Photo Identification Capture Mark Recapture Techniques For

TYRESE STOUT

Dugongs and Manatees Food & Agriculture Org.
Studying the population parameters of marine mammals requires that individuals be identified both spatially and temporally. Traditionally, to identify individuals in the field, animals have been captured and physically marked with a unique feature, allowing the individual to be identified in the future. This method known as Capture-Mark-Recapture (CMR) has been widely utilized to analyze marine mammal populations. While quite effective, traditional CMR is invasive and poses potential risk for both animals and researches. More recently, with advanced technology and camera equipment a far less invasive and more cost effective method of Photo-identification based Mark Recapture has been developed (PMR). To assess the efficacy of computer aided matching software and the applicability of such software for future pinniped studies, a photographic based mark recapture study was conducted across the 2011-2014 harbor seal seasons using both manual and computer aided methods to determine if the Long Island, NY population display site fidelity, in that they return to the same haul-out location over multiple seasons. Additionally, manual and computer methods were compared for accuracy and their potential use in future pinniped studies.
Reptile Ecology and Conservation CRC Press
Analysis and Management of Animal Populations deals with the processes involved in making informed decisions about the management of animal populations. It covers the modeling of population responses to management actions, the estimation of quantities needed in the modeling effort, and the application of these estimates and models to the development of sound management decisions. The book synthesizes and integrates in a single volume the methods associated with these themes, as they apply to ecological assessment and conservation of animal populations. Integrates population modeling, parameter estimation and decision-theoretic approaches to management in a single, cohesive framework Provides authoritative, state-of-the-art descriptions of quantitative approaches to modeling, estimation and decision-making Emphasizes the role of mathematical modeling in the conduct of science and management Utilizes a unifying biological context, consistent mathematical notation, and numerous biological examples
Field Research and Conservation of Complex Mammalian Societies Springer Science & Business Media
Dugongs and manatees, the only fully aquatic herbivorous mammals, live in the coastal waters, rivers and lakes of more than 80 subtropical and tropical countries. Symbols of fierce conservation battles, sirenian populations are threatened by multiple global problems. Providing comparative information on all four surviving species, this book synthesises the ecological and related knowledge pertinent to understanding the biology and conservation of the sirenia. It presents detailed scientific summaries, covering sirenian feeding biology; reproduction and population dynamics; behavioural ecology; habitat requirements and threats to their continued existence. Outlining the current conservation status of the sirenian taxa, this unique study will equip researchers and professionals with the scientific knowledge required to develop proactive, precautionary and achievable strategies to conserve dugongs and manatees. Supplementary material is available online at: www.cambridge.org/9780521888288.
Photo-identification Capture-mark-recapture Techniques for Estimating Abundance of Bay, Sound and Estuary Populations of Bottlenose Dolphins Along the U.S. East Coast and Gulf of Mexico, a Workshop Report Photo-identification Capture-mark-recapture Techniques for Estimating Abundance of Bay, Sound and Estuary Populations of Bottlenose Dolphins Along the U.S. East Coast and Gulf of Mexico, a Workshop Report"Bay, sound and estuary (BSE) populations of bottlenose dolphins are common along the U.S. Atlantic and Gulf of Mexico coasts. NOAA Fisheries currently identifies 9 BSE stocks in the Atlantic and 32 in the northern Gulf of Mexico. Accurate abundance estimates for these stocks are an essential component of MMPA-mandated stock assessment, yet only three of these BSE stocks have up-to-date abundance estimates. Abundance estimates based on data more than 8 years old are not considered valid for management (i.e., to estimate PBR) under the MMPA and those more than 5 years old drop a stock assessment from adequate to inadequate under the NOAA Fisheries Stock Assessment Improvement Plan. For most stocks in U.S. waters, aerial and/or large vessel line-transect surveys provide the platforms for abundance estimation. Linetransect 'distance' analysis methods from vessels and planes are relatively well understood and these methods are more or less standardized. While line-transect surveys using small boats may be appropriate for some estuarine systems, such surveys are not suitable when working inside estuarine waters with complex topography and turbid waters. As a result, alternative methodologies have been utilized, most centered around the use of photo-identification (photo-ID) capture-mark-recapture (CMR) techniques"--Introduction.Spatial Capture-Recapture
Spatial Capture-Recapture provides a comprehensive how-to manual with detailed examples of spatial capture-recapture models based on current technology and knowledge. Spatial Capture-Recapture provides you with an extensive step-by-step analysis of many data sets using different software implementations. The authors' approach is practical – it embraces Bayesian and classical inference strategies to give the reader different options to get the job done. In addition, Spatial Capture-Recapture provides data sets, sample code and computing scripts in an R package. Comprehensive reference on revolutionary new methods in ecology makes this the first and only book on the topic Every methodological element has a detailed worked example with a code template, allowing you to learn by example Includes an R package that contains all computer code and data sets on companion website
Status of Pollinators in North America Cambridge University Press
Wildlife Demography compiles the multitude of available estimation techniques based on sex and age data, and presents these varying techniques in one organized, unified volume. Designed to guide researchers to the most appropriate estimator based upon their particular data set and the desired level of study precision, this book provides quantitative consideration, statistical models, estimator variance, assumptions and examples of use. The authors focus on estimation techniques using sex and age ratios because this data is relatively easy to collect and commonly used by wildlife management. Applicable to a wide array of wildlife species, including game and non-game birds and mammals Features more than 100 annotated examples illustrating application of statistical methods Includes more than 640 references of the analysis of nontagging data and the factors that may influence interpretation Derives historical and ad hoc demographic methods in a modern statistical framework
Field Sampling Methods Elsevier
Context: Several studies have estimated cougar (Puma concolor) abundance using remote camera trapping in conjunction with capture-mark-recapture (CMR) type analyses. However, this methodology (photo-CMR) requires that photo-captured individuals are individually recognisable (photo identification). Photo identification is generally achieved using naturally occurring marks (e.g. stripes or spots) that are unique to each individual. Cougars, however, are uniformly pelaged, and photo identification must be based on subtler attributes such as scars, ear nicks or body morphology. There is some debate as to whether these types of features are sufficient for photo-CMR, but there is little research directly evaluating its feasibility with cougars. Aim: We aimed to

examine researchers' ability to reliably identify individual cougars in photographs taken from a camera-trapping survey, in order to evaluate the appropriateness of photo-CMR for estimating cougar abundance or CMR-derived parameters. Methods: We collected cougar photo detections using a grid of 55 remote camera traps in north-west Wyoming, USA. The photo detections were distributed to professional biologists working in cougar research, who independently attempted to identify individuals in a pairwise matching process. We assessed the level to which their results agreed, using simple percentage agreement and Fleiss?s kappa. We also generated and compared spatially explicit capture?recapture (SECR) density estimates using their resultant detection histories. Key results: There were no cases where participants were in full agreement on a cougar?s ID. Agreement in photo identification among participants was low (n=7; simple agreement=46.7%; Fleiss's kappa=0.183). The resultant SECR density estimates ranged from 0.7 to 13.5 cougars per 100km2 (n=4; s.d.=6.11). Conclusion: We were unable to produce reliable estimates of cougar density using photo-CMR, due to our inability to accurately photo-tag detected individuals. Abundance estimators that do not require complete photo-tagging (i.e. mark-resight) were also infeasible, given the lack of agreement on any single cougar's ID. Implications: This research suggested that there are substantial problems with the application of photo-CMR to estimate the size of cougar populations. Although improvements in camera technology or field methods may resolve these issues, researchers attempting to use this method on cougars should be cautious.

Spatial Capture-Recapture Springer Nature

This volume outlines the major findings from the Norwegian research programme on whales and seals in Norwegian waters. A wide range of topics are covered, including physiological aspects, social organization, population dynamics, stock assessment and management. The book will be of great value to scientists and managers, as well as to members of the general public interested in environmental issues.

Estimating Animal Abundance CRC Press

Much of our knowledge about marine mammals is derived from a long-term and dedicated research effort that is evolving rapidly due to the introduction and invention of new methods.This book reflects the inventiveness of marine researchers as they try to find ways around the problems presented to them by these unusual and challenging animals.

Assessing the Applicability of Compuer Aided Photo-identification for Pinniped Studies Through the Determination of Site Fidelity in Long Island, NY Harbor Seals (Phoca Vitulina Concolor). Springer

This thorough revision of the classic Encyclopedia of Marine Mammals brings this authoritative book right up-to-date. Articles describe every species in detail, based on the very latest taxonomy, and a host of biological, ecological and sociological aspects relating to marine mammals. The latest information on the biology, ecology, anatomy, behavior and interactions with man is provided by a cast of expert authors – all presented in such detail and clarity to support both marine mammal specialists and the serious naturalist. Fully referenced throughout and with a fresh selection of the best color photographs available, the long-awaited second edition remains at the forefront as the go-to reference on marine mammals. More than 20% NEW MATERIAL includes articles on Climate Change, Pacific White-sided Dolphins, Sociobiology, Habitat Use, Feeding Morphology and more Over 260 articles on the individual species with topics ranging from anatomy and behavior, to conservation, exploitation and the impact of global climate change on marine mammals New color illustrations show every species and document topical articles FROM THE FIRST EDITION “This book is so good...a bargain, full of riches...packed with fascinating up to date information. I recommend it unreservedly it to individuals, students, and researchers, as well as libraries." --Richard M. Laws, MARINE MAMMALS SCIENCE "...establishes a solid and satisfying foundation for current study and future exploration" --Ronald J. Shusterman, SCIENCE

Camera Trapping for Wildlife Research National Academies Press

The highly pathogenic avian influenza H5N1 strain has spread from domestic poultry to a large number of species of free-ranging wild birds, including non-migratory birds and migratory birds that can travel thousands of kilometers each year. The regular contact and interaction between poultry and wild birds has increased the urgency of understanding wild bird diseases and the transmission mechanisms that exist between the poultry and wild bird sectors, with a particular emphasis on avian influenza. Monitoring techniques, surveillance, habitat use and migration patterns are all important aspects of wildlife and disease ecology that need to be better understood to gain insights into disease transmission between these sectors. This manual contains chapters on the basic ecology of avian influenza and wild birds, capture and marking techniques (ringing, color marking and satellite telemetry), disease sampling procedures, and field survey and monitoring procedures.--Publisher's description.

An Investigation of Human-error Rates in Wildlife Photographic Identification Academic Press

AAP Prose Award Finalist 2018/19 Key features: Covers all aspects of marine mammal veterinary practice Written by internationally acknowledged experts Adds new chapters on Ophthalmology, Dentistry, Ethics, Oil Spill Response, Health Assessments, Whale Entanglement Response, Dive Response, and Biotoxins Richly illustrated in color throughout the new edition including updated anatomical drawings and extensive photographs of ocular lesions Provides guidance to websites that regularly present updated information and images pertinent to current marine mammal medicine such as imaging and stranding network contacts Discusses ethics and animal welfare For three decades, this book has been acknowledged as the most respected scientific reference specifically devoted to marine mammal medicine and health. Written by approximately 100 contributors who are recognized globally as leaders in their respective fields, the CRC Handbook of Marine Mammal Medicine, Third Edition continues to serve as the essential guide for all practitioners involved with marine mammals including veterinarians, technicians, biological researchers, students, managers, keepers, curators, and trainers. The 45 chapters provide essential information for the practitioner on pathology, infectious diseases, medical treatment, anesthesia, surgery, husbandry, health assessment, species-specific medicine, medically pertinent anatomy and physiology, and global health concerns such as strandings, oil spills, and entanglements of marine mammals. The book guides the reader through the veterinary care of cetaceans, pinnipeds, manatees, sea otters, and polar bears. In addition to summaries of current knowledge, chapters provide information on those digital resources and websites which present the latest information as it emerges in the field. The CRC Handbook of Marine Mammal Medicine, Third Edition gives a call to action for scientists to experiment with new endeavors to engage and inspire current and future generations to care for marine mammals and the marine environment, and work together to find solutions. As the most trusted reference for marine mammal conservation medicine and for marine mammal medical facilities around the world, this book needs to be in your library.

Ecology and Conservation of the Sirenia Academic Press

Issues in Global Environment—Biology and Geoscience: 2013 Edition is a ScholarlyEditions™ book that delivers timely, authoritative, and comprehensive information about Wildlife Research. The editors have built Issues in Global Environment—Biology and Geoscience: 2013 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Wildlife Research in this book to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Global Environment—Biology and Geoscience: 2013 Edition has been produced by the world’s leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/.

Camera Traps in Animal Ecology Springer Science & Business Media

Every day, biologists in parkas, raincoats, and rubber boots go into the field to capture and mark a variety of animal species. Back in the office, statisticians create analytical models for the field biologists' data. But many times, representatives of the two professions do not fully understand one another's roles. This book bridges this gap by helping biologists understand state-of-the-art statistical methods for analyzing capture-recapture data. In so doing, statisticians will also become more familiar with the design of field studies and with the real-life issues facing biologists. Reliable outcomes of capture-recapture studies are vital to answering key ecological questions. Is the population increasing or decreasing? Do more or fewer animals have a particular characteristic? In answering these questions, biologists cannot hope to capture and mark entire populations. And frequently, the populations change unpredictably during a study. Thus, increasingly sophisticated models have been employed to convert data into answers to ecological questions. This book, by experts in capture-recapture analysis, introduces the most up-to-date methods for data analysis while explaining the theory behind those methods. Thorough, concise, and portable, it will be immensely useful to biologists, biometricians, and statisticians, students in both fields, and anyone else engaged in the capture-recapture process.

Ethology and Behavioral Ecology of Phocids National Academies Press

Inspired by the International White Shark Symposium in 2010, Global Perspectives on the Biology and Life History of the White Shark incorporates the most important contemporary research findings into a single peer-reviewed book. This beautifully illustrated reference represents a historic change in the context of White Shark (Carcharodon carcharias) research. Once considered one of the most poorly understood and difficult sharks to study, this timely book recognizes a new sophisticated focus on the White Shark, raising its status from obscurity to enlightenment. The Global Perspectives on the Biology and Life History of the White Shark celebrates the White Shark as the most studied shark in the sea. Within the chapters one can find new insights into a vast range of topics, such as behavior, physiology, migration patterns, habitat preferences, daily activity patterns, molecular genetics, reproductive biology and new research methods. The book also delves into population monitoring and policy options for managers and researchers.

Whales, Seals, Fish and Man Elsevier

Remote photography and infrared sensors are widely used in the sampling of wildlife populations worldwide, especially for cryptic or elusive species. Guiding the practitioner through the entire process of using camera traps, this book is the first to compile state-of-the-art sampling techniques for the purpose of conducting high-quality science or effective management. Chapters on the evaluation of equipment, field sampling designs, and data analysis methods provide a coherent framework for making inferences about the abundance, species richness, and occupancy of sampled animals. The volume introduces new models that will revolutionize use of camera data to estimate population density, such as the newly developed spatial capture–recapture models. It also includes richly detailed case studies of camera trap work on some of the world’s most charismatic, elusive, and endangered wildlife species. Indispensible to wildlife conservationists, ecologists, biologists, and conservation agencies around the world, the text provides a thorough review of the subject as well as a forecast for the use of remote photography in natural resource conservation over the next few decades.

A Handbook of Techniques IUCN

The charismatic mammals that live in the ocean are a constant source of interest, both for scientists and our society at large. Their biology, behavior, and conservation are of utmost importance, as a vast number of species are currently threatened. Intended for the upper-level undergraduate or graduate student within biology, marine biology, or conservation/environmental science, An Introduction to Marine Mammal Biology and Conservation provides a broad introduction to marine mammal biology using cutting edge information and student-friendly learning tools. The text begins with chapters on the evolution and classification of marine mammals and their general biology. It moves on to discuss the behavior and ecology of different groups of marine mammals, such as polar bears, otters, and cetaceans. Part 3 dives into many different conservation issues facing marine mammals, as well as discussions on how they can be addressed. Closing chapters provide information on how scientists study marine mammals, how society can enjoy observing the animals while making sure they are preserved, and a word to students looking to pursue a career with marine mammals.

Analysis and Management of Animal Populations Pelagic Publishing Ltd

Occupancy Estimation and Modeling: Inferring Patterns and Dynamics of Species Occurrence, Second Edition, provides a synthesis of model-based approaches for analyzing presence-absence data, allowing for imperfect detection. Beginning from the relatively simple case of estimating the proportion of area or sampling units occupied at the time of surveying, the authors describe a wide variety of extensions that have been developed since the early 2000s. This provides an improved insight about species and community ecology, including, detection heterogeneity; correlated detections; spatial autocorrelation; multiple states or classes of occupancy; changes in occupancy over time; species co-occurrence; community-level modeling, and more. Occupancy Estimation and Modeling: Inferring Patterns and Dynamics of Species Occurrence, Second Edition has been greatly expanded and detail is provided regarding the estimation methods and examples of their application are given. Important study design recommendations are also covered to give a well rounded view of modeling. Provides authoritative insights into the latest in occupancy modeling Examines the latest methods in analyzing detection/no detection data surveys Addresses critical issues of imperfect detectability and its effects on species occurrence estimation Discusses important study design considerations such as defining sample units, sample size determination and optimal effort allocation

An Introduction to Marine Mammal Biology and Conswervation OUP Oxford

Pollinators--insects, birds, bats, and other animals that carry pollen from the male to the female parts of flowers for plant reproduction--are an essential part of natural and agricultural ecosystems throughout North America. For example, most fruit, vegetable, and seed crops and some crops that provide fiber, drugs, and fuel depend on animals for pollination. This report provides evidence for the decline of some pollinator species in North America, including America's most important managed pollinator, the honey bee, as well as some butterflies, bats, and hummingbirds. For most managed and wild pollinator species, however, population trends have not been assessed because populations have not been monitored over time. In addition, for wild species with demonstrated declines, it is often difficult to determine the causes or consequences of their decline. This report outlines priorities for research and monitoring that are needed to improve information on the status of pollinators and establishes a framework for conservation and restoration of pollinator species and communities.

Occupancy Estimation and Modeling Cambridge University Press

Originally published in 1982, this reprint of the second edition of The Estimation of Animal

Abundance and Related Parameters has been described as the "bible" of the field. Censuses of living populations are required for many purposes in wildlife management, fisheries and pest control and they are essential in policy making for the protection of the environment. In this book Professor Seber, one of the leading experts in the field, explains in detail the methods that have been developed by ecologists for estimating animal numbers and related parameters such as mortality and birth rates. He insists on the importance of experimental design and describes a great variety of statistical techniques that are required in analyzing the data obtained. These designs and techniques are classified for easy reference according to the particular types of problems encountered by the field worker and the kind of information that is available. The assumptions underlying practical methods in current use are fully examined, together with procedures for testing their validity. Each method is demonstrated by at least one worked example; in all there are over 90 such examples, mostly using data obtained from natural or free-ranging populations around the world. Ecologists will find this book - the first full-length treatment of its subject - a sound statistical assessment of methods which in the past were frequently developed on an intuitive basis; while applied mathematicians will benefit no less from a study of the interaction between mathematics and biology in this important branch of statistics. Field workers will be stimulated and helped by the real-life examples and the practical nature of the work. "George Seber's book became an instant classic following its publication in 1973. It dealt comprehensively with previously published research on methods for estimating abundance and demographic parameters of animal populations. Professor Seber provided detailed reviews of methods that were originally published with adequate statistical development, and he provided derivations and development for intuitive estimators that had been initially presented by ecologists. The second edition of the book was published in 1982 and included substantive additional coverage of "new" developments that had occurred since 1973. The 1982 book has become a citation classic and can be found on the bookshelf of every serious animal population ecologist and every biostatistician dealing with animal population data. For the 20 years since its publication, it has remained the only book of its kind. Many important methodological developments have occurred in animal estimation problems since 1982, but virtually all such methods represent extensions of the initial methods described by Seber (1982). Several excellent monographs and books have been written over the last 2 decades that deal in detail with particular subsets of the material in Seber (1982). What is remarkable is that these recent contributions have not superseded Seber's book, but are best viewed as supplements to his original comprehensive treatment. Thus, Seber's (1982) book can still be found on the bookshelf of every serious animal population ecologist and biostatistician. Now, in 2002, it is surrounded on the bookshelf by a handful of related books and monographs, but it has not lost its relevance or importance and remains the most detailed, comprehensive treatment of methods to estimate animal abundance and related parameters." Jim Nichols, Patuxent Wildlife Research Center, U.S. Geological Survey, Laurel, MD Professor Seber, Professor Emeritus at the University of Auckland, is regarded as the world's foremost authority on statistical methods for estimating the size of animal populations. His early work on capture-recapture methods was groundbreaking and the Jolly-Seber method still forms the basis of most modern work, more than 30 years after his first paper on the method in 1962.

5th Mexican Conference, MCPR 2013, Queretaro, Mexico, June 26-29, 2013. Proceedings Elsevier

Twenty years in the making by a distinguished dolphin expert and his associates, The Hawaiian Spinner Dolphin is the first comprehensive scientific natural history of a dolphin species ever written. From their research camp at Kealakeakua Bay in Hawaii, these scientists followed a population of wild spinner dolphins by radiotracking their movements and, with the use of a windowed underwater vessel, observing the details of their underwater social life. The authors begin with a description of the spinner dolphin species, its morphology and systematics, and then examine the ocean environment, the organization of dolphin populations, and the way this school-based society of mammals uses shorelines for rest and instruction of the young. The dolphins' reproductive cycle, their vision, vocalization, hearing, breathing, and feeding, and the integration of the school are carefully analyzed. The authors conclude with a comprehensive evolutionary analysis of this marine cultural system, with its behavioral flexibility and high levels of cooperation. This absorbing book is the richest source available of new scientific insights about the lives of wild dophins and how their societies evolved at sea.