

The Elasmobranch Husbandry Manual: Captive Care of Sharks, Rays and their Relatives

Editors

Mark Smith
Doug Warmolts
Dennis Thoney
Robert Hueter



Published by
Ohio Biological Survey, Inc.

Ohio Biological Survey

Special Publication

ISBN-13: 978-0-86727-152-3

ISBN-10: 0-86727-152-3

Library of Congress Number: 2004115835

Publication Director

Brian J. Armitage

Editorial Committee

Barbara K. Andreas, Ph. D., Cuyahoga Community College & Kent State University

Brian J. Armitage, Ph. D., Ohio Biological Survey

Benjamin A. Foote, Ph. D., Kent State University (Emeritus)

Jane L. Forsyth, Ph. D., Bowling Green State University (Emeritus)

Eric H. Metzler, B.S., The Ohio Lepidopterists

Scott M. Moody, Ph. D., Ohio University

David H. Stansbery, Ph. D., The Ohio State University (Emeritus)

Ronald L. Stuckey, Ph. D., The Ohio State University (Emeritus)

Elliot J. Tramer, Ph. D., The University of Toledo

Literature Citation

Smith, M., D. Warmolts, D. Thoney, and R. Hueter (editors). 2004. The Elasmobranch Husbandry Manual: Captive Care of Sharks, Rays and their Relatives. Special Publication of the Ohio Biological Survey. xv + 589 p.

Cover and Title Page

Illustration by Rolf Williams, The National Marine Aquarium, Rope Walk, Coxside, Plymouth, PL4 0LF United Kingdom

Distributor

Ohio Biological Survey, P.O. Box 21370, Columbus, Ohio 43221-0370 U.S.A.

Copyright

© 2004 by the Ohio Biological Survey

All rights reserved. No part of this publication may be reproduced, stored in a computerized system, or published in any form or in any manner, including electronic, mechanical, reprographic, or photographic, without prior written permission from the publishers, Ohio Biological Survey, P.O. Box 21370, Columbus, Ohio 43221-0370 U.S.A.

Layout and Design: Brian J. Armitage, Ohio Biological Survey

Printing: The Ohio State University, Printing Services, Columbus, Ohio

Ohio Biological Survey
P.O. Box 21370
Columbus, OH 43221-0370
<ohiobiosurvey@sbcglobal.net>
www.ohiobiologicalsurvey.org

11-2004—1.5M

Chapter 37

Census of Elasmobranchs in Public Aquariums

BETH FIRCHAU

*Virginia Aquarium and Marine Science Center,
717 General Booth Boulevard,
Virginia Beach, VA 23451, USA.
E-mail: BFIRCHAU@vbgov.com*

WARREN PRYOR

*Biology Department,
University of Saint Francis,
2701 Spring Street,
Fort Wayne, Indiana, 46808, USA.
E-mail: Wpryor@sf.edu*

JOÃO P. CORREIA

*Oceanário de Lisboa,
Esplanada D. Carlos I - Doca dos Olivais,
1990-005 Lisboa, Portugal.
E-mail: jpcorreia@oceanario.pt*

Abstract: Ever since animals have been kept in captivity there has been a need to record the composition of collections for management and development purposes. In an effort to record the composition of elasmobranch collections and enhance communication between facilities holding elasmobranchs, the American Elasmobranch Society (AES) Captive Elasmobranch Census (CEC) and the European Union of Aquarium Curators (EUAC) Fish and Invertebrate Taxon Advisory Group (FAITAG) Taxonomic Database (TD) were created in 1991 and 1999, respectively. The CEC boasts a strong participation, averaging 78 facilities worldwide and reporting on an average of 3,710 specimens and >140 species each year. The most numerous shark, ray, and chimera species maintained in CEC aquaria between 1992 and 2001 were the whitespotted bambooshark (*Chiloscyllium plagiosum*), southern stingray (*Dasyatis americana*), and spotted ratfish (*Hydrolagus colliei*), respectively, accounting for >16% of all elasmobranchs maintained. The 2000 CEC reported reproductive activity in >33% of the elasmobranchs maintained in the 91 participating facilities. The TD surveyed 31 facilities in 2002 and recorded 1,010 specimens and 82 species of elasmobranchs. The most numerous shark, ray, and chimera species maintained in TD aquariums were the smallspotted catshark (*Scyliorhinus canicula*), thornback ray (*Raja clavata*), and spotted ratfish (*Hydrolagus colliei*), respectively, accounting for >36% of all elasmobranchs maintained. The 2002 CEC reported reproductive activity, research, and specialized husbandry techniques for 15, 8, and 24 species of elasmobranchs, respectively.

Ever since animals have been kept in captivity, there has been a need to record the composition of collections for management and development purposes. Periodic inventories are vital to understanding the dynamic nature of collections and helping to determine the focus of an institution's propagation and acquisition strategies, husbandry regimes, educational programs, public relations campaigns, and conservation agendas.

In recent years, the public aquarium industry has undergone extensive growth, due to advances in aquarium science and increased public interest in the aquatic environment. In response to this interest and the industry's improved ability to propagate, collect, transport, and maintain a wider range of species, collections managers worldwide have found it necessary to communicate with each other to maintain an economic and environmental focus on their work. The compilation of inventories and databases, from a variety of different facilities, has proven to be an excellent way of aiding this communication.

The American Elasmobranch Society (AES) and European Union of Aquarium Curators (EUAC) conduct and compile elasmobranch censuses, national and international in scope, on an annual basis. These efforts are referred to respectively as the AES Captive Elasmobranch Census (CEC) and the EUAC Fish and Invertebrate Taxon Advisory Group (FAITAG) Taxonomic Database (TD). The development, purpose, use, trends, and future goals of these two efforts are the subject of this chapter.

CAPTIVE ELASMOBRANCH CENSUS (CEC)

In June of 1989, at the annual meeting of the AES, Demski and Scott (1989) suggested that increased communication was essential to both improved research efforts and the development of successful breeding programs for captive elasmobranch populations. Warren Pryor (Fort Wayne Children's Zoo, Fort Wayne, Indiana, USA) was inspired by this presentation and implemented a regional census, collecting data on elasmobranch species held at facilities within Midwestern USA. In July of the same year, after surveying zoos and public aquariums from seven Midwestern states, Pryor compiled and distributed the first AES Great Lakes Regional Inventory. Dependent on voluntary participation and compiled on a typewriter, the inventory recorded 137 elasmobranch specimens, representing 27 species, held at 14 institutions. In 1989, a second

survey was completed by the same facilities and an additional 47 specimens were added to the inventory (Pryor, 1989).

Pryor conducted a third census during 1990. While attending the 1990 annual meeting of the AES, Pryor suggested that a national census be developed, giving a synopsis of his efforts and calling on members for their support (Pryor, 1990a). Later that year Pryor (1990b) published the first combined Central and Great Lakes Regional Elasmobranch Inventory, surveying 25 institutions and recording over 200 elasmobranch specimens representing more than 55 species.

In 1991 the AES president, Jack Musick, officially established the CEC as an ad hoc committee of the Society. With the assistance of volunteer regional coordinators (i.e., Beth Firchau, Columbus Zoo and Aquarium, Columbus, Ohio; Alan Henningsen, National Aquarium in Baltimore, Baltimore, Maryland; John Morrissey, Hofstra University, Hempstead, New York; John Rupp, Point Defiance Zoo and Aquarium, Tacoma, Washington; Tom Schmidt, Sea World, Orlando, Florida; and Kathy Vires, Henry Doorly Zoo, Omaha, Nebraska) the first national CEC was published in 1991 (Pryor, 1991). The 1991 CEC recorded 1,659 specimens, representing 65 species from 53 facilities. The 1991 CEC included elasmobranchs held in facilities located in the Caribbean. Contact information for each participating facility was included. Thus, the AES CEC was born.

Over the next two years, Pryor recruited additional facilities to participate in the annual CEC and expanded its reach to include regional coordinators and facilities from Canada, the Far East, and France. Survey return rates typically approached 100% and new facilities were added each year. In March of 1994, Pryor stepped down as chair of the CEC committee and Beth Firchau took his place.

Firchau's first goal as CEC committee chair was to expand participation within the USA, and to include more facilities from throughout the world. The international CEC of 1995 included 2,674 specimens, representing 103 species, from 64 facilities—drawn from 24 states of the USA and 12 additional countries (Firchau, 1995).

From 1995 until the present, Firchau, with the assistance of many regional coordinators, has built the CEC into an increasingly valued information resource, issuing annual national CECs and biennial international CECs.

Role and organization of the CEC

The AES CEC was developed as a tool to improve communication between public aquarium professionals, specifically with regard to elasmobranch husbandry and health-management. It has grown to be an internationally recognized resource for aquarists, curators, the media, researchers, the medical community, government agencies, and conservation organizations. The CEC boasts a strong participation, averaging 78 facilities worldwide each year of survey, and reports on an average of 3,710 specimens, representing more than 140 species.

The CEC is compiled each year, with the help of regional coordinators, and is guided and managed by the CEC committee chair. Each year facilities throughout the USA are invited to participate in the CEC, while international facilities are invited to participate on alternating years. Institutions are asked to provide information about species and numbers of individual elasmobranchs held in their collections. Sponsoring institutions absorb costs associated with contacting facilities, publishing, and distributing the CEC. Facilities that have participated in the CEC are not charged for the finished report. Information contained in the CEC is the property and responsibility of the CEC committee and the AES.

The CEC began as, and continues to be, a voluntary effort, detailing sensitive information. The information within the CEC must therefore be managed with care. In some cases, live animal collections at participating facilities are considered to be the assets of a private organization. To maintain the privacy of participants, the CEC chair and contributors must be discrete about how they use and distribute CEC information. A breach in trust between voluntary participants and the CEC committee would harm the latter's ability to effectively perform its role. Information drawn from the CEC is normally only distributed to participating facilities. Requests for CEC information by government agencies, conservation and environmental organizations, advocate coalitions, and other non-CEC groups may be granted. Each request is reviewed carefully and completely by the CEC committee chair and then forwarded to CEC participants for their ultimate consent. All CEC participants are encouraged to follow this guideline.

Observed trends in the CEC

Participation in the CEC continues to grow and diversify. With a repeat contribution rate reaching

>95% nationally, and ~75% internationally, credible trends in collection size and composition may be inferred. The diversity of elasmobranch collections recorded in any one year, between 1992 and 2001, tended to be low, averaging ~147 species per CEC. Collection composition seemed to be somewhat connected to the geographical location of the participating facility. The most numerous shark, ray or skate, and chimera species maintained in aquariums were the whitespotted bambooshark (*Chiloscyllium plagiosum*), the southern stingray (*Dasyatis americana*), and the spotted ratfish (*Hydrolagus colliei*), respectively. These three species accounted for >16% of all elasmobranchs held in captivity. The nurse shark (*Ginglymostoma cirratum*) was another commonly maintained species.

Broadening the scope of the CEC

During the last 10 years, the CEC has included topical surveys to gain some insight into the state of captive elasmobranch husbandry. The 1999 national CEC included a survey of elasmobranch husbandry protocols from aquariums throughout the USA. Diet composition, feeding protocols, health-management protocols, acquisition techniques, quarantine regimes, exhibit dimensions, and collection compositions, from 38 institutions, were recorded. The survey illustrated a diverse approach to elasmobranch exhibition, husbandry, and health management. The results of the survey have since been used by exhibit designers, collection managers, public-relations specialists, veterinarians, and other public aquarium professionals to assist with the development of elasmobranch exhibits, to develop education and conservation programs, and to promote improvements in the husbandry of elasmobranchs.

The 2000 international CEC included a survey of reproductive activity within elasmobranch collections (i.e., had copulation, gestation, or birth been observed?). Of the 91 participating facilities, >33% reported reproductive activity, mostly occurring in *Chiloscyllium* spp. and *Raja* spp. The results of the survey have since been consulted to help facilities develop elasmobranch breeding programs.

Future of the CEC

As concern over the sustained use of global elasmobranch populations increases and public

interest in sharks and rays grows, there will be an increased desire for aquariums throughout the world to display elasmobranchs. The AES CEC will be used increasingly by managers to develop exciting and educational collections, and to prioritize and organize captive propagation programs. The CEC committee desires that the Census remain a respected and important resource for elasmobranch husbandry personnel and researchers around the world. To this end, the CEC committee is committed to expanding the Census and remaining responsive to the changing communication and information needs of public aquariums.

TAXONOMIC DATABASE (TD)

In January of 1999, members of the EUAC met at the Chester Zoo (North of England Zoological Society, Chester Zoo, UK) with the objective of structuring the taxon advisory group for European aquariums, or the FAITAG. The mission of the FAITAG was as follows (Hall, pers. com.):

“...to establish coordinated breeding programs as a means of increasing public awareness of fishes and aquatic invertebrates, with an emphasis on the threats to endangered species and their habitat and in conjunction with promoting positive initiatives within the natural environment...”

During the meeting it became apparent that a database detailing fishes exhibited at EUAC aquariums would be an invaluable tool. Mark Smith (Oceanário de Lisboa, Lisbon, Portugal) and João Correia (Oceanário de Lisboa, Lisbon, Portugal) volunteered to initiate and develop the program, which became known as the FAITAG Taxonomic Database (TD).

Role and organization of the TD

The role of the TD is encapsulated by the mission statement (Smith, pers. com.):

“...The mission of the TD (Taxonomic Database) is to compile, analyze and distribute information about the entire collection of fishes, aquatic invertebrates and aquatic plants maintained within European aquariums. Specifically, to produce a list of all species, using an agreed-upon taxonomic nomenclature, and to facilitate the exchange of information about the source, provenance, breeding, husbandry, research and conservation activities related to those species, within each respective institution...”

To structure the database, Smith and Correia initially established a simple spreadsheet where each record (row) corresponded to a single species within a single institution. The objective was to create an electronic database whereby data sets were easily transmissible (i.e., in ASCII or text format) to any part of the world, and easily incorporated into a software package for analysis and interpretation. Each record contained 18 standardized data fields detailing taxonomy, gender, provenance, reproduction, specialized husbandry, and research activities. Since the creation of the TD in 1999, EUAC member participation has been encouraged and the database has been updated continually. Under the guidance of the TD chair (Correia since 2001), the TD has grown into a valued husbandry and communication tool.

Observed trends in the TD

Participation in the FAITAG TD has grown rapidly since its inception in 1999. As of this writing, the database includes data from 31 aquariums throughout Europe and reports on 1,010 specimens and 82 species of elasmobranchs. The most numerous shark, ray, and chimera species maintained in EUAC aquariums were the smallspotted catshark (*Scyliorhinus canicula*), the thornback ray (*Raja clavata*), and the spotted ratfish (*Hydrolagus colliei*), respectively, accounting for >36% of all elasmobranchs. The 2002 TD reported reproduction, research, and specialized husbandry techniques for 15, 8, and 24 species, respectively.

Future of the TD

The future of the TD relies heavily on continued and broadening participation. Members of the EUAC are frequently urged to take part.

In recent years, non-EUAC aquariums have been invited to participate. Until recently, results drawn from the database have only been made available to participating EUAC institutions. However, steps are being taken to make the TD available to all EUAC members (via www.EUAC.org), and non-EUAC-affiliated institutions via Fishbase (www.fishbase.org) and the IUCN (International Union for the Conservation of Nature and Natural Resources).

PARTICIPATION

To take part in the AES CEC please contact the AES through their web site at www.flmnh.ufl.edu or e-mail the CEC chair on bfirchau@vbgov.com

To take part in the EUAC TD please contact the database coordinator on jpcorreia@oceanario.pt

REFERENCES

- Demski, L. S. and S. W. Michael. 1989. Reproductive biology of captive elasmobranchs: Needs and strategies. *In*: Proceedings of the 5th annual meeting of the American Elasmobranch Society, June 17-23, 1989, San Francisco, California, USA. Abstract, p. 8.
- Firchau, B. 1995. The American Elasmobranch Society International Captive Elasmobranch Census. Columbus Zoo and Aquarium, Ohio, USA. 23 pp.
- Pryor, W. 1989. American Elasmobranch Society: Great Lakes Regional Inventory. Fort Wayne Children's Zoological Society, Indiana, USA. 3 pp.
- Pryor, W. 1990a. Toward a national elasmobranch inventory. *In*: Proceedings of the 6th annual meeting of the American Elasmobranch Society, June 14-20, 1990, Charleston, South Carolina, USA. Abstract, p. 19.
- Pryor, W. 1990b. American Elasmobranch Society: Great Lakes Regional Inventory. Fort Wayne Children's Zoological Society, Indiana, USA. 6 pp.
- Pryor, W. 1991. American Elasmobranch Society: Captive Elasmobranch Inventory. Fort Wayne Children's Zoological Society, Indiana, USA. 27pp.

PERSONAL COMMUNICATIONS

- Hall, H. 2001. Zoological Society of London, London NW1 4RY, UK.
- Smith, M. 2002. Oceanário de Lisboa, 1990-005 Lisboa, Portugal.