter of the American Statistical Association, Kodiak, Alaska, USA (August, 2000), INTA, Buenos Aires, Argentina (September, 2004).
- Two day workshop on Resource Selection by Animals, Laramie, Wyoming (January, 2003).
- Half day workshop on Resource Selection by Animals, Wildlife Society meeting, Bismark, South Dakota (September, 2002).
- One day workshop of *Computer-Intensive Statistics: Applications in Environmental Science*, The International Environmetrics Society, Portland, Oregon, USA (August, 2001); Yucatan Autonomous University, Merida, Mexico

(September, 2001); University of Wollongong, Australia (December, 2001); University of South Alabama, Mobile, USA (March, 2002); Meeting of the Colombian Statistical Society, Bogota (August, 2002).

Two day workshop on *Statistical Methods for Environmental Management*: University of Canterbury (June, 1999); Upper Midwest Environmental Sciences Center (April, 2001); University of Naples, Italy (April, 2002).

One week workshop on *Resource Selection by Animals*, Hedmark College, Finland (August, 2000).

Five day workshop on *Advanced Statistics*, Max Planck Institute for Limnology, Ploen, Germany (May, 2000).

Two day workshop on *Environmental Statistics* for New Zealand Department of Conservation staff (October, 1999, presented three times).

Four day workshop on *Resource Selection by Animals*: Denver, Colorado (January, 1993); Boise, Idaho (August, 1993); Alaska Science Center, Anchorage (January, 1994); University of Wyoming (February, 1997).

One day workshop on *Computer Intensive Methods in Biology*: Los Alamos National Laboratory (February, 1997); Bararas Hindu University, Varanasi, India (December, 1998); Kansas State University (April, 1999).

Five day workshop on *Ecological and Environmental Sampling*: Alaska Science Center, Anchorage (January, 1995); University of Otago (February, 1995); four day version at CONICET, Corrientes, Argentina (November, 1996).

Three day Bodega Field Conference on *Spatial Statistics*: Bodega Marine Laboratory, California (February, 1995).

Three day workshop on *Biological Sampling*: Denver, Colorado (January, 1993).

One week workshop on *Statistics for Field Ecology and Resource Selection*: Anchorage (January, 1990); University of Otago (August, 1990); University of Wyoming (January, 1991, twice); Durango, Colorado (January, 1992); Helena, Montana (May, 1992).

Four day workshop on *Multivariate Statistical Methods*: University of Otago (August, 1991).

One week workshop on *Multistage Populations: Sampling and Analysis for Research and Environmental Monitoring*: Denver, Colorado (August, 1989).

Mid-America State University Association two day seminar on *Estimation and Analysis with Multi-Stage Populations*: Oklahoma State University (November, 1988).

USA-NZ Cooperative Science Programme sponsored one week workshop on *Sampling and Analysis of Stage-Structured Populations*: University of Wyoming (January, 1988).

Three day (six hour) workshop on Computer-Intensive Methods for Multivariate and Other Analyses, 13th Colloquium of the Argentinean Statistical Society, Villa Giardino, Cordoba, Argentina.

### **SOME RECENT CONSULTING PROJECTS**

1991 Review of a MAFFish Orange Roughy Trawl Survey south on New Zealand in June and July 1991 (for Clement and Associates Ltd., Tauranga, New Zealand).

Assessment of the level of metering errors on power generators (for Electricorp Production, Dunedin, New Zealand).

Assessment of loss of sales from a fire (for Robin MBS Loss Adjusters, Dunedin).

Sample size requirements for an Accident Compensation Corporation quality survey (for C.M. Associates, Wellington, New Zealand).

1992 The investigation of inference procedure for long term monitoring programmes (for the Environmental Protection Agency, Corvallis, Oregon, USA).

1993 Establishment of confidence limits for the number of compulsive gamblers in New Zealand (for the New Zealand Lotteries Board, Wellington, New Zealand).

1994 Development of a method for estimating the number of pieces of mail delivered (for New Zealand Post, Dunedin).

Review of a pricing model for New Zealand Crown Health Enterprises (for the Central Regional Health Authority, Wellington, New Zealand).

A study of the properties of mark-recapture methods as they relate to Northern Spotted Owls populations in the Pacific northwest of the United States (for the National Council of the Paper Industry for Air and Stream Improvement, Corvallis, Oregon, USA).

Analysis of kelp densities to assess environmental impact near the San Onofre nuclear power station (for Coastal Resource Associates, Vista, California, USA).

1995 Report on the design and analysis of experiments on smelter cells (for New Zealand Aluminium Smelters, Tiwai Point, New Zealand).

Analysis of a survey on irrigation by farmers in Kakanui (for the Otago Regional Council, Dunedin, New Zealand).

Estimation and analysis of till losses from thefts by a shop server (for Acquisitions, Dunedin, New Zealand).

1996 Review of the National Marine Fisheries Service smolt survival studies on the Columbia River (for The Independent Scientific Group, Oak Ridge National Laboratory, Tennessee, USA).

Advice on levels of observer cover required to monitor bycatch of marine mammals and birds in New Zealand fisheries, and rules for determining the closure of a fishery (for the Department of Conservation, Wellington).

Production of the draft *Population Management Plan* for the New Zealand sea lion in conjunction with Akroyd Walshe consultants (for the Department of Conservation, Wellington).

1997 Continuation of work for the Department of Conservation on the development of the *Population Management Plan* for the New Zealand Sea lion and on various problems related to fisheries bycatch.

- Report on flow variation for the Waitaki, Ahuriri, Mararoa and Raikaia Rivers (for the Electricity Commission of New Zealand, Southern Generation, Twizel).
- 1998 Review of 'The Impact of Incidental Catch on Hooker's Sea Lions *Phocarcos Hookeri*' by R. Hilborn, M. Pascual, L. Gerber and F. Gulland, 1997; advice on the analysis of trials on the effect of 1080 poison on invertebrates (for the Department of Conservation, Wellington).
- Report on *Monitoring Distribution and Abundance of the Kea and New Zealand Falcon Using Sighting Reports* with C.D. Jamieson (for the Department of Conservation, Dunedin).
- Analysis of Hook Trials on Snapper* (for Akroyd-Walshe, Auckland).
- Advice on the design and analysis of trials related to epilepsy treatment (for the Department of Neurology, University of Kansas Medical Center, Kansas City, USA).
- Advice on modelling resource selection by juvenile chinook salmon in the Columbia River (for Western Fisheries Research Center, Cook, Washington, USA).
- 1999 Review of a proposal for an expanded hatchery marking program for salmon from hatcheries in the Pacific North West of the USA (for West Inc., Cheyenne, Wyoming, USA).
- Advice on modelling resource selection by juvenile chinook salmon in the Columbia River (for Western Fisheries Research Center, Cook, Washington, USA).
- Continuation of work for the New Zealand Department of Conservation on the analysis of data related to the accidental capture of marine mammals and birds during fishing operations.
- 2000 Design and analysis of shellfish surveys on Auckland beaches (with Akroyd-Walshe, Auckland, for the Ministry of Fisheries, Wellington).
- Production of the draft Population Management Plan for the Wandering Albatross (with Akroyd-Walshe, Auckland for the Department of Conservation, New Zealand).
- The design of a sampling scheme for estimating the size of the Pacific walrus population (for the U.S. Fish and Wildlife Service).
- Analysis of predation of dusky geese in Alaska (for the U.S. Fish and Wildlife Service).
- Advice on the design and analysis of trials related to epilepsy treatment (for the Department of Neurology, University of Kansas Medical Center, Kansas City, USA).
- Review of studies for estimating demographic parameters of Californian spotted owl populations (for the California Forestry Association).
- 2001 Estimation of a resource selection function for spotted owl nests in Washington state (for the Plum Creek Timber Company).
- Review of studies of the fisher in Sierra Nevada (for the California Forestry Association).
- Advice on the design and analysis of trials related to epilepsy treatment (for the Department of Neurology, University of Kansas Medical Center, Kansas City, USA).
- The design of a sampling scheme for estimating the size of the Pacific walrus population (for the U.S. Fish and Wildlife Service).
- Analysis of pellet group counts for estimating deer and elk numbers (for the Olympic National Park, Washington).
- Estimation of a resource selection function and a function relating abundance to habitat variables, for amphibians in streams in the state of Washington (for the Weyerhaeuser Forestry Company).
- 2002 Randomization test for heterogeneity in the probability of detecting marbled murrelet birds at different sites (for Hamer Environmental).
- Sensitivity analyses for energetics calculations for bowhead whales in the Eastern Alaskan Beaufort Sea (for LGL Ltd).
- Bootstrap confidence limits for mean values of chemicals (for the SOMA Corporation).
- Review of statistical analyses related to the possible listing of the Sacramento splittail as an endangered species (for Kronick, Moskovitz, Tiedemann and Girard, LLD).
- Compositional analysis for foraging site selection by spotted owls (for the Plum Creek Timber Company).
- Estimation of population trends for Kittlitz's murrelet in Alaska, taking into account the birds that have only been identified as either Kittlitz's murrelet or marbled murrelet (for the U.S. Fish and Wildlife Service).
- 2003 Analysis of pellet group counts for estimating deer and elk numbers (for the Olympic National Park, Washington).
- Review of a sampling plan for vegetation inventory and monitoring at Shenandoah National Park (for the U.S. National Park Service).
- Analysis of the effects of human activities and sea ice on the fall migration of bowhead whales (Marine Management Service, U.S. department of the Interior).
- Design and analysis of a study of the marine mammal and bird bycatch from the salmon setnet fishery at Kodiak Island, Alaska (for the National Marine Fisheries Service, Alaska, and the Fish and Wildlife Service, Alaska).
- 2004 Analysis of a study of the marine mammal and bird bycatch from the salmon setnet fishery at Cook Inlet, Alaska (for the National Marine Fisheries Service, Juneau, Alaska).
- The production of guidelines for the design of future fisheries observer programmes for non-fish bycatch in salmon fisheries in Alaska (for the National Marine Fisheries Service, Juneau, Alaska).
- The analysis of trials related to epilepsy treatment (for the Department of Neurology, University of Kansas Medical Center, Kansas City, USA).

- The production of guidelines for future fisheries observer programmes for non-fish bycatch in New Zealand (for the Department of Conservation, Wellington, New Zealand).
- 2005 Analysis of the abundance of fish, zooplankton, mysids and physical variables in the Sacramento-San Joaquin Delta, California, to determine whether there was a regime change in the system in the late 1990s to early 2000s (for the Interagency Ecological Program, California, USA).
- Intertidal shellfish monitoring in the Auckland Fisheries Management Area (with K. Walshe and J. Akroyd, for the New Zealand Ministry of Fisheries).
- Advice on the design and analysis of trials related to epilepsy treatment (for the Department of Neurology, University of Kansas Medical Center, Kansas City, USA).
- Design and analysis of a study of the marine mammal and bird bycatch from the salmon setnet fishery at Kodiak Island, Alaska (for the National Marine Fisheries Service, Juneau, Alaska).
- Analysis of pellet group counts for estimating deer and elk numbers (for the Olympic National Park, Washington).
- 2006 Analysis of a study of the marine mammal and bird bycatch from the salmon setnet fishery at Kodiak Island, Alaska in 2005 (for the National Marine Fisheries Service, Juneau, Alaska).
- Various analyses and reviews related to the distribution and abundance of delta smelt and the survival of salmon in the Sacramento San-Joaquin Delta (for the San-Luis and Delta-Mendota Water Authority, California).
- Analysis of surveys of recreational catches of shellfish in harbours around Auckland, New Zealand, and the analysis of biomass surveys of shellfish in many of the same harbours (with K. Walshe and J. Akroyd, for the New Zealand Ministry of Fisheries).
- 2007 Report on Incidental Take and Interactions of Marine Mammals and Birds in the Kodiak Island Salmon Set Gillnet Fishery, 2002 and 2005 (for the National Marine Fisheries Service, Juneau, Alaska).
- Report on the Analysis of Covariance of Fall Migrations of Bowhead Whales in Relation to Human Activities and Environmental Factors, Alaskan Beaufort Sea: Phase I, 1996-1998 (for LGL Ltd.).
- Review of Analyses Presented at the Environmental Water Account Meeting December 7-8, 2005 (for the San Luis and Delta Mendoza Water Authority, California).

#### **MEMBERSHIP OF SOCIETIES**

- Fellow: Royal Society of New Zealand, Royal Statistical Society.
- Member: Environmetrics Society, International Biometric Society, New Zealand Statistical Association, Society for Population Ecology.