EDUCATION AND EXPERIENCE PREFERRED

FOR ENTRY-LEVEL POSITIONS IN

ZOOLOGICAL CARE

By

KEVIN SCOTT SHERMAN

Bachelor of Science
California State University, Fresno
Fresno, California
1986

Master of Agriculture
Oklahoma State University
Stillwater, Oklahoma
1997

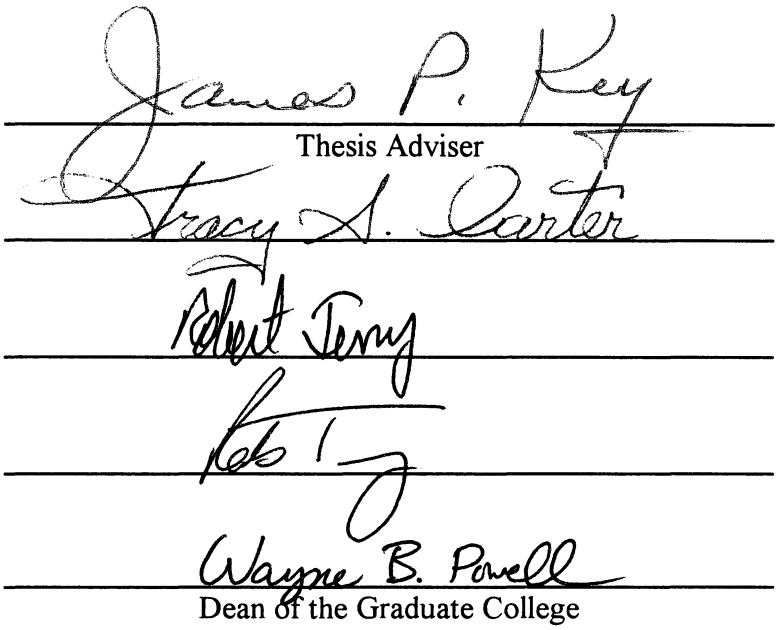
Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF PHILOSOPHY
May, 1999

EDUCATION AND EXPERIENCE PREFERRED

FOR ENTRY-LEVEL POSITIONS IN

ZOOLOGICAL CARE

Thesis Approved:



Thesis Adviser

Dean of the Graduate College

PREFACE

While teaching vocational agriculture in three different high schools in California, it became apparent that students in urban agriculture programs wanted to learn more than just traditional farm animals. They had a desire to learn about the many different types of animals such as pets, exotics, animals raised in zoos, and wild animals. This desire brought together the creation of an agricultural education program which used the objectives of both animal agriculture and natural resource management with leadership development and supervised occupational practice to a program which became known as the Center for Agricultural Science and Technology's Applied Zoological Program. This program allowed students to focus their training toward more than traditional agricultural occupations (i.e. animal production) and look at the many different options that the knowledge of the care and management of different animals could afford them.

One of the problems that became apparent when trying to determine which elements of the curriculum should be included in this program was the lack of information that was available on curriculum content. It was because of this problem and need to validate the program that this research project took place. As the project comes to the end of the beginning, it is was well worth knowing that training in vocational agricultural education can help those individuals who desire to be involved in the care and management of animals both that are wild as well as domesticated.

ACKNOWLEDGMENTS

As I look back over my life, all of it has culminated into the beginning of the next stage of my life. This is to support and prepare new teachers for both formal and informal educational settings. This is due to the calling and the following of God's direction over my life, the salvation of the Lord Jesus Christ and the inspiration of the Holy Spirit. Thus true acknowledgment goes to God the Father, the Son, and the Holy Ghost.

Through this process of growing as a person, as well as an educator, there are many which God has used to support my life. The first are my parents Gordon and Darla Sherman. It is with their direction, support through the hard times and a strong upbringing that I have been able to accomplish this step in my life. I also wish to acknowledge my grandparents Lawrence and Mozelle Giacomelli, Baldwin and Grace Sherman, and Louis and Marge Sherman. It was because of their seeds of faith and commitment, that agriculture and the love of people become an important part of my life.

While pursing my higher education I would like to acknowledge two men who have been true mentors in training me to be an ethical and caring educator. These individuals are Dr. James Key and Dr. James White. I would also like to thank the many other faculty and staff who have played a major part in my education. The first group includes the rest of my committee, Dr. Robert Terry, Dr. Robert Terry, Jr., and Dr. Tracy Carter. I would also like to thank the other faculty and staff who have been part of my life over the last thirty-two months; including Dr. James Shaw, Dr. James Liesing, Dr. Kevin

Hayes, Shelly Sitton, Darlene Biyeau, Bonnie Milby, Pat Dick, Dr. Robert Price, Dr. Bill Barfield, Dr. J. R. Kropp, Dr. R. P. Wettermann, Dr. Kate Baird, Dr. Wen-Song Hwu, Dr. Rey Martinez, Dr. Nan Restine, Dr. Ted Mills, Dr. Christine Moseley, Sandy Dearing, Dr. Phillip Nokes, Dr. Micheal Strange, and Dr. David Engle.

A special thanks goes to the staff at Sunnybrook Christian Church for the rebirthing of a ministry which had been buried so deep with in my soul for so long. I would also like to thank my former students who have grown to be part of my family for life.

One of the exciting parts of working toward the goals that I have been able to pursue was the time spent at both the Oklahoma City Zoological Park and The Tulsa Zoo and Living Museum. The best part was the time working with the administration department for the Oklahoma City Zoological Park. A special thanks goes to Dr. Connie Mack McCoy, Stephen Wylie and the rest of the zoo staff.

The last thank-you goes to Kay Porter and Donna Christenberry who are responsible for making this manuscript look professional and have given me the support in making sure I was doing a good job.

Indeed I have been blessed by those who have touched my life and now it is time to resume my job as an educator and take all that these lives have poured into mine to those with whom I will work in the future.

TABLE OF CONTENTS

Chapter Page

LIST OF TABLES

Table Page

CHAPTER I

INTRODUCTION

> "Animal collections", "menageries" and "zoological gardens" are names that reflect human curiosity about the animal kingdom throughout history. Until recent decades, however, that interest was rarely matched by understanding or concern for the animals' well-being.
>
> The recent evolution of zoos reflects our changing insight into the interdependence of the human species with all other species, and our increasing awareness of the accelerating environmental crisis threatening the earth's natural ecosystems and animal populations.
>
> Zoos have become central in advancing science, technology and management--areas that are essential to preserving the earth's natural ecological diversity. William Conway (Koebner, 1994, p. 13)

From the earliest time, people have been fascinated with animals. Animals have played many roles in the lives of people. They have been used for food, clothing, tools, medicine, pets, protection, and research. Animals have also been important in the role of just being part of people's lives by existing (Gray, 1991). For many people, just being able to observe and see animals as they are is very important. It is because of this need that animals have always been of great significance to the lives of many human beings.

As people progressed from being just hunters and gatherers to being producers of food, they have been involved in the care and management of animals. The more time people spent working with animals, the more they developed the ability to raise animals productively and extend animal's lives in captivity. It is because of this knowledge and

the advancement of science that animals in captivity today are much better provided for than in the past (Herren, 1994).

As with the care and management of domesticated animals, the love of exotic animals has also been important to the well-being of human beings (Herren, 1994). For some the simple beauty and experience of seeing an exotic animal is a joy; for others the collecting of animals from all over the world is a thrill in itself. For many centuries the care and management of animals have been part of people's lives.

The first animal collections became places where wealthy people would see who could have the best, largest, and/or most exotic collection of animals. The number and exoticness of animals were more important than the care and management of the animals being kept.

Later, animal collections became places where people went for entertainment. In fact some of the traveling shows and circuses had both animals and people from different cultures on show for entertainment. At that point in time, the exploitation of animals and their abilities became the focus of individuals and companies in the business of exotic animal care and management. The search for knowledge in caring for these animal collections was not as important as the profit from the public. In fact in many cases it was easier and cheaper to replace animals from the wild than care for them properly. The more unfamiliar/different the animals were, the more people were likely to spend money to see them (Croke, 1997).

As zoological collections embarked into the latter part of the twentieth century, many species approached extinction (Gray, 1991). It became more important for zoological institutions to look at the reproduction of animals in their collections for the

replacement of animals which had died or those which were needed for new exhibits in other institutions. The zoo and aquarium industry had to change from being a consumer of exotic animal species to being a producer of these same species (Croke, 1997).

The major difference in the reproduction of exotic species and the raising of domestic animal species is that zoo and aquarium institutions have to pay careful attention to the genetic make-up of the animals with which they are working. It is vital to keep a large genetic pool of animals for the population to remain strong and viable. Thus those in the industry had to look at both agricultural and scientific principles in order to maintain animal collections. This was important because for some species the only factor preventing extinction was the careful management of animal collections in zoos and aquariums. (Kleiman, Allen, Thompson, Lumpkin & Harris 1996; Herren, 1994).

Today's zoological parks and aquariums (biological parks) have a major challenge to accomplish their mission of educating about and conserving the world's natural resources. First, they must be able to care for and manage animal collections which have very special requirements. Secondly, they must, as an international group of institutions, manage both wild and captive populations of animals which are threatened by extinction. Thirdly, they must serve as a united group which will focus beyond their doors and help countries throughout the world to save and conserve valuable habitat. Fourthly, they must educate the public about the importance of conserving the earth's natural resources. Finally, they must be able to provide the public with entertainment through education (Sausman, 1982, Marshall, 1994). For all of these reasons the modern zoo and aquarium must employ the best prepared personnel they can find.

According to Ledder (1993):

> As zoos evolve, so does the role of the most critical component in animal care: the keeper. Originally hired because of experience on the farm or in the circus, keepers of the past were often unskilled laborers, hired to clean and feed the animals in their care. In contrast, the keeper of the 90's plays an integral role in animal management, veterinary care and research, along with public relations and education (p. 344).

The American Zoo and Aquarium Association (AZA) represents zoos and aquariums in the United States, the territories, Canada, and Bermuda. In 1996, the AZA represented 176 member zoos and aquariums which cared for 913,153 animal specimens (including mammals, birds, reptiles, amphibians, fish, and invertebrates) with the support of 16,264 full-time employees (plus part time employees and volunteers). These institutions covered 21,273 acres of land and provided entertainment and education to 119,815,857 visitors. The total operating budgets of these institutions was $1,137, 297,734 with an additional budget of $505,819,462 for capital improvement making this a $1,644,117,196 industry (Boyd, 1996).

In the United States and Canada, people of all ages have been very interested in careers related to the field of zoological care and management. There is a strong attraction to the care of exotic animals which has led many to search out information on career preparation in the areas of zoological care and management. Depending on who is contacted, information on requirements for entry level careers in this field can be anything from no education and practical experience to a Bachelors degree and four years of practical experience (Ray, 1996a, 1997b).

In summary, there is a need for pre-service training of persons seeking positions in zoological parks and aquariums in order to prepare well trained personnel. There are a few educational institutions which have developed programs to support the zoological

industry, but many zoological institutions have had to develop their own training programs to meet the educational needs for their personnel. Even though there are a few educational programs, overall there has not been a standard curriculum developed based on the needs of the zoo industry as a whole to support the needs of the modern zoological institution. Thus there is a need for a preferred curriculum for training prospective employees in zoological care. According to Maple, McManamon and Stevens (1995) "Good Zoos" are in need of a superior talented zoo workforce. The following is their feelings in regards to a "good zoo."

> We believe that good zoos exceed the highest standards of the profession and , furthermore, engage in the consistent pursuit of excellence in conservation, education, science, and recreation. By this definition, good zoos are leaders, not followers. Good zoos eschew mediocrity. To maintain their high standards, good zoos must recruit superior talent to the zoo workforce. By their deeds, good zoos are regarded highly by their peers with their communities. (p 215)

Problem

At the time of this study there were no standards for educational curriculum, levels of education, or years/types of practical experience required for people seeking careers in the field of zoological care and management. Those looking for a career in this field have had difficulty preparing for jobs in this field because of the lack of information. In addition to this, it has been difficult for institutions to train people for entry-level positions in zoological care because of the lack of information about education and experience preferred by zoo management. Thus there was a need to conduct research to determine what zoo and aquarium management preferred in the way of training and expertise.

Purpose

The purpose of this study was to determine the curricular topics, educational level, and practical experience needed for entry-level positions in the area of zoological care.

Objectives

The following objectives were developed to accomplish the purpose of this study:

1) To determine selected demographic information about respondents filling out the instrument in relation to educational levels and years of experience.
2) To determine the need for trained personnel for entry-level positions in the area of zoological care.
3) To determine the level of training needed to meet the entry level requirements of zoological parks and aquariums.
4) To determine the amount of practical animal care experience most desirable for employing personnel in the area of zoological care.
5) To determine preferred levels of training for curricular and topical areas for entry-level positions in zoological care.

Assumptions

In conducting this study the following assumptions must be made in looking at the population selected:

1) That the respondents, who are managers of institutions which are members of the AZA, are experts in the field of zoological care and management and

are qualified to make judgments in regard to the skills needed in hiring entry-level personnel for their institutions.

2) That respondents were objective and professional in the completion of the study instrument.

Scope

The scope of this study included Directors, who are in charge of the entire zoological operation, and General Curators, who are primarily in charge of the animal collection at each institution that is accredited by the American Zoo and Aquarium Association (AZA). One hundred and eighty-two institutions (see Appendix A) were identified with 365 individuals selected to be part of this research project.

Definitions

Acting (Interim) Director – A person appointed to take on the responsibilities of the Director when the Director is on leave from the institution or when the facility is without a Director.

American Zoo and Aquarium Association – A professional association (corporation) of zoos and aquariums.

Animal Welfare –

> Animal welfare is the position that animals should be treated humanely. This includes proper housing, nutrition, disease prevention and treatment, responsible care, handling, and humane euthanasia or slaughter. Animal welfare people believe that animals can be used for human purposes, but that they should be treated so that discomfort is kept to a minimum (Warren, 1995, p. 42).

Biopark – A facility which represents and integrates all aspects of biological sciences into education and research.

Domestication – "To adapt (an animal or plant) to live in a human environment and be of use to human beings" (Soukhanov, 1992, p. 550).

Director – The chief operating officer of a zoo and/or aquarium.

Enlightenment – "To give spiritual or intellectual insight to" (Soukhanov, 1992, p. 611).

Exotic – The opposite of indigenous, not native. "From another part of the world; foreign: exotic tropical plants in a greenhouse" (Soukhanov, 1992, p. 643).

General Curator – The manager of a zoo and/or aquarium who is responsible for all animal exhibits and the staff which take care of them.

Menagerie – "A collection of live wild animals on exhibition. An enclosure in which wild animals are kept" (Soukhanov, 1992, p. 1126).

Practical Experience – Formal experience either through volunteering or a paid position which is directly related to a career area. In some cares a supervised experience project can be counted towards the area of practical experience.

Zoo and Aquarium – "Permanent-type establishments, open to and administered for the public to provide education, recreation, and cultural enjoyment through the exhibition, conservation, and preservation of the earth's fauna" (Boyd, 1996, p. 18).

Zoological Care and Management (Zoo Animal Caretakers) –

> ...are responsible for attending to the everyday needs of zoo animals. They feed and clean the animals, clean their cages, and examine the animals to make sure that they are healthy. Generally, the job is to make sure that the animals are healthy and ready to be exhibited.

Caretakers in some zoos work with animal trainers. Animal trainers teach animals to do tricks to entertain the public. Zoo animal caretakers repair fences, exercise the animals, give information to the public about the animals, and make sure that visitors do not do anything to harm the animals (Warren, 1995, p. 62).

CHAPTER II

REVIEW OF LITERATURE

The review of literature was developed to provide a foundation for this study. The review of literature was divided into the eight sections listed below:

1) The History of Animal Menageries (Zoos and Aquariums)
2) The Modern Role of Zoos and Aquariums
3) The American Zoo and Aquarium Association
4) Animal Welfare and the Care and Management of Animals
5) Training Needs in the Zoo and Aquarium Industry
6) Present Zoological Training Programs in the United States
7) Agricultural Education and Non-traditional Careers
8) Summary

The History of Animal Menageries (Zoos and Aquariums)

According to The American Heritage Dictionary of the English Language (Soukhanov, 1992, p. 2078) the word zoo is defined as, "A park or an institution in which living animals are kept and usually exhibited to the public. Also called a zoological garden." Throughout the history of zoos (or menageries), people have placed great importance on the collection of both fauna and flora. Not on all occasions has the general

public had the opportunity to see these wonders of nature, but animals have played special roles in the development of people throughout time (Gray, 1991).

According to the book of Genesis, in the Bible, man was given the dominion over the earth and the creatures living upon it. Chapter 1, verses 27- 28 stated "So God created man in His own image; in the image of God He created him; male and female He created them. Then God blessed them, and God Said to them be fruitful and multiply; fill the earth and subdue it; Have dominion over the fish of the sea, over the birds of the air, and over every living thing that moves on the earth (Hayford et al., 1991, p. 5)." Overall in this description of the creation of earth, man's mission was to rule over and care for the other creatures that had been created.

According to Anthony D. Marshall (1994), when early humans returned to their caves after hunting, they spent time drawing pictures of the animals they had seen. It was Marshall's view that with these drawings people were creating images of animals on their walls and having visual collections of animals (a visual zoo).

The earliest collections of animals, according to historians included both domesticated animals and a few exotics. These collections were kept on royal estates and were used in many cases for hunting. The earliest of these belonged to the Great King Shulgia from 2094 to 2047 BC (Croke, 1997).

The first true zoos, according to the zoo historian Gustave Loisel, were found in ancient Egypt more than 1000 years BC. These collections of animals were a sign of great wealth and were collected on behalf of royalty. When a pharaoh would pass away, their animal collections would be buried in the tomb with him/her. According to Herman

Dembeck, every pharaoh had his own collection of animals which would be used for personal satisfaction, hunting, and showing off to their guests (Croke, 1997).

R.F. Hoage, Anne Roskell, and Jane Mansour, said that the Egyptians kept many different types of animals. Records indicate possessions of cattle, oryx, gazelles, antelope, cranes, baboons, spotted nose addax, storks, brown addax, pigeons, ibis, and falcons. Many of these animals have been found mummified and entombed (Hoage & Deiss, 1996).

Around 1100 BC, the Zhou dynasty in China had a park which contained animals from different locations around the world. The Chinese had a different feeling and concept of the keeping of animals. It was their feeling that these animals were part of a "Garden of Enlightenment." According to historian Sarah Queen, the Chinese believed that animals could facilitate communication between men and the spiritual realm.

During the time of Alexander the Great, animals were kept in facilities to be studied in Greece. Aristotle used these animals to write his book on the history of animals. With the work of the Greeks who studied the area of zoology, animals were cared for and thought of as great treasures (Croke, 1997, Hoage & Deiss, 1996).

The Old Testament mentioned that King Solomon was interested in animals and most likely kept animals at his palace (Hoage & Deiss, 1996).

In the lands of the Roman Empire the role of animals and their care and use changed. The Romans used animals for gaming. Thousands of animals were collected and raised so they could be challenged against other animals and/or man. It was estimated that over a period of four months an average of 100 animals a day were sacrificed in the Roman games. In contrast, as mammals were being slaughtered, aviaries

were developed throughout Italy keeping collections of birds (Croke, 1997, Hoage & Deiss, 1996). Many of the Roman governors had their own collections of animals. "Menageries existed simply as bullpens, warming up the beasts to be farmed for slaughter" (Croke, p. 133).

By 1200 AD the Europeans once again began to collect animals as a sign of nobility. These collections were seen only by their owners and their owner's guests. Zoology began once again to have a place in society.

Also at this time, animals were used as a product for trade between nations. To obtain the animals for their collection, the Chinese (around 1400 AD) opened trade relations with Africa. This allowed exotic animals to be traded throughout the world. Even Columbus, through his travels, brought back animals from the New World to Europe.

With the onset of shipping, animals could be exported around the world. This allowed Europe to obtain animals from many different continents. When Cortez explored the New World, he found one the largest animal collections in the world located behind Montezuma's palace.

In the early 1800s, institutions that had been seen only by the wealthy were opened to the public. For the price of a penny or a cat or dog, which could be fed to the zoo's animals, people could enter the Regent's Park Zoo in London, England (Croke, 1997).

In 1907 Carl Hagen Beck began the idea of a zoo without bars. It was his idea to plan a naturalistic zoo. He was the first to build enclosures using moats, hedges, and artificial rocks to separate groups of animals from each other. This allowed the public to

see many different species of animals which appeared to be living together (Croke, 1997, Hoage & Deiss, 1996).

The twentieth century brought a new practice in the care of animals in zoos. In the United States, there were three institutions which were part of this early history. The first zoological institution to open in the United States was the Philadelphia Zoo. The other zoos included the Central Park Zoo in New York and the Lincoln Park Zoo in Chicago. Each of these institutions opened their doors in the 1860's. With the development of these institutions, care and management became the primary focus. These institutions became the model of the modern zoo. They focused on caring of animals for the education of the public, developing scientific learning, and the conserving of both animals and habitat (Croke, 1997).

The Modern Role of Zoos and Aquariums

Once upon a time, not so long ago, zoos were little more than jails. Animals were kidnaped from the wild and imprisoned in bleak cells. Inbreeding was so common that their offspring rarely survived. Today, zoos are being reinvented, revolutionized. Old cages are being knocked down and replaced with lush habitats. Thanks to ingenious breeding programs, baby animals are busting out all over for some species (Hirshberg, 1997, p. 30).

The role of the zoo in society has changed greatly over the last fifty years. At one time it was an institution of pleasure for a few, but today it is a scientific facility which serves to discover, educate, and conserve. Until the last twenty to thirty years, zoos have been consumers of exotic populations of animals and not protectors and producers of wild

animals. Overall the modern zoo is a place of change with a mission much different than that of the historic zoo (Croke, 1997).

Michael Hutchins and William Conway (1995) said that the modern zoological facility is more than a breeding facility for trying to save animal species from extinction. The modern zoo and aquarium must fulfill five major functions. Those functions are:

1) Be involved in the educating of the public. Every year, millions of people visit zoo and aquariums throughout the United States. This large audience allows the zoo to educate the public on the needs of saving animal species from extinction and preventing habitat destruction.

2) Be involved in scientific research. Zoos have large collections of animals which can be studied in close contact situations. Much of the knowledge learned in these situations can be used in field work and to provide animals in captivity with better care and management of captive animals. According to the AZA Annual Report on Conservation and Science, from 1990 to 1994 scientists working with accredited facilities produced over 1600 technical and semi-technical articles.

3) Be involved in the development of relevant technologies. Many of the procedures and technologies developed by working with animals in captivity can be transferred to field work. Such work allows scientists to fine tune their methodology before taking it out to remote situations.

4) Be involved in professional training and technology transfer. If conservation is to succeed, it will be necessary to train and empower a new generation of leaders, particularly in developing countries.

5) Be involved in fund raising in support of field conservation.

> Since many of the countries with animal extinction are poor and developing it has been difficult to save both animals and habitat from being destroyed. Many zoological institutions have discovered that they have to go beyond their parks and boundaries to provide conservation funding for programs where threatened animals come from (Hutchins & Conway, 1995, p. 117).

Another factor having an impact on the zoo and aquarium industry has been the transition from public institutions to private ones. These institutions must be self supporting. They have to be more involved in marketing of their facilities and producing a product for which the consumer is willing to pay. Bob Ramin, director of marketing for the AZA, said, "Zoos and aquariums have had to become more aggressive, whether they are public or private. They aren't just there for recreation, but for conservation purposes, and they're fun to boot. Still, they have to recognize there's a lot more competition out there for my leisure dollar" (Thurston, 1995, p. 3).

One of the biggest changes which has come to the modern zoo is the selection of breeding animals. For many years, zoos tried to obtain male and female animals so they might reproduce and provide the public offspring to see. Today in many zoos, controlled breeding has taken the place of random breeding programs. Many of the animals that are bred in zoos either are part of the Species Survival Plan (SSP) or are bred only if animals are wanted for other accredited facilities. The SSP program was put together through the AZA to make sure that animals which are bred are genetically different. The SSP works throughout the world to help control the problem of inbreeding. This program allows the control of populations so that genetic diversity exists and is preserved in the species population (Sunquist, 1995).

Terry L. Maple Ph.D., the director of Zoo Atlanta, said in the Afterword section of the text, Zoo book; The evolution of wildlife conservation centers:

> These new conservationists are the men and women employed by accredited zoos and aquariums who work on behalf of the world's wildlife. They are competent, diligent and energized. They will expend all of their skills and resources to combat the terrible forces of extinction. Admittedly, some major battles have been lost, but the war itself is far too important to be surrendered.
>
> Today's accredited zoos and aquariums reach hundreds of millions of people annually, touching their lives with formal and informal messages of hope. Zoos can be inspiring locales where batteries are charged an spirits up lifted. Zoos must continue to report successful conservation outcomes, just as they have so carefully documented crises and disasters. If they are to be the institutions that collectively bring disparate resources together, they must demonstrate to the public that our fight can be won, life so many of humanity's challenges, this one requires the cohesion that derives from team-building. And we don't have time to argue about it. Fortunately, as Koebner documents, the world's best zoos have learned to work together. It wasn't always thus. If we are less competitive and more cooperative today, it is because we recognized in our industry's history a dismal conservation record. Recent successes in captive propagation and in situ (field) conservation are the direct result of improvements in communication, technology and population management. It is also clearly the result of an infusion of new talent, bright young scholars and practitioners who have entered the profession that has come to be known as "zoo biology." As this trend continues, zoos and aquariums will become recognized as environmental problem solvers on a global scale. This specialized work force must grow to meet the challenge.
>
> To succeed, the zoo world must enlist every available resource. By carefully orchestrating our plan, even the tiniest of zoos will have a role to play. We need every curator and every zoo keeper, and we must organize an army of volunteers and technical partners. We must staff conservation, but we must form meaningful coalitions with governments, universities and other conservation organizations. Following the lead of the esteemed Wildlife Conservation society, our accredited zoos appear equal to these tasks. As Koebner reveals, conservation has become the first priority of all accredited zoos and aquariums" (Koebner 1994, p. 174 - 175).

These changes in the role of the modern zoo give rise to the need for greater education and experience in zoological care personnel.

The American Zoo and Aquarium Association

Throughout the world there are many associations representing zoos and aquariums. The International Zoo Yearbook stated that in 1995 there were 38 different organizations representing the zoo and aquarium industry (Hutchings International Zoo Yearbook, 1995). Of those, the primary organization representing the zoo and aquarium industry in the United States is the American Zoo and Aquarium Association (AZA).

During the early 1900s, most zoos and aquariums were part of park and recreation departments. There was a need to link these groups together so they could have a way to communicate. From 1924 to 1954, the American Association of Zoological Parks and Aquariums (AZAPA) was affiliated with the American Institute of Park Executives. That group later became part of the professional branch of the National Recreation and Park Association. In January of 1972, the AAZPA became its own organization meeting the direct needs of its member zoos and aquariums. "Our goal of the newly incorporated AAZPA was to strive for higher levels of professionalism among facilities and for those working in zoos and aquariums" (Boyd, 1996, p. 42). In 1994 the AAZPA became the American Zoo and Aquarium Association (AZA) (Boyd, 1996).

Since its inception the association made conservation its major focus, establishing its national conservation headquarters in Minnesota. The AZA also works with many other groups including the US Fish and Wildlife Service, the National Marine Fisheries Service, the Animal and Plant Health Inspection Service, Conservation in Trade in Endangered Species (CITES), and the International Whaling Commission (IWC). The mission of the AZA is to, "Advance zoological parks and aquariums as centers for

conservation, education, scientific studies, and recreation, as well as, foster and support excellence in the purposes of zoological parks and aquariums" (Boyd, 1996, p.43).

> AZA represents virtually every professionally operated zoological park, aquarium, wildlife park, and oceanarium in North America, as well as most of their professional employees. On occasion, AZA represents nearly five million society members who offer support to their local zoological facilities. Additionally, AZA represents over 200 Commercial members, as well as many zoological societies, animal suppliers, and other related organizations, which have close ties to our institution members.
>
> AZA members support a growing number of cooperative wildlife research and conservation efforts, both regionally and internationally. In 1995 alone, members initiated or supported over 1,200 conservation projects in over 60 countries and published 660 articles on wildlife management and biology (Boyd 1996, p. 43).

Membership in the AZA is comprised of individuals, institutions, societies, related organizations, or corporations which are properly nominated. The objectives of the AZA are:

1) To promote the welfare of zoological parks and aquariums and their advancement as public educational institutions, as scientific centers, as natural science and wildlife exhibition and conservation agencies, and as cultural recreational establishments, dedicated to the enrichment of human and natural resources.

2) To foster continued improvement of the zoological park and aquarium profession through the development and regulation of high standards of ethics, conduct, education, and scholarly attainments; to encourage and disseminate increased knowledge through meetings, reports, publications, discussions, seminars, and the various communications media; to foster programs for professional and vocational education; and to engender cooperation among zoological parks and aquariums throughout the world and among those interested in their development.

3) To aid, foster, and engage in the exchange of zoological specimens for exhibition, conservation, scientific, and preservation purposes, cooperating with governmental agencies for the health and welfare of animals and assisting these agencies in the drafting of legislation and regulations; to respect conditions and regulations established by any country in the protection of its animal life in both importation and exportation; and to foster sound captive animal management practices and engender research and study designed to increase biological knowledge and understanding.

4) To advance public education on the need for wildlife conservation and preservation; to assume leadership in the captive propagation of rare and endangered animal species; to actively participate in the international efforts of wildlife preservation; and to review periodically the status of endangered species of animals and take action, binding all members, in protecting the species (Boyd, 1996, p. 18-19).

The population of this study was made up of managers from AZA institutions, since they should be in the best position to make recommendations concerning education and experience needed for entry-level positions in zoological care.

Animal Welfare and the Care and Management of Animals

With the changes in zoos over time, the public has demanded that the care and management of animals be a major concern. As with many different industries, the zoo and aquarium industry must also deal with the animal welfare issue. The zoo and aquarium industry has to present it's side in the argument of why wild animals should be kept in a captive environment, which many times is so different than their native

environment. Michael Hutchins of the AZA stated that, in some cases in order to save animals from total destruction, animals are far safer in a captive environment than in the unprotected environment (Kreger, 1997). In 1991 Tony Vecchio, Director of Roger William's Park Zoo, stated "The animal welfare movement will be a major issue for zoos in the coming years" (p. 538). He also said zoos need to take on two different roles in the management of animal welfare. First, zoos must make an extremely strong effort to go out and educate the public. The pressure will come from the public. If they do not understand why animals are kept in zoological parks and aquariums, the public will not support the role of zoos and aquariums. Zoos must make sure that the methods used in caring for animals are correct and in no way harm the animals being kept. Zoos have now begun to provide naturalistic enclosures, as well as, enrichment so that animals will not be bored (Veachio, 1991).

Presently the animal welfare issue is a great concern. According to Hutchins and Fascione, there are four major issues with which zoos need to deal. The first is the process of how zoos obtain new genetic material for their collections. The second is how to deal with the surplus of animals which are of no use to zoos dealing with population dynamics. Third is the basic husbandry care and management of animals. Fourth is the use of animals for education, research, and/or recreation. (Kleiman, Allen, Thompson, Lumpkin & Harris, 1996). It is very important to make sure that the zoo and aquarium industry has control of these issues and that the proper message is given to the public to meet the demand of proper care and management of animals kept in captivity. Edward Schmitt mentioned the problem of surplus animals in zoological parks in a paper he presented in 1990. Schmitt said that in earlier times, the surplus of animals was seen as a

positive sign that a zoological facility was doing a good job of maintaining a strong collection of animals. Today, the problem of surplus animals is seen as an irresponsible means of increasing unwanted animals. Thus, those who are in the animal welfare ranks have become more critical of zoological institutions that breed animals that have no place to go. (Schmitt, 1990). Schmitt's answer for those in the zoological profession to this problem was:

> Everyone, individuals and institutions, must develop the acceptance of and be accountable for their individual actions and or accomplishments. Everyone must recognize and accept that their individual actions have an effect, both positive, and most noticeably, negatively, on all other colleagues and member institutions. When an individual adopts a policy relative to dispersal of excess specimens, that individual needs to recognize and appreciate the overall potential effect of that decision on the profession as a whole . . . Zoo personnel have been placed in a position of public trust. The public expects the primary concern of all zoo personnel to be the health, welfare, and recently, the psychological well-being of the animals in our collections. Our critics have seized what they perceived as the moral high ground on the emphasis of accountability in management/conservation programs and the responsible disposition of surplus specimens that are the results of those programs (Schmitt, 1990).

This statement in fact can be a positive answer to issues pertaining to welfare of animals in zoological collections. Ultimately the welfare, care, and management of the animals is the responsibility of the persons employed in zoological care positions. Therefore there is a need to know training and experience levels required for these positions.

Training Needs in the Zoo and Aquarium Industry

After searching the literature for the training needs in the zoo and aquarium industry, the researcher was able to find very little in regards to the curricular areas which

were needed for training personnel. The literature indicated that both in-house zoological care training programs as well as management training in research and conservation are important. Much of the literature focused on programs which were part of employee training at zoos.

Maple, McManamon, and Stevens in a chapter of Defining the Good Zoo stated:

> The concept of a good zoo requires definition. We believe that good zoos exceed the highest standards of the profession and, furthermore, engage in the consistent pursuit of excellence in conservation, education, science, and recreation. By this definition, good zoos are leaders, not followers. Good zoos eschew mediocrity. To maintain their high standards, good zoos must recruit superior talent to the zoo workforce. By their deeds, good zoos are regarded highly by their peers with their communities. (Norton, Hutchins, Stevens & Maple, 1995, p. 219)

Jack Hanna, Director Emeritus, for the Columbus Zoological Gardens made two points in chapter he wrote for a book on the new American zoo.

> The zoological world is an exciting, demanding, frustrating, elating, rewarding, thankless, and wonderful place in which to work. Few occupations involve themselves so thoroughly in the daily drama of life and death, survival or extinction.
>
> As the new zoo has evolved as an international network of keepers, scientists, veterinarians, behaviorists, and others, its diversity has necessitated a wide range of staff skills, attitudes and talents. Whether they come from veterinary medicine, business, or public administration, or through the ranks of zoological positions, the zoo world benefits from this diversity.
>
> Zoo staffs are keeping pace with change. Increasingly, zookeepers have bachelor's degrees and beyond in zoology, biology, anthropology, herpetology, and related fields.... Zoo research, better known today as "scientific studies," is an exciting and growing area. In addition to improving the lives of today's zoo residents, researchers also look to the future. For example, genetic maps of animals are laid out and compared, and methods of "test tube" reproduction are being studied and perfected. Futuristic concepts such as having one species (such as a domestic cow) carry and give birth to another species (an endangered eland, for instance) have already been realized. This is just one potential way to counteract the extinction rate of slowly reproducing species (Nichols, 1996, p 75, 80).

The AZA provided some of this training in its own school which is administrated by North Carolina State University. The following is a list of programs available:

1) Applied Zoo and Aquarium Biology: A one year program which provides a fundamental background for "non-animal" zoo and aquarium personnel.
2) Population Management: A one-year program designed to produce competent program managers for SSP and non-SSP populations.
3) Principles of Elephant Management: A workshop which teaches history, conservation, training theories, and management of elephants.
4) Science of Zoo and Aquarium Animal Management: A one-year program which provides hands-on training in the techniques for the integration of individual, population, species, and taxon management for the long-term management of living animal collections within the context of wildlife conservation.
5) Studbook 1: A one-year program which teaches current and prospective studbook keepers to prepare and publish a studbook (Boyd, 1996, p. 8).

The AZA began a new class in 1997 titled Conservation Educators' Training Program. It will pilot in 1998 a program titled Institutional Records Keeping. In 1997 alone, more than 300 students and 61 instructors participated in this program (Carr, 1997).

Three groups have generalized information on the career of being a zoo keeper. These groups were the American Association of Zookeepers (AAZK), the AZA, and the Sea World World Wide Web home page. According to the AAZK "Zoo Keeper is a term used to describe an individual who cares for animals in zoological parks or aquariums. A

career as a Zoo Keeper offers a unique opportunity in the specialized and demanding profession of maintaining captive exotic animals for conservation, research, public education and recreation." (1996, p. 1) AAZK said the educational requirements vary, but most often a college degree is preferred in the areas of zoology, biology, or other animal-related majors. Upper level occupational opportunities are available, but require additional college preparation (AAZK, 1996).

On their website, AZA stated the following:

> With more than 110 million people visiting AZA institutions annually, all zoo and aquarium employees have the opportunity to educate the public about the critical need for the conservation of wildlife and wild lands. This responsibility assures an interesting and rewarding career, but the profession requires more than a commitment to conservation - it requires hard work.
>
> Zoo and aquarium employment is not always glamorous. Much of the work requires physical strength, as well as the ability to make detailed observations and keep information up-to-date. It takes a special kind of dedication to provide care to captive animals that require attention 24 hours a day, seven days a week, come snow, rain, or shine.
>
> The rewards for such efforts are great. Zoo and aquarium employees share in the knowledge that they are providing the best care for the creatures in their facility, as well as developing a forum for others to learn how they too can participate in the conservation of our planet's natural resources.
>
> Requirements:
>
> The conservation and scientific programs in zoos and aquariums have become highly technical and specialized. Although practical experience with animals may sometimes be substituted for academic training, most entry-level keeper positions now require a four-year college degree. Training in animal science, zoology, marine biology, conservation biology, wildlife management, and animal behavior is preferred. Curatorial, research, and conservation positions typically require advanced academic degrees. However, advanced academic training by itself is insufficient, and it may take years of "on-the-job training" for someone to learn the practical aspects of exotic animal care. A few institutions offer curatorial internships which are designed to provide practical experience.
>
> Students wishing to pursue animal-related careers are encouraged to carefully review the curriculum of the schools they wish to attend, as some programs focus more on a zoological application than others.

> Students who are interested in the business side of zoo and aquarium operations should concentrate on skills related to a particular area of expertise, such as accounting, public relations, marketing, personnel management, etc. Whatever your career goal, guidance counselors can offer assistance in determining the most appropriate course of study" (Boyd, 1996 p. 1).

Appendix G presents a list of careers and their corresponding job descriptions on the AZA website. Also found in Appendix F is the list of preferred levels of education and years of experience preferred by Directors and General Curators, as identified in this study.

In addressing preparation for careers, the Sea World website pointed out that some of the most important factors the employee needs are to be hard working and be able to physically handle the work required of them. Some jobs may require special skills in the areas of research design, SCUBA certification, and/or technical abilities (Sea World, 1996). Sea World defined the title of an Animal Care Specialist/Animal Keeper and the duties as follows (this title was targeted toward mammals and would be similar for other animal areas):

> Main job duties: Animal Care Specialists/Animal Keepers are responsible for the daily care of the mammals, which includes cleaning enclosures, preparing and distributing food, and maintaining records on each animal's diet and behavior. With the exception of veterinary procedure assistance, most Animal Care Specialists/Animal Keepers have limited physical contact with the animals under their care. This is often for the safety of the Animals Care Specialists as well as that of the animal. An important aspect of a keeper's job, however, is careful and frequent observation of the animal's behavior.
>
> Initial training: Experience working with animals such as in a veterinary hospital, animal shelter, pet store, or ranch is essential.
>
> Minimum education: Bachelor's degree in biology or zoology; in some cases, SCUBA certification.
>
> Works closely with: Other animal services departments, Education department, laboratory and veterinary staff.

> Challenges: The daily work of an Animal Care Specialist is very physical, and includes some heavy lifting. This position also might require 24-hour care of critically injured animals. Regardless of these and other conditions (such as cold, rainy, windy, or hot weather), animals must be fed and their exhibits cleaned on a regular basis (Sea World, 1996, p. 2).

Other authors have talked about the importance of training personnel and the needs of zoological institutions. Heinz Heck, Jr. said that it was very important for zoos to concentrate on the breeding and welfare of animals in zoological facilities and it was very important that well-trained personnel be part of the institution (1965). Lawrence Curtis said in an article on the husbandry of mammals, "Properly trained personnel are mandatory for all levels of zoo keeping" (Sausman, 1982, p. 254). This indicates the zoo and aquarium industry recognizes the need for education and experience in beginning personnel but has not established specific needs or standards.

Current Training in Zoological Care

Several zoos and aquariums began training programs in their institutions. Sue Maher, from the Lincoln Park Zoo in Chicago, stated in a letter that their institution was in the process of setting up a training program for their personnel. The subjects they were to concentrate on in their keeper classes included: a) Record Keeping, b) Conservation and Science, c) Nutrition, d) Communication, e) Sanitation, f) Animal and Keeper Safety, g) Basic Keeper Skills, h) Basic Birds, i) Veterinary Medicine, j) Basic Mammals, k) Animal Restraint, and l) Basic Herps (Reptiles and Amphibians) (Maher, 1996).

The Keeper Training Project at the National Zoological Park in Washington, DC included curriculum in the areas of:

Main Subject Area	Elective Instruction Area
Biology	Mammals
Anatomy	Birds
Physiology	Reptiles
Feeding	Amphibians
Sanitation	Fish
Disease	Specialized instruction on children zoos
Restraint	Diet Preparation
Behavior (Iliff, 1972).	

Diane Ledder from the Zoological Society of San Diego stated that there are some overall goals for their program. She further stated that their program had to first improve the care of the animals in their collection, secondly promote communication between personnel and the different departments within the organization, and thirdly provide a safe working condition for employees. (Ledder, 1993) She also states that

> As zoos evolve, so does the role of the most critical component in animal care: the keeper. Originally hired because of experience on the farm or in the circus, keepers of the past were often unskilled laborers, hired to clean and feed the animals in their care. In contrast, the keeper of the 90's plays an integral role in animal management, veterinary care and research, along with public relations and education (p. 344).

The program which Diane Ledder talks about includes subjects in a) Zoo/Wild Animal Park Orientation and Communication, b) Behavior Management, c) Taxonomy, d) Enclosure Design and Maintenance, e) Biology, f) Handling and Restraint, g) Feeding and Nutrition, h) Keeper Health and Safety, i) Animal Health, j) Record Keeping, and k) Animal Behavior (Ledder, 1993).

Peter Karsten, Director of the Calgary Zoo, said that the following objectives in their In-service Training Programs are as follows:

1) Better job performance.
2) Faster acquisition of skills and job understanding.
3) Better means of staff requirements.
4) Better grading opportunity for promotion and demotion.

5) Improvement of status and professional identity.
6) Better interchangeability for keeper staff.
7) Better exchange of job knowledge among staff at all levels.
8) Safer work methods.
9) Better opportunity to secure competitive wages. (Karsten, 1975, p.123)

In 1990 Fred Koontz and Michael Hutchins presented a paper on the keeper training program at the New York Zoological Park. Those who became new keepers had to participate in a "Fundamentals of Zoo Biology" course. This program lasted 24 four weeks and was instructed by 26 members of the Zoo's senior staff. Along with this program, continuing education was also available at this institution. This was comprised of keeper meetings, seminar series, workshops, conferences and a college tuition program. The list of topics presented to new keepers included: a) Department Orientation, b) Horticulture, c) Course Introduction, d) Dangerous Animal Escapes, e) Safety, Zoo Rules and Regulations, f) Elephants and Hoofstock, g) Animal Records/Identification, h) Veterinary Care, i) Zoo Education, j)Hygiene/Parasites, k) Reptiles and Amphibians, l) Carnivores, m) Animal Nutrition, n) Housing and Zoo, Design, o) Birds I, p) Birds II, q) Captive Propagation and Research, r) Wildlife Conservation International, s) Small Mammals, t) Animal Capture and Restraint (Reptiles, Mammals, Birds), and u) Primates.

Also in the early 1990s a group of zoological institutions got together at San Diego Zoo and hired John Shea and his wife to put together a self-study course in keeper training. This project came to be known as ZooTec International, Ltd. Keeper Training Program. This program was designed to be done on the job, able to be adapted to the institution using it and had to be effective, inexpensive and fast (easy) (Shea, 1993). Table I displays a list of the topical areas that were built into this self-study program.

TABLE I

ZOOTEC INTERNATIONAL KEEPER TRAINING PROGRAM

Modules	Sections	Major Areas
Observation Skills and Techniques	Module Introduction	Introduction and Overview
		Identifying Baseline
		Observing as Part of the Keeper's Job
	What Keepers Observe	Introduction and Overview
		Observing Behavior
		Wild & Captive Animal Behavioral Differences
		Non-Behavioral Animal Observations
		Observing the Enclosure
		Special Observation Situations
	How Keepers Observe	Introduction and Overview
		Using Senses to Observe
		Special Techniques
		Special Equipment
	Using Observations	Introduction and Overview
		Identifying and Interpreting Change
		Solving Identified Problems
	Improving Observing Skills and Recordkeeping	Introduction and Overview
		Improving Observation Skills
		Recordkeeping
	Ethograms for Formal Observation	Introduction and Overview
		The Scientific Method for Behavior Research
		Ethogram Construction
Designing and Caring for Enclosures	Module Introduction	Introduction and Overview
		Ways to Group Zoological Collections
	Principles of Enclosure Design	Introduction and Overview
		Meeting the Animals' Needs

TABLE I – continued

Modules	Sections	Major Areas
		Meeting the Animals' Psychological Needs
		Meeting the Animals' Physical Needs
		Meeting Keeper Needs
		Meeting the Needs of the Public
		Enclosure Elements and Their Functions
		Educating the Public
		Budgetary Constraints
	Environmental Control	Introduction and Overview
		Managing Environmental Factors
	Cleaning Enclosures	Introduction and Overview
		Cleaning Techniques
		Cleaning Agents
		Special Cleaning Considerations
		Barrier Techniques
	Enclosure Maintenance	Introduction and Overview
		Identifying and Repairing Enclosure Hazards
		Tool and Equipment Storage
		Pests, Vectors, and Predators
	Health and Safety Issues and Routines	Introduction and Overview
		Keeper Health and Safety Issues
		Cleaning and Maintenance Routines
		Recordkeeping
Principles of Nutrition and Feeding	Module Introduction	Module Introduction
	What Animals Eat	Introduction and Overview
		Water
		Vitamins
		Minerals
		Carbohydrates
		Proteins
		Fats
		Dietary Fiber
	How the Body Processes Food	Introduction and Overview

TABLE I – continued

Modules	Sections	Major Areas
		The Digestive System
	Diet Development and Evaluation	Introduction and Overview
		Developing the Diet Dietary Change and Evaluation Solving Dietary Problems
	Obtaining and Storing Foodstuffs	Introduction and Overview
		Obtaining Foodstuffs Receiving and Checking Foodstuffs Storage
	Preparing and Delivering Food	Introduction and Overview
		Preparing Meals Delivery and Feeding Recordkeeping and Reporting
	Energy Metabolism and Neonatal Feeding (For Further Study)	Introduction and Overview
		Energy Metabolism Feeding Neonates
Animal Behavior Management	Module Introduction	Introduction and Overview
		Why Keepers manage and Animal's Behavior
	Behavior Management Concepts	Introduction and Overview
		Habituation Training
	Behavior Management Process	Introduction and Overview
		Assessing Behavior Management Potential Developing the Behavior Management Plan Implementing the Plan Special Training Situations
Principles of Restraint and Handling	Module Introduction	Introduction and Overview

TABLE I – continued

Modules	Sections	Major Areas
	Why Keepers Handle Animals	Introduction and Overview
		Animal Relocation
		Medical Care
		Miscellaneous
	Tools and Techniques for Handling Animals	Introduction and Overview
		Manual Techniques
		Behavioral Techniques
		Directive Techniques
		Restrictive Devices
		Specialized Tools and Techniques
		Chemical Agents
	Planning an Animal Manipulation	Introduction and Overview
		Factors That Affect the Event
		Putting a Plan Together
	Conducting the Manipulation Event	Introduction and Overview
		Preparing for the Event
		Restraining the Animal
		Handling and Transporting Restrained Animals
		Special Handling Situations
	After the Event	Introduction and Overview
		Monitoring the Animal
		Loose Ends
	Handling Specific Animals	Introduction and Overview
		Handling Amphibians
		Handling Reptiles
		Handling Birds
		Handling Mammals
The Keeper's Role in Animal Health	Factors that Affect Animal Health	Module Introduction
		Section Introduction and Overview
		Causes of Disease

TABLE I – continued

Modules	Sections	Major Areas
		Causes of Injury
	Preventing Animal Health Problems	Introduction and Overview
		Proper Nutrition
		Proper Keeper Hygiene
		Enclosure and Environmental Maintenance
		Performing Routine Health Procedures
	Recognizing Animal Health Problems	Introduction and Overview
		Health Observations and Physical Examinations
		Identifying Parasites
		Health Testing
	Treating Animal Health Problems	Introduction and Overview
		Treating Parasitic Infection
		Handling Injury and Illness
		Administering Emergency First Aid
		Handling Behavior-Related Health Problems
		Handling Dead Animals
	Reproduction and Neonates	Introduction and Overview
		Reproduction and Animal Health
		Caring for Neonates
	Assisting the Veterinary Staff and Recordkeeping	Introduction and Overview
		Assisting in Medical Procedures
		Administering Medication
		Recordkeeping
	Optional Material	Introduction and Overview
		Temperature Control
Preventing Keeper Injury and Illness	Module Introduction	Introduction and Overview
		The Keeper's Role in Keeper Safety
	Why Zoos are Dangerous	Introduction and Overview
		Factors That Make Zoos Dangerous

TABLE I – continued

Modules	Sections	Major Areas
	Preventing Non-Animal-Caused Injury	Introduction and Overview
		Types and Causes of Injuries
		Safe Tool and Equipment Use
		Dangerous Tasks
		Hazardous Places
		Uniform and Safety Equipment
	Preventing Animal-Caused Injury	Introduction and Overview
		Avoid or Minimize Contact with Animals
		Entering Occupied Enclosures
		Close Contact
		Escaped Animals
		Non-Collection Animals
		Self-Defense against Animal Attack
	Job-Related Diseases and Illness	Introduction and Overview
		Pathogenic Diseases
		Environmental Illnesses
		Human Diseases
		Zoonotic Diseases
		Non-Pathogenic Illness
	Preventing Job-Related Illness	Introduction and Overview
		Preventing Pathogenic Diseases
		Preventing Non-Pathogenic Illness
		Improving and Maintaining Physical Health
		Psychological Well-Being
	Responding to Emergencies	Introduction and Overview
		Backup Plan
		Emergency Situations
		First Aid
Principles of Communications	Introduction to Communications	Introduction and Overview
		Elements of Communication
		Improving Communication
	Types of Communication	Introduction and Overview

TABLE I – continued

Modules	Sections	Major Areas
	Types of Communication	Introduction and Overview
		Non-Verbal Communication
		Verbal Communication
		Written Communication
		Graphic Communication (Shea, 1993)

Throughout the United States and the world, educational institutions for students of all ages are cooperating with zoos. For many of these institutions, the use of zoos and aquariums supplement their school curriculum. Some institutions in the United States have actually designed programs which focus on preparing students for animal care and management careers. Two creators of a junior college program described the rationale for their program:

> Little formal zoo keeper training has been available in the United States. People interested in caring for zoo animals often have only had experience on farms, in laboratories, in veterinarian hospitals, or simply with their own pets. Some may have studied zoology or other subjects related to animal care. However, an integrated program of supervised experience and instruction in wild animal husbandry has been lacking (Giron & Vandiver, 1973, p. 265).

In-house training programs need to know preferred training and experience levels for training persons for zoological care position as well as educational institutions. The following educational programs were found which have or had programs in the area of zoological care and management. Many of these programs fall under departments of agriculture.

Four Year Public Institutions

State University of New York at Oswego, Oswego, New York. This program is a joint program with Santa Fe Community College in Gainesville, Florida (see section under 2 year institutions). The Bachelor degree requires ten semesters of study between the two institutions (five semesters in each institution). This institution provides training in general education, animal science, and related fields. Santa Fe provides students with training in animal care, breeding, and management. The program is structured toward nature. For

those students completing the Santa Fe Community College portion of the work, an Associate of Science degree is granted. Students completing both programs receive a Bachelor of Science degree.

Courses Taken at Oswego:
- General Education Requirements (21 credits)
  - Basic Requirements
  - Distribution Requirements
  - Social and Behavioral Sciences
- Major Requirements (23 credits)
  - College Biology
  - Genetics
  - General Physiology
  - Invertebrate Zoology
  - Vertebrate Zoology
- Cognate Requirements (22-24 credits)
  - Math and Statistics
  - Chemistry
- Additional Upper Division Requirements (16-20 credits)
  - Zoo Related Courses Available
  - Zoo Biology
- Zoo Data Analysis
- Zoo Internships

Courses taken at Oswego or Santa Fe Community College:
- General Requirements (3 credits)
  - Social Science Elective
- Oswego Zoology Cognate Requirements (11 credits)
  - Physics

Courses taken at Santa Fe Community College:
- Career Education Requirements (3 credits)
  - Biological Conservation and Parks Orientation
  - Basic Keeper Technology Lecture

(Chepko-Sade, 1997).

Oklahoma State University; Stillwater, Oklahoma. This course is designed to support agriculture, zoology, and veterinary students in the operation and management of zoological parks and aquariums. Students spend two weeks of instruction between the

Oklahoma City Zoological Park and The Tulsa Zoo and Living Museum. Students spend time being instructed by both management/staff of the zoological institutions as well as two university professors from Oklahoma State University. Each day, there is a balance between lecture and behind the scene activities. Students fill out a survey form each speaker and must complete two exams during the two-week course. For those students that desire, an additional experience they can take is in the format of a one unit internship. This allows students who have completed the above course to work with animal staff at The Tulsa Zoo and Living Museum during the same summer the course is provided. The following is the course description for this course:

> ZOOL 4532: Zoo Biology and Management. Lab 3/day. Prerequisite: 4 hours of zoology or biology. Conservation and propagation of endangered species, animal acquisition and transport, restraint, sanitation and animal health, exhibit planning and design, public relations, administration and research. Lectures by professional zoo staff members. Extension course taught at the Oklahoma City and Tulsa zoos. (Oklahoma State University, 1998, p.309)

Four Year Private Institutions

Friends University; Wichita, Kansas. This institution offers both a Bachelors and Masters degree in the areas of Zoo Science, Zoo Management, and Zoo Education. The Bachelor's program has a strong background in biology, management, and interpersonal relations. The Masters programs has a strong environmental emphasis. This institution works closely with the Sedgwick County Zoo in Wichita. Three hundred -fifty hours are required in experience working in a zoo setting.

Bachelor of Science Degree in Zoo Science:

Required Coursework	Recommended Coursework
Biology	Human Anatomy

Zoo Science
Management of
Wild Animals in Captivity
Design for Non-Design Professionals
Vertebrate Zoology
Ecology
Genetics
Zoo Science Practicum
Chemistry
Horticulture
Algebra
Statistics
Public Administration
Interpersonal Relations
Microbiology
Human Physiology

Master of Science Degree in Environmental Studies (Coursework):
Natural History of Invertebrates
Natural History of Vertebrates
Energy and the Environment
Environmental Geology
Natural History of Plants
Environmental Chemistry
Human Ecology
Environmental Law
Management History and Current Practice
Practicum
Directed Study
(Friends University, 1997)

Two Year Institutions

Moorpark College; Moorpark, California. The EATM (Exotic Animal Training and Management) program focuses on the care, management, and training of exotic animals. Student have the opportunity to earn a certificate and/or an associate degree when completing the program. The program has its own teaching zoo facility when is cared for by the students. The following is a list of the curriculum for the program:

Subject Matter	Subject Matter Continued
Animal Diversity	Exotic Animal Management and Supervision
Animal Health and Safety	Education and Entertainment in Animal Parks
Animal Behavior	Exotic Animal Training
Anatomy/Physiology of Exotic Animals	Elementary Veterinary Procedures
Exotic Animal Care and Handling	Advanced Education and Entertainment in Animal Parks (Moorpark, 1996)

Niagara County Community College, Buffalo, New York. Persons professionally prepared in this program are concerned with the care, management, breeding and environmental requirements of a wide range of animals. They generally have a broad range of responsibilities in zoos and other animal facilities. These responsibilities include dealing with the public, exhibition design and day-to-day animal care. Classroom and hands-on learning are effectively combined in the program. Students spend one day per week at the Buffalo Zoo each semester and two days per week for the summer school session. (Niagara County Community College, 1997)

Niagara County Community College Coursework:

- Animal Management (Minimum of 35 credit hours)
  - Basic Keeper Technology
  - Park Management I
  - Park Management II
  - Park Management III
  - Park Management IV
  - Zoo Seminar I
  - Zoo Seminar II
  - Zoo Seminar III
  - Zoo Seminar IV
  - Herpetoculture
  - Aviculture
  - Mammal Culture
  - Aquarium Science
- Business (A minimum of 1 credit hour)
  - Issues in Zoo Management
- Computer Technology (A minimum of 2 credit hours)

Fine Arts (A minimum of 2 credit hours)
- Zoo and Park Design

Health/Physical Education (A minimum of 2 credit hours)

Humanities (A minimum of 6 credit hours)
- Writing 1
- Writing II and Introduction to Literature

Sciences (A minimum of 17 credit hours)
- Animal Behavior
- Zoology
- Monkeys, Apes and Man
- Population Genetics and Evolution
- Life on Earth

Social Sciences (A minimum of 3 credit hours)
- Security of Cultural Institutions
- Social Science Elective

(Niagara County Community College, 1997)

After the completion of the program, students are eligible to receive an Associate Degree in Applied Science (Animal Management).

Pensacola Junior College, Pensacola, Florida

Pensacola Junior College's Associate of Science degree in Zoo Animal Technology is a two-year program offering a wide range of practical instruction and hands-on experiences. This program is designed to prepare the graduate for employment in a zoological park or in settings requiring animal care, husbandry, breeding and health. Many of the general courses may be used to transfer to a four-year institution to study zoology or animal science. The program is conducted in association with The Zoo in Gulf Breeze, Florida, which is accredited by the American Association of Zoos and Aquariums. Because of limitations in clinical/laboratory experiences at The Zoo, the program is limited to a class of 24 students annually. (Pensacola Junior College, 1997)

Pensacola Junior College Zoo Animal Technology Program (66 Credits)

Term 1 – Fall (First Year)	English Composition I
	College Algebra
	General Psychology
	General Zoology
	General Zoology Laboratory
Term II – Spring	Animal Care Technology I
	Animal Medical Husbandry
	Animal Medical Husbandry Clinic

	Aviculture
	Zoo Seminar I
Term III A – Summer	Herpiculture
	Animal Care Technology II
	Zoo Seminar II
Term IIIB – Summer	Herpiculture (continued)
	Animal Care Technology III
	Zoo Seminar III
Term I – Fall (Second Year)	Mammaculture
	Animal Care Technology IV
	Vertebrate Morphology
	Animal Nutrition
	Zoo Seminar IV
Term II – Spring	Visitor Relations
	Aquarium Culture
	Animal Breeding
	Animal Behavior
	Humanities/Fine Arts (Category II)
	(Pensacola Junior College, 1997)

Santa Fe Community College, Gainesville, Florida. The goal of this facility is "to train adaptable well-rounded keepers for entry level positions in the animal fields" (p. 247). The program is for five semesters and allows students to earn an associate degree. The program has its own teaching zoo where students are responsible for the care and management of the animals. The following curriculum is what students in this program take:

General Education (22 credits)	Zoological Lecture Classes (34 credits)
English	Animal Husbandry and Care
Math	Safety
Vertebrate Zoology	Custodial Care
Speech	Animal Breeding
Psychology	Animal Nutrition
Environmental Science	Mammalogy
Social Science	Ornithology
	Herpetology
	Aquarium Culture
	(Giron & Vandiver, 1973; Brown, 1993; Vandiver, 1978)

Public High School Programs

> Current trends in public education are grouped along lines of developing vocational tracts for high school students. Vocational tracts are designed to give students a functional education in their special field of interest. Unlike in the past. Vocational training encompasses the full spectrum of community employment needs, and shows students a more realistic view of employment and independent living.
>
> Zoos represent a microcosm of community employment needs where there exists a wide variety of training and work opportunities, from Arborists to Zoologists. The institution of a training program in the zoo provides access to schools and public agencies in return for providing training opportunities. The zoo may receive volunteer labor, trained seasonal workers, training moneys, and reimbursements. Students in the training program become skilled workers, not only for the zoo, but for the whole community (Craft, Martch, & Hatfield, 1991, p. 315).

New York Public Zoo, New York, New York. This program was set up to advance students in the area of biology. Students met on Saturdays for 15 weeks of instruction. The program was titled Animal Care and Behavior. The program was put together between the Bronx Zoo and the New York Public Schools. Curriculum areas included the following:

Curricular Area	Subject Matter
Basic Principles of Captive Animal Management	Nutrition
	Sanitation
	Handling and Restraint
	Exhibit Design
	Preventative Medicine
Basic Concepts in Animal Behavior	Individual and Social Behavior
	Communication
	Territoriality
	Dominance
	Ethological Research
	Individual and Courtship
	Mating and Parental Care
Methods of Ethological Research	Behavioral Observation and Description
	Ethogram Construction

Data Gathering and Analysis
(Roxby, 1986)

Cincinnati Public Schools, Cincinnati, Ohio. The Cincinnati Zoo Academy was designed for students in the eleventh and twelfth grades. Students are selected from schools in the Cincinnati Public School District. Students take classes at the Cincinnati Zoo. The following are the curricular in areas in which these students are involved:

Curricular Areas	Subject Matter
College-prep Level Science	Zoology
	Natural Resource
	Wildlife Management
	Exotic and Domestic Animal Care Topics
Core Classes	English
	Math
	History
Student Organizations	National FFA Organization
	Animal Organization
	Nature Organization

(Lanman, 1991)

Pioneer High School; San Jose, California. The Center for Agricultural Science and Technology program allows students to be involved in a four year vocational agriculture program focusing on non-traditional animal careers. The program includes a working zoological animal facility. Students are involved in both industry related activities and presentations of animal related programs in the community. This program works with zoological parks in California including Marine World Africa USA, Happy Hollow Zoo, and the San Francisco Zoo. This program was closed due to pressure from the administration, after July 1998. The following areas were focused in the curriculum: a) Agriculture and Society, b) Record Keeping, c) Employability and Leadership Development, d) Animal Nutrition, e) Natural Resource Management, f) Animal

Classification, g) Animal Science, h) Animal Tools and Restraint, i) Parliamentary Procedure and Public, j) Anatomy and Physiology, k) Public Speaking, l) Large and Small Animal Production, m) Plant Science, n) Waste Management, o) Careers, p) Animal Observation, q) Animal Health, r) Enclosure Design, s) Animal Selection and External Anatomy, t) Safety, and u) Principles of Communication.(Some of the material focused on in the final year of instruction was curriculum designed by Zootech International) (Sherman, 1996)

Private High School Programs

Millbrook School, Dutchess County, New York. This program is part of coeducational independent boarding high school serving 210 students. The school has its own zoological training facility which is part of the school grounds. The zoo was started in the 1930's and is used for a course entitled Zoo Science. Students work during the day to take care of the animals in the facility. Classes are offered in their strong science program: a) General and Advanced Physics, b) Animal Behavior, c) General and Advanced Chemistry, d) Astronomy, e) General and Advanced Biology, f) Ornithology, g) Discovery in Science, h) Independent Study, i) Conservation Biology, j) Zoo Science (Miegs, 1986; Millbrook, 1997).

There are other programs in the United States focusing on areas indirectly related to careers in zoological care and management. These include programs in Conservation Biology, Forestry and Natural Resources, Wildlife Management, and Veterinary Medicine and Technology.

(Special Note: There were additional programs that were not included in this list since they either were not occupational training programs or focused on subject matter other than animal care and management. Most of these programs were in the area of Ornamental Horticulture or Science Education). As can be seen, there are training programs at many levels but they are not based on an assessment of education and experience needed or a standard curriculum.

Agricultural Education and Non-Traditional Careers

As stated earlier, many of the education facilities which prepare personnel for careers in zoological care and management are housed in the departments of agriculture education. Over the last decade those in the leadership of agricultural education have stressed the need for agricultural education to place more emphases in the areas of natural resource management and environmental science. In 1988 a study by the National Research Council (Understanding Agriculture New Directions for Education, 1988) was released. Two of the many recommendations made by the group said that:

1) The establishment of specialized magnet high schools for agricultural science in major urban and suburban areas should be encouraged. (These high schools should offer the full range of academic courses in addition to courses in the agricultural sciences, nutrition, horticulture, natural resources and the environment, agribusiness marketing and management, and other related agricultural objects.) (p. 4)

2) The subject matter of instruction about agriculture and instruction in agriculture must be broadened. (The dominance of production agriculture

> in the curriculum must give way to a much broader agenda, including the utilization of agricultural commodities, agribusiness marketing and management in a global economy, public policy, environmental and resource management, nutrition, and health.) (p. 6)

Kirts (1990) stated that it is time for linking both agriculture and environmental education so that students have the opportunity to use both areas to benefit zoos and aquariums. Rutledge (1983) said for cost effectiveness in the area of captive management "Agricultural perspectives must be incorporated in many areas of animal management. These include a whole range of topics, from economics and species selection to the incorporation of bulk feed handling mechanisms" (p. 262).

Throughout the United States, large numbers of students take coursework and major in the departments of animal science and natural resources, under colleges and departments of agriculture. Much of the curriculum being taught in these departments are applicable to the care and management of animals and plants that are cared for in zoos and aquariums. According to a study done by Litzenberg, Stebenne & Scamardo (1991) in 1991, 20% and 17% of Bachelors Degree, 14% and 16% of Masters Degree and 13% and 6% of Doctors of Philosophy Degree students, majored in animal science and natural resource management, respectively, thus providing the possibility of a large number of alternative employees for the zoo and aquarium industry.

Peterson (1995) emphasized that it is very important to the future of agricultural education, that students be able to collaborate with others. There is a need to look at what others are doing and learn to work with them no mater if the industry is directly or indirectly related to the field of agriculture. In looking at zoos and aquariums there is

little difference between the field of ornamental horticulture (considered part of agriculture) and animals kept as pets or in zoos and aquariums. In both cases species are being cared for based on what they are and not what we can extract from them.

Summary

People throughout history have found animals intriguing and kept them for the purpose of collections, sports and food. The Greeks saw animals as possible answers to life, where the Romans were excited by the destruction of these same animals. The modern zoological institution has come from a place of animals being kept in unhealthy conditions for the amazement of people to institutions which are responsible for the conservation, research and education of these wonders of nature.

Because of this modern mission, zoos and aquariums have had to seek and apply new research to better care for the specimens under their care. This has meant that personnel have had to be trained in the latest practices to keep animal species protected from extinction. Even though some species have passed from existence, the modern zoological institution has had many successes in protecting much of this earth's animal richness from extinction. This has come from the support of competent personnel.

With the modernization of the zoological industry, has come standards developed and followed by institutions being accredited by the American Zoo and Aquarium Association. This organization has brought zoos from the United States, Canada and Bermuda together to support research, education, conservation and recreation through a strong code of ethics and accreditation standards that focus on the proper care of animals

in public and private institutions as well as making sure that the overall welfare of animals are taking care of.

Zoological institutions have now become more accountable for each and every animal they take care of then in the past due to the animal welfare movement. This movement has placed added pressure to the proper care of animals in zoological institutions. Those in zoological care are responsible for some of the rarest species of animals in the world. Thus they need to be properly be trained to prevent the extinction of those species of animals, which in the past came from a lack of information about the care and management of animals in zoological institutions.

For several years zoological institutions have had to provide post-service training for personnel. This was due to the fact that few educational institutions provided training directly for this industry. A few institutions began to develop and train entry-level keepers for the zoological industry. In the last ten years more educational institutions offer training in animal care for zoos and aquariums than before. These educational institutions work with local zoological institutions and thus serve more as regional vocational education program. At the same time there has been a surplus of graduates in agricultural programs who have graduated from both animal science and/or natural resource programs who could also help supply the industry with trained personnel.

With the importance of keeping animals safe from extinction and healthy, standards for entry-level zoological care personnel concerning education, experience, and curriculum. Management needs to determine priorities for pre-service training of future employees. Training institutions need to look beyond regional boundaries in preparing

future employees for careers in the care of animals housed in zoo and aquariums to establish standardized programs.

CHAPTER III

METHODOLOGY

The methodology of the study was determined by the purpose and objectives to solve the problem presented. The primary purpose of this study was to determine the curricular needs, educational level, and practical experience needed for entry-level careers in the area of zoological care and management in the United States and Canada.

Objectives of the Study

The following objectives are:

1) To determine selected demographic information about respondents filling out the instrument in relation to educational levels and years of experience.
2) To determine the need for trained personnel for entry-level positions in the area of zoological care.
3) To determine the level of training needed to meet the entry level requirements of zoological parks and aquariums.
4) To determine the amount of practical animal care experience most desirable for employing personnel in the area of zoological care.
5) To determine the preferred levels of training for curricular and topical areas for entry-level positions in zoological care.

Institutional Review Board (IRB)

Federal regulations and Oklahoma State University policy require review and approval of all research studies that involve human subjects before investigators can begin their research. The Oklahoma State University Office of University Research Services (IRB) conducts this review to protect the rights and welfare of human subjects involved in biomedical and behavioral research. In compliance with this policy, this study received the proper surveillance and was granted permission to proceed. This research was assigned the following research project number: AG-98-009. A copy of the IRB approval form is presented in Appendix B.

Population

The population in this study consisted of Directors, those who are directly in charge of AZA accredited institutions in the United States, Canada, and Bermuda, and General Curators who are directly in charge of animal exhibits and the personnel who care for those exhibits. The population was identified by using the 1997/1998 AZA Directory (Boyd, 1997). This accounted for a population of 365 individuals representing 182 institutions. In most cases, two responses were sought from each institution. For some institutions one individual was in charge of both duties. In a few institutions there was more than one individual in charge of the animal collection. One hundred and sixty three (89.6%) institutions were sent two instruments, 11 (6%) institutions were sent one instrument, 4 (2.2%) institutions were sent three instruments and 4 (2.2%) institutions were sent four instruments. To identify the response groups the title listed on the

completed survey was compared to the title listed in the directory. It was assumed that even though instruments were sent to all Directors, that some would have others fill out the information for them. If the two titles were not the same, then the responses were added to the General Curator group. Of the 365 instruments sent out, a total of 300 (82.19%) returned. Of these, 130 (43.33%) were from Directors and 170 (56.67%) were from General Curators. Of the 182 institutions included in this study 165 (89.7%) returned at least one completed instrument. The lists of institutions used in this study are found in Appendix A .

Instrument Development

Since the population was located throughout such a large area, it was determined that a mail survey would be used to collect data for this study. The mail survey was selected based on the benefits of being able to contact respondents from a reliable address list. Immediate turnaround time was not a major point, and money and qualified staff were relatively scarce (Salant & Dillman, 1994).

Content for the survey was based on information found in the literature. Items were generated from curricula from educational institutions that currently offer or were planning to offer training programs for personnel for zoos and aquariums.

After initial development, the instrument was submitted to the author's committee for recommendations and refinement. The instrument was then sent to a panel of experts (validation committee) to be evaluated for validity and content. A description of members of the panel of experts is shown in Table II

TABLE II

VALIDATION COMMITTEE

Number in Category	Area Represented	Sub Area
2	Agriculture	Junior College Instructors
2	Agriculture	High School Instructors
2	Agriculture	Junior College Dean
2	Agriculture	University Professors
2	Animal Science	University Professors
2	American Zoo and Aquarium Association	National Officers
1	American Zoo and Aquarium Association	Employee
2	American Zoo Keepers Association	National Officer
2	Vocational Instructor – Zoological	High School
2	Vocational Instructor – Zoological	Two Year College
2	Zoological Institution	Upper Management
2	Zoological Institution	Education Department Heads
2	Zoological Institution	Animal Management
1	Zoological Institution	Human Relations Management
2	University	Zoology Professors
28	Total Validation Committee Members	

Special Note: Both individuals from agriculture and science institutions were used in validating the instrument since those institutions which provide instruction directed at this profession are housed in departments representing both these areas, and advertisements for entry-level keeper positions include both areas as acceptable for previous training required.

The Validation Committee represented many different content areas, associations, and were spread out throughout the United States. Members of the committee were sent a

cover letter and initial instrument for examination in November of 1997. They were to return the survey by December so that the final instrument could be ready to send out in February of 1998. A postcard was sent to remind those on the committee that their responses were needed. Phone calls were made to those who had not returned their responses by December.

The validation committee was asked to examine the instrument in regards to the objectives of the study. They were to look at each area and see that zoological industry respondents would be able to answer the questions being asked for and that the information obtained through the study would be of use by the zoological industry. The committee was also asked to look at the overall format and make suggestions for improvement. Two major changes were made in the instrument itself. The word management was dropped from zoological care and management since entry-level keepers were not responsible for making management decision and that respondents might misunderstand what was being asked. The other major change was made in the topical area section of the questionnaire. It was felt that seeking the depth of each topic was more important than asking the respondents which level of importance each topic should have. Another major change came from recommendations of the validation committee in regards to the audience selected to participate. It was felt that Directors might not be able to give knowledgeable information since they were not the ones in many institutions who do the hiring of entry-level zoological personnel. The committee recommended that surveys be sent both to those in charge of the overall institution as well as those who are primarily responsible for the animal collection and its keepers.

After responses from the panel of experts were collected, the final survey was developed and presented to the author's committee for final approval. The survey was then sent to the Institutional Review Board to verify compliance with federal and college requirements. A pilot test of the instrument was conducted with a group of zoological management personnel in Oklahoma. Then the survey was checked for editing errors and then sent to the university printers for printing.

Instrument Description

Questions asked and information requested on the instrument were based on the objectives of this study. See Appendix C for the final copy of the survey instrument.

The first section of the instrument was designed to determine selected demographic information about the respondents. This section consisted of five questions asking for: educational level, major and/or specialty, number of years they had worked with animals before beginning their career in the zoo and aquarium industry, how many years paid work experience they currently had in the zoo and aquarium industry, and their present position title and number of years in that position.

The second section of the instrument consisted of three questions to obtain data about the need for trained personnel for entry-level position, training needed for those positions, and experience desired for entry-level employees. The following is a description of that section:

a. Question six asked if there was a need for academically trained individuals for positions in the area of zoological care as directly related to the Zoo and Aquarium Industry.

b. Question seven consisted of two parts. The first part of the question asked the respondent to check the level of education which best met the needs of those preparing for entry-level positions in zoological care as directly related to the Zoo and Aquarium Industry. The second part of this question asked the respondent to check any of four areas which were listed as possible educational areas for those entering the Industry: Zoology, Conservation Biology, Animal Husbandry and Animal Science, or "Degree Does not matter."

c. The last question of this section asked the number of years of experience working with animals an individual should have to prepare for entry-level employment in the area of zoological care with Pet/Hobby Domestic and/or Exotic Animals, Domestic Animals, Exotic Animals and Zoological and/or Aquarium experience. The two responses for each category included volunteer and paid experience.

The third section of the instrument included a section of curricular categories and topical areas for training programs. The respondents were given five choices. A five-point scaled response was provided for items in this section (see Table III)

TABLE III

FIVE-POINT SCALE

Response	Definition
○	No emphasis in this area is needed through academic training.
①	Introductory information, in this area, should be included in academic training programs.
②	A minor unit in this area should be included in academic training programs.
③	A major/In-depth unit in this area should be included in academic training programs
④	A course in this area should be included in academic training programs.

Respondents had the opportunity to add additional items for each curricular category.

The last section of the instrument listed each of the 26 careers found on the AZA web-site. Respondents were asked to indicate the educational level and the number of years of experience needed for each position. See Appendix F for this list.

Procedures for Conducting the Study, Gathering Data, And Confidentiality

Dillman's (1978) Total Design Method was followed in this research. Some modifications were made to fit the target audience. Data collection took place during the winter months because that season tends to be less busy for the respondent group.

The first step in the process was to send a notification postcard to the population. This card was sent seven days before the first mailing of the instrument. The postcard (see Appendix D) was designed with the return address, project logo and mailing label on the front. The labels were individualized from a population database. The back of the post card had the project logo and title with a short message introducing the population to the project. Each card was signed in blue ink in order to indicate the signature was an original. The card was printed four to 8 ½" x 11" yellow cardstock and cut by machine in the University's print shop. The color yellow was chosen since it was bright and easy to distinguish from other mail. The card was sent first class metered mail.

The second part of data collection was mailing the first round of packets. Each institution was sent a packet addressed to Directors the first week in February of 1997 (see Appendix C & E for contents of the packets). The packets were sent first class metered mail. Packets returned unopened prompted a phone call to the institution to check the address. A new packet was then sent. The packet included:

a. Envelopes: Three types of envelopes were used in the first mailing. The first envelope was addressed to Directors. This envelope was white in color and 6 ½ " x 9 ½" in size. The envelope contained colored animals hand stamped on both the front and back to draw attraction to the packet. It had the return address stamped on the top of envelope and the same type of label that was used for the pre-notification postcard. The second type of envelope was for those who were considered General Curators. This was a white standard size envelope, also stamped and addressed as was the first envelope. This envelope was placed into the larger envelope with the instrument for Directors so that postage was paid on the packet and not on every piece that was sent. The third envelope

was the reply envelope. This envelope was also a standard size envelope. It was stamped with the return address both in the middle of the envelope and at the left hand corner. Each of the self-return envelopes had a first class postage stamp affixed to it. The stamp selected for this envelope contained a plant, nut, and insect, selected to relate to nature. One self return envelope was placed with each instrument sent. Directors were asked to see that the inner envelopes were distributed to those whose names appeared on them.

b. The second part of the mailing was the cover letter that was included with the mailing. Each instrument had a personalized addressed cover letter. Two different cover letters were designed. The first cover letter was for the Directors. It contained the project logo and title on the top of the page and was signed by the project director, dissertation chair, who was from the Department of Agricultural Education, Communications, and 4-H Youth Development, and another member of the dissertation committee that represented the Zoology Department. The first two signatures were original and the third was applied by a stamp. Each individual had their name, phone number, title, and address under their signature. The first page of the cover letter was printed on special preprinted paper with the second page printed on matching tan paper. The cover letter was stapled. For ease of printing the cover letter was printed on two separate pieces of paper instead of front and back. This allowed for the first page to be personalized with the computer and the second page to be printed at the University's print shop and then signed. The paper chosen for the first cover letter was based on its simple design and relation to zoological institutions. The second cover letter was for the General Curators group. It did not have the logo placed on it, there was a different paper design, and the second sheet was printed on white paper stock. Otherwise, the cover letter said basically the same thing. The paper design was

selected based on the different types of animals on the borders of the paper. Since these individuals are in more direct contact with all of the animals in the institution, it seemed appropriate for this design to be used.

c. The final part of this mailing was the instrument itself (Appendix C). The instrument was printed in two different colors, yellow and tan. The yellow colored instrument was sent to the Directors. The tan colored instrument was sent to the General Curators. The top of the instrument had the title of the project and two graphics selected to draw attention to the instrument. A box at the bottom was placed for the coded label to be affixed. This label was used for keeping track of returns and in the support of follow-up attempts. The instrument was five pages long and was printed back to back to lessen the amount of paper used, as well as look less bulky to the study population. Graphics were used throughout the instrument to fill up empty white space. The instrument was folded in half for the large envelopes and folded in thirds for the standard sized envelopes.

A special note regarding the pre-incentives. Pre-incentives were not sent on this project. The Marketing Director at the Oklahoma City Zoological Park suggested that according to the studies they have done with the same population they have received the same response rate with and without sending a pre-incentive. Thus, it was decided to not send a pre-incentive for cost savings.

Two weeks after the packets were mailed, a second postcard was sent to those individuals who had not responded to remind them of the March 1 deadline. The post card followed the same development guidelines as the first post card except for the text printed on the card and the color of the card. The card was printed on orange cardstock to stand out (see Appendix D). On March 8, 1997 a second packet was mailed to individuals who

had not returned the instrument. This mailing was similar to the first except for the following (see Appendix E):

a. All packets were sent out personally addressed, to those not responding, in a standard size white envelope.

b. The cover letter was reduced to one page and was again printed on special paper stock which was different from the first mailing. The cover letter explained the response rate up to the date of the letter.

The last phase of data collection took place in the summer of 1997. A different method was tried for double sampling (Van Dalen, 1979). During an internship at the Oklahoma City Zoological Park, the researcher observed the common use of the fax machine for communications between the zoological institutions. Thus, distribution of the instrument of fax was attempted. The first fax was sent in May to all institutions that had turned in at least one instrument. The second fax was sent in Jun to all institutions that had not returned any of the instruments sent to them. Before the double sampling, 270 (74%) instruments had been returned. Through this process 30 (8.2%) additional responses were received bringing the total number of responses to 300 (82.2%).

In examining the responses of the two groups (group 1 being those that responded to the mailed survey in the spring and group 2 being those who responded to the faxed survey in the summer) two observations could be made. First, the demographics of group 2 were different from the original responses. Second, the answers to questions in regard to the main objectives of the study were essentially identical with those from group 1. Thus the additional 30 responses increased the representativeness of the total responses returned and added additional responses.

Data collection concluded on August 15, 1998 so that a draft report of the study could be presented to the Annual AZA Conference in Tulsa, Oklahoma in September of 1998.

All surveys were kept in sealed containers and kept under lock and key so that only the researcher knew the identity of each respondent. The key to the coding was kept in a different locked facility from the surveys.

The survey responses were transferred to a computer spreadsheet for data analysis. Once the responses were transferred, the surveys were kept locked until the next analysis.

Data Analysis Techniques

Descriptive statistics were used in summarizing data compiled from this study. Leedy (1997) defines descriptive statistic as ". . . describing the contour of data and, in the case of two or more groups of data, their proximity or remoteness of relationship" (p 37). Descriptive statistics were selected since this was a census study. Frequency and percentages were used to compare most of the data. In summarizing questions where open numerical answers were given standard deviations and ranges were used. All data were analyzed using Microsoft Excel.

CHAPTER IV

FINDINGS

The purpose of looking at Directors versus General Curators came from requests from the validation committee. Individuals on the committee believed there might be a difference in opinion because not all Directors have a background in education and experience as it related to the care and management of animal and plant communities. It was also pointed out that in many institutions those who usually make the decisions to hire entry-level zoological care positions are General Curators. In noting this, it was decided to look at the differences between these two groups. The two groups had different demographic characteristics, but their responses to the questions on the survey were essentially the same. Therefore, the two groups were combined and the responses reported from the overall group.

Demographics

The first comparison in addressing the objectives of this study examined selected demographic information of individuals participating in this study.

The first demographic area was education level of participants. The majority had a bachelor's degree at the start of their career and at the time of the study (Table IV). The next highest level was high school graduation for those at the start of their career and a

Master's degree for those at the time of the study. Overall it appears that the educational level rose from the time participants began their careers and when the data was collected.

The next educational level was the education major and/or specialization of the respondents. This was an open-ended question, thus many different answers were provided. The information was first broken into two groups consisting of those that gave a single area and those that gave multiple areas. The answers were then broken into major subject areas (Table V).

TABLE IV

RESPONDENT'S EDUCATIONAL LEVELS
AT START OF CAREER AND
AT TIME OF STUDY

	Start of Career		At Time of Survey	
	n	%	n	%
Less than High School	8	2.76	0	0.00
High School Graduate	51	17.59	25	8.62
Associate Degree	19	6.55	15	5.70
Bachelor Degree	128	44.14	109	37.59
Bachelor Degree +	28	9.66	41	14.14
Masters Degree	31	10.69	63	21.72
Ph.D. or Ed.D	16	5.52	24	8.28
Professional Degree (D.V.M.)	9	3.10	13	4.48
% and n of those that answered the question.	290	96.67	290	96.67

TABLE V

RESPONDENT'S EDUCATIONAL MAJOR/OR SPECIALIZATION AT START OF CAREER AND AT TIME OF STUDY

Major or Specialization (Category)	Start of Career		At Time of Survey	
	n	%	n	%
Respondents who wrote in a single major or specialization.				
Agriculture - High School	2	.76	1	.38
Agriculture	12	4.54	8	3.02
Biological Science	94	35.61	99	37.36
Animal Health	11	4.17	15	5.66
Science – Other	13	4.92	12	4.53
Engineering or Architecture	2	.76	2	.75
Business	11	4.17	23	8.68
Other	7	2.65	10	3.77
Arts	6	2.27	3	1.13
Social Sciences	4	1.52	6	2.26
Respondents who wrote in more than one major or specialization.				
Agriculture and Agriculture	2	.76	1	.38
Agriculture and Science	5	1.89	4	1.51
Agriculture and Other	0	0.00	1	.38
Biological Science and Biological Science	21	7.95	26	9.81
Biological and Other Science	10	3.95	13	4.91
Biological and Other Degree Area	5	1.89	9	3.40
Science and Other Degree Area	2	.76	2	.75
Business and Other Degree Area	5	1.89	9	3.40
Other and Other Degree Area	2	.76	2	.75
n and % of those who did not answer the question	87	32.32	57	19.97

When examining respondents at the start of their career the majority had a major and/or specialization in biological sciences. The second greatest number of those

beginning their careers were those who had just graduated from high school. At the time of the survey, the majority of individuals had education in the biological sciences followed by business. Eight percent (n=22) of the individuals at the time of the survey still had a high school diploma.

The experience of respondents was the last area examined. Table VI shows that the majority of experience prior to work was unpaid experience with both domestic and exotic animals. Domestic animal experience had a higher mean as well as a higher standard deviation. Unpaid years of experience was almost twice that of paid years of experience.

Industry related experience was also examined from the time the individuals began in the Zoo and Aquarium Industry to the time of filling out the survey instrument (Table VII). The greatest experience came from experience other than animal care and management and zoo management. It is important to note that while concentrating on animal and zoo experience, more experience was reported in the area of management than in actual care of animals.

TABLE VI

RESPONDENTS' RELATED ANIMAL EXPERIENCE AT TIME OF ENTERING THE ZOO AND AQUARIUM INDUSTRY

	Mean/ Years	Standard Deviation/ Years	Range/ Years	Respondents	
				n	%
Unpaid Domestic Work Experience	5.63	6.937	0- 25	185	61.67
Unpaid Exotic Animal Experience	3.184	4.929	0-20	186	62.00
Paid Domestic Animal Experience	1.847	3.251	0-18	168	56.00
Paid Exotic Animal Experience	1.481	3.493	0-25	158	52.66

TABLE VII

RESPONDENTS' ZOOLOGICAL EXPERIENCE AT THE TIME OF COMPLETING THE SURVEY

	Mean/ Years	Standard Deviation/ Years	Range/ Years	Respondents	
				n	%
Animal Care Experience	5.39	6.639	0-30	50	16.67
Animal Management Experience	8.927	7.228	0-35	211	70.33
Zoo Management Experience	10.408	7.363	0-32	217	72.33
Other Experience	10.932	7.641	0-32	243	81.00

Each individual who filled out a survey instrument was asked to list their present position and the number of years they had held the position. Listed in Table VIII was the reported amount of time each respondent had at their present job. The respondents reported a mean of almost eight years at their current position with a range of 29 years.

TABLE VIII

RESPONDENT'S NUMBER OF YEARS AT PRESENT POSITION

Mean/ Years	Standard Deviation/ Years	Range/ Years	Respondents Who Answered the Question	
			n	%
7.702	6.56	0 - 29	289	96.3

Education and Experience Needs

The second part of this study looked at the needs and requirements of those preparing to enter the Zoo and Aquarium Industry in entry-level zoological care positions. Education and experience recommendations were targeted for this portion of the study.

Almost one-hundred percent of the respondents felt that there was a need for academically trained individuals in zoological care for the zoo and aquarium industry (Table IX).

TABLE IX

RESPONDENTS' OPINIONS REGARDING THE NEED FOR ACADEMICALLY TRAINED INDIVIDUALS IN ZOOLOGICAL CARE FOR THE ZOO AND AQUARIUM INDUSTRY

Yes		No		Respondents to the Question	
n	%	n	%	n	%
286	97.61	7	2.39	293	97.67

Respondents were then asked to rate which educational level they would prefer for those preparing for entry-level positions in zoological care before beginning their career. The majority of respondents preferred those with a bachelor's degree (63.54%, n=183). The second highest percentage was an associate's degree (26.83%, n=183). (Table X).

Respondents were then asked to respond to the majors in Table XI. Respondents had the opportunity to check any of the areas listed and add others. Overall, Animal Husbandry was selected first (83.11%, n=246), Zoology second (82.43%, n=244), Animal Science third (72.11%, 211) and finally Conservation Biology (67.91, n=201). Thirteen and a half percent of the respondents chose the response that the degree did not matter.

TABLE X

LEVEL OF EDUCATION PREFERRED FOR ENTRY-LEVEL ZOOLOGICAL CARE POSITIONS

Category	n	%
Less Than High School Diploma	0	0.00
High School Diploma/Certificate	16	5.56
Junior/Community College Certificate	26	9.03
Junior/Community College Associate Degree	60	26.83
Four year College Graduation – Bachelor Degree	183	63.54
Greater Than Bachelor Degree	1	.35
Academic Training is not important, since our institution can properly prepare individuals after they have been hired.	2	.69
n and % of individuals who responded to the question.	288	96.00

TABLE XI

MAJORS/SPECIALIZATION PREFERRED FOR ENTRY-LEVEL ZOOLOGICAL CARE POSITIONS

Category	n	%
Zoology	244	82.43
Conservation Biology	201	67.91
Animal Husbandry	246	83.11
Animal Science	212	72.11
Degree does not matter	40	13.51

The following (Table XII) is a list of those majors and/or specializations listed by the respondents as being acceptable for entry-level positions in zoological care. The number listed after the major and/or specialization is the number of individuals that wrote this answer. Some surveys contained more than one response. There were a wide variety of responses, but Biology was listed most often with 19 responses, followed by Animal Behavior with 11, and Psychology with 9.

TABLE XII

MAJORS/SPECIALIZATIONS ACCEPTABLE FOR ENTRY-LEVEL POSITIONS IN ZOOLOGICAL CARE

Major/Specialization	Major/Specialization	Major/Specialization
Administration (3)	Animal Behavior (11)	Animal Work Experience (1)
Any Science Major (1)	Aquaculture (1)	Bacteriology (1)
Biology (19)	Botany (2)	Business (7)
Business Management (2)	Chemistry (3)	Communications (3)
Computer Science (2)	Customer Service (2)	Education (4)
Environmental Biology (3)	Environmental Science (2)	Fisheries Biology (4)
Forestry (1)	General Education (1)	General Management (2)
Horticulture (1)	Laboratory Science (1)	Life Science (1)
Marine Science (1)	Marketing (2)	Natural Science (1)
Nutrition (1)	Other Appropriate Degree (3)	Personnel Management (1)
Psychology (9)	Public Administration (2)	Public Relations (1)
Recreation (1)	Research (1)	Sociology (1)
Veterinary Technician (1)	Wildlife Management (3)	

The last area that was examined, in this section of the study was the preferred amount of experience for entry-level positions in zoological care. The response rate was low since not all areas were answered by every participant. The means among the areas ran from .79 to 1.69 years. Paid experience had a lower mean than volunteer experience. Zoological and exotic experience generally had lower means and higher responses. (Table XIII).

TABLE XIII

EXPERIENCE PREFERRED FOR ENTRY-LEVEL ZOOLOGICAL CARE POSITIONS

Experience Type	n Answered	% Answered	Years M	Years S D	Years R
Volunteer – Pet/Hobby Domestic and/or Exotic Animals	193	64.33	1.69	1.91	1-10
Paid - Pet/Hobby Domestic and/or Exotic Animals	193	64.33	1.05	1.42	1-10
Volunteer – Domestic Animals	190	63.33	1.53	1.84	1-10
Paid - Domestic Animals	204	68	1.16	1.36	1-10
Volunteer – Exotic Animals	201	67	1.17	1.22	1-6
Paid - Exotic Animals	210	70	.94	1.03	1-6
Volunteer – Zoological and/or Aquarium	220	73.33	1.09	1.12	1-5
Paid - Zoological and/or Aquarium	220	73.33	.79	.88	1-6

Note: M=Mean, S D=Standard Deviation, R=Range.

Preferred Levels of Training for Curricular Areas

The following information provides the respondents' views of what curricular and topical areas should be part of an educational program for those entering into an entry-level position in zoological care. Each participant was asked to decide what level of training was needed to prepare individuals for entry-level positions in zoological care as directly related to the Zoo and Aquarium Industry. A mean was calculated by assigning a value to each level of emphasis, multiplying it by the number of responses and then dividing the total response rate into the total. This value was used to determine the preferred level of education desired. At the end of each curricular area table is a list of additional responses (see Tables XIV to XXVIII for these responses).

Agricultural Sciences and Natural Resources (Table XIV) – The preferred levels of training for the topical areas for Agricultural Sciences and Natural Resources spread from being an introductory unit to a major unit. Ecology and Conservation Biology were preferred as major units of study. Agriculture and Society, Agriculture and the Environment, Agricultural Business and Technology, Renewable Resources, and Non-renewable Resources were preferred as introductory units of study.

Animal Anatomy and Physiology (Table XV) – The preferred levels of training for the topical areas for Animal Anatomy and Physiology were all preferred as minor units of instruction. This included the topical areas of the Central Nervous System, the Circulatory System, Comparative Anatomy, the Endocrine System, External Anatomy,

TABLE XIV

PREFERRED LEVELS OF TRAINING FOR THE AGRICULTURAL SCIENCES AND NATURAL RESOURCES CURRICULAR AREAS

Topic Areas	No Emphasis		Introductory Unit		Minor Unit		Major Unit		Entire Course		Respondents		*Preferred Level
	n	%	n	%	n	%	n	%	n	%	n	%	
Agriculture and Society	130	49.81	83	31.8	37	14.18	8	3.07	3	1.15	261	87	I
Agriculture and the Environment	93	35.01	96	36.23	56	21.13	17	6.42	3	1.13	265	88.33	I
Agricultural Business and Technology	135	52.33	81	31.52	29	11.28	10	3.89	2	.78	257	85.67	I
Renewable Resources	68	25.56	77	28.95	80	30.08	31	11.65	10	3.76	266	88.67	I
Ecology	12	4.20	56	19.58	54	18.88	71	24.83	93	32.52	286	95.3	MA
Non-Renewable Resources	61	24.4	65	26	79	31.6	34	13.6	11	4.4	250	83.3	I
Conservation Biology	12	4.18	41	14.29	38	13.24	96	33.45	100	34.84	287	95.7	MA

Note: Other topic areas mentioned were Economics and the Environment, History of Zoos in Human Culture, International, Agriculture, Marine Biology, and Population Biology.
*Preferred Level – NE=No Emphasis, I=Introductory Unit, MI=Minor Unit, MA=Major Unit, E=Entire Course.

TABLE XV

PREFERRED LEVELS OF TRAINING FOR THE ANIMAL ANATOMY AND PHYSIOLOGY CURRICULAR AREAS

Topic Areas	No Emphasis		Introductory Unit		Minor Unit		Major Unit		Entire Course		Respondents		*Preferred Level
	n	%	n	%	n	%	n	%	n	%	n	%	
Central Nervous System	20	7.19	119	42.81	81	29.14	36	12.95	22	7.91	278	92.67	MI
Circulatory System	20	7.19	116	41.73	79	28.42	40	14.39	23	8.27	278	92.67	MI
Comparative Anatomy	13	4.66	109	39.07	65	23.30	53	19.00	39	13.98	279	93.00	MI
Endocrine System	20	7.22	113	40.79	82	29.60	40	14.44	22	7.94	277	92.33	MI
External Anatomy	12	4.30	100	35.80	77	27.6	57	20.43	33	11.83	279	93.00	MI
Major Body Systems	8	2.87	97	34.77	72	25.81	61	21.86	41	14.70	279	93.00	MI
Muscular System	16	5.57	111	38.68	99	34.49	40	13.94	21	7.32	287	95.67	MI
Reproductive System	11	3.96	98	35.25	67	24.10	68	24.46	34	12.23	278	92.67	MI
Respiratory System	17	6.14	114	41.16	81	29.24	44	15.88	21	7.58	277	92.33	MI
Skeletal System	16	5.63	115	40.49	80	28.17	46	16.20	27	9.51	284	94.67	MI
Urinary System	18	6.62	118	43.40	77	28.31	39	14.34	20	7.35	272	90.67	MI

Note: Other topics mentioned were Basic Anatomy/Comparative Zoo Physiology, Environmental Psychology, General Anatomy and Physiology, Immunology, Invertebrate/Vertebrate Zoology, and On the Job Training.
*Preferred Level – NE=No Emphasis, I=Introductory Unit, MI=Minor Unit, MA=Major Unit, E=Entire Course.

Major Body Systems, the Muscular System, the Reproductive System, the Respiratory System, the Skeletal System, and the Urinary System.

Animal Behavior (Table XVI) – The preferred levels of training for the topical areas for Animal Behavior spread from being minor units to major units of instruction. Animal Behavior, Behavior Enrichment and Observation and Record Keeping were preferred as major units of instruction. Animal Training, Behavior Management, Ethograms for Formal Observation, Principles of Learning, and Operant Conditioning were preferred as minor units of instruction.

Animal Health (Table XVIII) – The preferred levels of training for the topical areas for Animal Health were all preferred as minor units of instruction. This included topical areas in the Causes of Disease, Disease-fighting Agents, Health Evaluation, Health Practices, Infectious and Non-infectious Diseases, Internal and External Parasite Life Cycles, Neonatal Care, Normal Values, Nutritional Diseases, Pathogenic Classification, Terminology, Vaccination and Administration of Biological Agents and Zoonosis.

Animal Management (Table XVIII) – The preferred levels of training for the topical areas for Animal Management spread from minor units to major units of instruction. Mammals was the only topical area preferred in this curricular area as a major unit of study. Animal Regulations/Laws, Amphibian Species, Avian Species, Fish Species, Invertebrate Species and Reptile Species were preferred as minor units of instruction.

TABLE XVI

PREFERRED LEVELS OF TRAINING FOR THE ANIMAL BEHAVIOR CURRICULAR AREA

Topic Areas	No Emphasis		Introductory Unit		Minor Unit		Major Unit		Entire Course		Respondents		*Preferred Level
	n	%	n	%	n	%	n	%	n	%	n	%	
Animal Behavior	5	1.75	23	8.07	43	15.09	90	31.58	124	43.51	285	95.00	MA
Animal Training	18	6.45	56	20.07	85	30.47	67	24.01	53	19.00	279	93.00	MI
Behavior Management	11	4.00	63	22.91	49	17.82	106	38.55	46	16.73	275	91.67	MI
Behavior Enrichment	9	3.21	37	13.21	57	20.36	108	38.57	69	24.64	280	93.33	MA
Ethograms for Formal Observation	35	12.82	60	21.98	95	34.80	54	19.78	29	10.62	273	91.00	MI
Learning (Principles of)	30	11.19	63	23.51	86	32.09	61	22.77	28	10.45	268	89.33	MI
Observation and Record Keeping	20	7.19	29	10.39	63	22.58	99	35.48	68	24.37	279	93.00	MA
Operand Conditioning	13	4.64	69	24.64	75	26.79	67	23.93	56	20.00	280	93.33	MI

Note: Other topics mentioned were Behavioral Ecology, Internship, and On the Job Training.
*Preferred Level – NE=No Emphasis, I=Introductory Unit, MI=Minor Unit, MA=Major Unit, E=Entire Course.

TABLE XVII

PREFERRED LEVELS OF TRAINING FOR THE ANIMAL HEALTH CURRICULAR AREA

Topic Areas	No Emphasis		Introductory Unit		Minor Unit		Major Unit		Entire Course		Respondents		*Preferred Level
	n	%	n	%	n	%	n	%	n	%	n	%	
Causes of Disease	8	2.88	60	21.58	79	28.42	85	30.58	46	16.55	278	92.67	MI
Disease-Fighting Agents	17	6.20	86	31.39	87	31.75	61	22.27	23	8.39	274	91.33	MI
Health Evaluation	9	3.19	64	22.70	87	30.85	86	30.50	36	12.79	282	94.00	MI
Health Practices	8	2.84	70	24.82	89	31.56	79	28.01	36	12.77	282	94.00	MI
Infectious and Non-Infectious Diseases	9	3.23	69	24.73	86	30.82	79	28.32	36	12.90	279	93.00	MI
Internal and External Parasites Life Cycles	10	3.56	69	24.56	93	33.10	64	32.78	45	16.01	281	93.67	MI
Neonatal Care	11	3.91	71	25.27	107	38.08	64	22.78	28	9.96	281	93.67	MI
Normal Values	26	9.42	109	39.49	86	31.16	43	15.58	12	4.35	276	92.00	MI
Nutritional Diseases	21	7.47	68	24.20	87	30.96	79	28.11	26	9.25	281	93.67	MI
Pathogenic Classification	36	13.04	102	36.96	88	31.88	43	15.58	7	2.54	276	92.00	MI
Terminology	12	4.30	89	31.90	97	34.77	60	21.51	21	7.53	279	93.00	MI
Vaccination and Administration of Biological Agents	36	13.14	97	35.40	89	32.48	37	13.50	15	5.47	274	91.33	MI
Zoonosis	18	6.43	54	19.29	72	25.71	87	31.07	49	17.50	280	93.33	MI

Note: Other topics mentioned were Clinical Signs, Infection Control, On the Job Training, Quarantine Procedures, Symptom Identifications, and Wildlife or Fish Diseases.

*Preferred Level – NE=No Emphasis, I=Introductory Unit, MI=Minor Unit, MA=Major Unit, E=Entire Course.

TABLE XVIII

PREFERRED LEVELS OF TRAINING FOR THE ANIMAL MANAGEMENT CURRICULAR AREA

Topic Areas	No Emphasis		Introductory Unit		Minor Unit		Major Unit		Entire Course		Respondents		*Preferred Level
	n	%	n	%	n	%	n	%	n	%	n	%	
Animal Regulations/Laws	29	10.25	72	25.44	105	37.10	48	16.96	29	10.25	283	94.33	MI
Amphibian Species	9	3.18	60	21.20	89	31.45	83	29.33	42	14.84	283	94.33	MI
Avian Species	9	3.16	55	19.30	88	30.88	75	26.32	58	20.35	285	95.00	MI
Fish Species	11	3.89	65	22.97	87	30.74	72	25.44	48	16.96	283	94.33	MI
Invertebrate Species	22	7.77	51	18.02	92	32.52	73	25.80	45	15.90	283	94.33	MI
Mammals	9	3.16	52	18.25	71	24.91	87	30.53	66	23.16	285	95.00	MA
Reptile Species	20	7.17	43	15.41	76	27.24	83	29.75	57	20.43	279	93.00	MI

Note: Other topics mentioned were Botany, Exotic Animal Management Practices, On the Job Training, Shipping and Introductions, Specialty Areas, Species Diversities, System/Landscape Interaction in Zoos.
*Preferred Level – NE=No Emphasis, I=Introductory Unit, MI=Minor Unit, MA=Major Unit, E=Entire Course.

Animal Nutrition (Table XIX) – The preferred levels of training for the topical areas for Animal Nutrition spread from minor to major units of instruction. General Nutrition was the only topical area preferred in this curricular area as a major unit of study. Diet Development and Evaluation, Digestion and Absorption, Energy Metabolism, Feed Additives, Feed Identification/Quality, Neonatal Nutrition, Nutrient Needs, Nutritional Evaluation, Obtaining/Storage of Feed Stuffs and Preparation and Deliver were preferred as minor units of instruction.

Animal Reproduction (Table XX) – The preferred levels of training for the topical areas for Animal Reproduction spread from introductory to minor units of instruction. Breeding Systems and Genetics, Estrous Cycles and Breeding Capacities, Environmental Care of Reproducing Animals, Genetics, Gestation, Parturition, Population Management (Captive) and Reproductive Physiology were preferred as minor units of instruction. Artificial Insemination and Embryo Transfer was the only topical area preferred in this curricular area as an introductory unit of study.

General Animal Science (Table XXI) – The preferred levels of training for the topical areas for Animal Science spread from introductory to minor units of instruction. Animals and Society, Animal Selection (General), Animal Species Classification, Animal Welfare and Hormones and their Influence were preferred as minor units of instruction. Meat and Processing was the only topical area preferred in this curricular area as an introductory unit of study.

TABLE XIX

PREFERRED LEVELS OF TRAINING FOR THE ANIMAL NUTRITION CURRICULAR AREA

Topic Areas	No Emphasis		Introductory Unit		Minor Unit		Major Unit		Entire Course		Response to Question		*Preferred Level
	n	%	n	%	n	%	n	%	n	%	n	%	
Diet Development and Evaluation	20	7.09	57	20.21	80	28.37	80	28.37	45	15.96	282	94.00	MI
Digestion and Absorption	28	10.00	87	31.07	95	33.93	60	21.43	10	3.57	280	93.33	MI
Energy Metabolism	30	10.75	102	36.60	89	31.90	51	18.28	7	2.51	279	93.00	MI
Feed Additives	31	11.19	108	38.99	90	32.49	40	14.40	8	2.89	277	92.33	MI
Feed Identification/Quality	22	7.86	86	30.71	85	30.36	67	23.93	20	7.14	280	93.33	MI
General Nutrition	6	2.13	51	18.09	65	23.05	91	32.27	69	24.47	282	94.00	MA
Neonatal Nutrition	24	8.60	71	25.45	109	39.07	55	19.71	20	7.17	279	93.00	MI
Nutrient Needs	12	4.29	69	24.64	100	35.71	83	29.64	16	5.71	280	93.33	MI
Nutritional Evaluation	30	10.87	73	26.45	96	34.78	63	22.83	14	5.07	276	92.00	MI
Obtaining/Storage of Feed Stuffs	30	10.79	83	29.86	90	32.37	61	21.94	14	5.04	278	92.67	MI
Preparation and Delivery	30	10.87	72	26.09	79	28.62	72	26.09	23	8.33	276	92.00	MI

Note: Other topics mentioned were General Animal Nutrition, and On the Job Training.
*Preferred Level – NE=No Emphasis, I=Introductory Unit, MI=Minor Unit, MA=Major Unit, E=Entire Course.

TABLE XX

PREFERRED LEVELS OF TRAINING FOR THE ANIMAL REPRODUCTION CURRICULAR AREA

Topic Areas	No Emphasis		Introductory Unit		Minor Unit		Major Unit		Entire Course		Respondents		*Preferred Level
	n	%	n	%	n	%	n	%	n	%	n	%	
Artificial Insemination and Embryo Transfer	60	21.43	112	40.00	74	26.43	26	9.29	8	2.86	280	93.33	I
Breeding Systems and Genetics	27	9.71	78	28.06	81	29.14	61	21.94	31	11.15	278	92.67	MI
Estrous Cycles and Breeding Capacities	21	8.17	59	22.96	86	33.46	68	26.46	23	8.95	257	85.67	MI
Environmental Care of Reproducing Animals	24	8.57	59	21.07	81	28.93	89	31.79	27	9.64	280	93.33	MI
Genetics	31	10.62	63	21.58	97	33.22	55	18.84	46	15.75	292	97.33	MI
Gestation	27	9.68	93	33.33	99	35.48	48	17.20	12	4.30	279	93.00	MI
Parturition	30	10.79	89	32.01	102	36.39	42	15.11	15	5.40	278	92.67	MI
Population Management (Captive)	14	5.15	59	21.69	67	24.63	70	25.74	62	22.79	272	90.67	MI
Reproductive Physiology	18	6.57	71	25.91	81	29.56	69	25.18	35	12.77	274	91.33	MI

Note: Other topics mentioned were Hand Rearing Birds, and Reproductive Control.
*Preferred Level – NE=No Emphasis, I=Introductory Unit, MI=Minor Unit, MA=Major Unit, E=Entire Course.

TABLE XXI

PREFERRED LEVELS OF TRAINING FOR THE GENERAL ANIMAL SCIENCE CURRICULAR AREA

Topic Areas	No Emphasis		Introductory Unit		Minor Unit		Major Unit		Entire Course		Respondents		*Preferred Level
	n	%	n	%	n	%	n	%	n	%	n	%	
Animals and Society	26	9.56	92	33.82	90	33.09	34	12.50	30	11.03	272	90.67	MI
Animal Identification	12	4.29	59	21.07	89	31.79	78	27.86	42	15.00	280	93.33	MI
Animal Selection (General)	33	11.83	77	27.60	85	30.47	58	20.79	26	9.32	279	93.00	MI
Animal Species Classification	17	6.09	46	16.49	69	24.73	85	30.47	62	22.22	279	93.00	MI
Animal Welfare	11	3.96	55	19.78	84	30.22	87	31.29	41	14.75	278	92.67	MI
Hormones and their Influence	24	8.66	101	36.46	102	36.82	41	14.80	9	3.25	277	92.33	MI
Meat and Processing	118	43.70	111	41.11	33	12.22	4	1.48	4	1.48	270	90.00	I

Note: Other topics mentioned were Animals in Society (International), and Zoo History.
*Preferred Level – NE=No Emphasis, I=Introductory Unit, MI=Minor Unit, MA=Major Unit, E=Entire Course.

Enclosure Design (Table XXII) – The preferred levels of training for the topical areas for Enclosure Design were all preferred as minor units of instruction. This included topical areas in Enclosure Design, Enclosure Specifications and Planning.

Leadership Development (Table XXIII) – The preferred levels of training for the topical areas for Leadership Development spread from minor units to major units of instruction. Ethics, Public Speaking/Communication and Interpersonal skills were preferred as major units of instruction. Industry Associations/Organizations, Management Skills, Meeting/Procedure Skills and Team Building were preferred as major units of instruction.

Occupational Skills (Table XIV) – The preferred levels of training for the topical areas for Occupational Skills spread from introductory to major units of instruction. Writing Skills was the only topical area preferred in this curricular area as a major unit of study. Computing Skills, Interviewing Job Preparation, Organization Structures, Research Skills and Resumes/Job Applications were preferred as minor units of instruction. Career Counseling, General Accounting, Higher Education Preparation, Personal Grooming and Portfolio Preparation were preferred as introductory units of instruction.

Plant Science (Table XXV) – The preferred levels of training for the topical areas for Plant Science spread from introductory to minor units of instruction. Plant Identification and Toxicity of Plants were preferred as minor units of instruction. Plant Growth and Functions, Plant Nutrition, Management of Plant Populations and Plant Physiology were preferred as introductory units of instruction.

TABLE XXII

PREFERRED LEVELS OF TRAINING FOR THE ENCLOSURE DESIGN CURRICULAR AREA

Topic Areas	No Emphasis		Introductory Unit		Minor Unit		Major Unit		Entire Course		Response to Question		*Preferred Level
	n	%	n	%	n	%	n	%	n	%	n	%	
Enclosure Design	31	11.07	53	18.93	84	30	74	26.43	38	13.47	280	93.33	MI
Enclosure Specification	35	12.73	58	21.09	88	32	66	24.00	28	10.18	275	91.67	MI
Planning	38	13.67	64	23.02	84	30.22	60	21.59	32	11.51	278	92.67	MI

Note: Other topics mentioned were Animal Needs, Graphics, On the Job Training, and Regulations.
*Preferred Level – NE=No Emphasis, I=Introductory Unit, MI=Minor Unit, MA=Major Unit, E=Entire Course.

TABLE XXIII

PREFERRED LEVELS OF TRAINING FOR THE
LEADERSHIP DEVELOPMENT
CURRICULAR AREA

Topic Areas	No Emphasis		Introductory Unit		Minor Unit		Major Unit		Entire Course		Respondents		*Preferred Level
	n	%	n	%	n	%	n	%	n	%	n	%	
Ethics	5	1.74	57	19.86	72	25.09	79	27.53	74	25.78	287	95.67	MA
Industry Associations/Organizations	27	9.75	96	34.66	80	28.89	55	19.86	19	6.86	277	92.33	MI
Public Speaking/Communication	11	3.85	43	15.03	79	27.62	79	27.62	74	25.87	286	95.33	MA
Management Skills	21	7.42	54	19.08	85	30.04	80	28.27	43	15.19	283	94.33	MI
Meeting/Procedure Skills	29	10.36	69	24.64	88	31.43	74	26.43	20	7.14	280	93.33	MI
Team Building	14	4.95	57	20.14	64	22.61	98	34.63	50	17.67	283	95.33	MI
Interpersonal Skills	5	1.79	47	16.85	61	21.86	101	36.20	65	23.30	279	93.00	MA

Note: Other topics mentioned were Business Management, Conflict Management, Conflict Resolution, and On the Job Training
*Preferred Level – NE=No Emphasis, I=Introductory Unit, MI=Minor Unit, MA=Major Unit, E=Entire Course.

TABLE XXIV

PREFERRED LEVELS OF TRAINING FOR THE OCCUPATIONAL SKILLS CURRICULAR AREA

Topic Areas	No Emphasis		Introductory Unit		Minor Unit		Major Unit		Entire Course		Respondents		*Preferred Level
	n	%	n	%	n	%	n	%	n	%	n	%	
Computing Skills	16	5.65	40	14.13	83	29.33	81	28.62	63	22.26	283	95.33	MI
Career Counseling	62	22.30	113	40.65	74	26.62	22	7.91	7	2.52	278	92.67	I
General Accounting	78	28.36	114	41.45	61	22.18	18	6.55	4	1.45	275	91.67	I
Higher Education	65	24.53	90	33.96	77	29.06	28	10.57	5	1.89	265	88.33	I
Interviewing Job Preparation	30	10.95	86	31.39	100	36.50	45	16.42	13	4.74	274	91.33	MI
Organizational Structures	36	13.09	107	38.91	94	34.18	32	11.64	6	2.18	275	91.67	MI
Personal Grooming	58	20.86	87	31.29	88	31.65	34	12.23	11	3.96	278	92.67	I
Portfolio Preparation	72	26.47	73	26.84	112	41.18	10	3.68	5	1.84	272	90.67	I
Research Skills	28	10.11	81	29.24	83	29.96	66	23.83	19	6.86	277	92.33	MI
Resumes/Job Applications	34	12.50	104	38.24	98	36.03	27	9.93	9	3.31	272	90.67	MI
Writing Skills	17	6.12	36	12.95	70	25.18	83	29.86	72	25.90	278	92.6	MA

Note: Other topics mentioned were Communication, Creative Problem Solving, Information Research, Library Research Skills, and Time Management.

*Preferred Level – NE=No Emphasis, I=Introductory Unit, MI=Minor Unit, MA=Major Unit, E=Entire Course.

TABLE XXV

PREFERRED LEVELS OF TRAINING FOR THE
PLANT SCIENCES CURRICULAR AREA

Topic Areas	No Emphasis		Introductory Unit		Minor Unit		Major Unit		Entire Course		Respondents		*Preferred Level
	n	%	n	%	n	%	n	%	n	%	n	%	
Plant Growth and Functions	50	18.25	103	37.59	70	25.55	37	13.50	14	5.11	274	91.33	I
Plant Identification	45	16.01	76	27.05	82	29.18	53	18.86	25	8.90	281	93.67	MI
Plant Nutrition	55	20.22	94	34.56	88	32.35	31	11.40	4	1.47	272	90.67	I
Management of Plant	67	24.63	87	31.99	82	30.15	30	11.03	6	2.21	272	90.67	I
Plant Physiology	59	21.61	108	39.56	75	27.47	23	8.42	8	2.93	273	91.00	I
Toxicity of Plants	28	70.04	64	22.94	86	30.82	69	24.73	32	11.47	279	93.00	MI

Note: Other topics mentioned were Botany, Ecosystem Relationships, Landscaping (2), On the Job Training, Plant Ecology, and Plant Science/Horticulture

*Preferred Level – NE=No Emphasis, I=Introductory Unit, MI=Minor Unit, MA=Major Unit, E=Entire Course.

Practical Experience (Table XXVI) – The preferred levels of training for the topical areas for Practical were all preferred as major units of instruction. This included topical areas in Animal Care, Animal Health, Animal Management, Animal Reproduction, Animal Restraint and Record Keeping.

Safety (Table XXVII) – The preferred levels of training for the topical areas for Safety spread from minor to major units of instruction. Safe Handling of Animals was the only topical area preferred in this curricular area as a major unit of study. Facility Safety, Responding to Emergencies, Safe Handling of Drugs and Equipment and Vehicle Safety were preferred as minor units of instruction.

Tools, Equipment and Handling (Table XXVIII) – The preferred levels of training for the topical areas for Tools, Equipment and Handling spread from minor to major units of instruction. Animal Restraint and Cleaning and Sanitation were preferred as major units of instruction. Animal Manipulation, Animal Tools and Equipment, Animal Transportation and Waste Management were preferred as minor units of instruction.

TABLE XXVI

PREFERRED LEVELS OF TRAINING FOR THE PRACTICAL EXPERIENCE CURRICULAR AREA

Topic Areas	No Emphasis		Introductory Unit		Minor Unit		Major Unit		Entire Course		Respondents		*Preferred Level
	n	%	n	%	n	%	n	%	n	%	n	%	
Animal Care	4	1.41	31	10.92	42	14.79	87	30.63	120	42.25	284	94.67	MA
Animal Health	5	1.81	30	10.87	69	25.00	92	32.61	82	29.71	278	92.00	MA
Animal Management	12	4.26	31	10.99	70	24.82	86	30.50	83	29.43	282	94.00	MA
Animal Reproduction	8	2.84	48	17.02	80	28.37	83	29.43	63	22.34	282	94.00	MA
Animal Restraint	6	2.12	47	16.61	57	20.14	88	31.10	85	30.40	283	94.33	MA
Record Keeping	7	2.47	40	14.13	68	24.03	92	32.51	72	26.86	279	94.33	MA

Note: Other topics mentioned were Observation Skills, On the Job Training, and Pest Control
*Preferred Level – NE=No Emphasis, I=Introductory Unit, MI=Minor Unit, MA=Major Unit, E=Entire Course.

TABLE XXVII

PREFERRED LEVELS OF TRAINING FOR THE SAFETY CURRICULAR AREA

Topic Areas	No Emphasis		Introductory Unit		Minor Unit		Major Unit		Entire Course		Respondents		*Preferred Level
	n	%	n	%	n	%	n	%	n	%	n	%	
Facility Safety	13	4.63	57	20.28	77	27.40	91	32.38	43	15.30	281	93.67	MI
Responding to Emergencies	10	3.56	57	20.28	75	26.69	82	29.18	57	20.28	281	93.67	MI
Safe Handling of Animals	7	2.48	45	15.96	43	15.25	108	38.30	79	28.01	282	94.00	MA
Safe Handling of Drugs and	22	7.76	55	19.37	77	27.11	77	27.11	53	18.66	284	94.67	MI
Vehicle Safety	28	10.14	78	28.26	106	38.41	42	15.22	22	7.97	276	92.00	MI

Note: Other topics mentioned were On the Job Training (2), Visitor Safety, and Work-safety/OSHA.
*Preferred Level – NE=No Emphasis, I=Introductory Unit, MI=Minor Unit, MA=Major Unit, E=Entire Course.

TABLE XXVIII

PREFERRED LEVELS OF TRAINING FOR THE TOOLS, EQUIPMENT, AND HANDLING CURRICULAR AREAS

Topic Areas	No Emphasis		Introductory Unit		Minor Unit		Major Unit		Entire Course		Respondents		*Preferred Level
	n	%	n	%	n	%	n	%	n	%	n	%	
Animal Manipulation	11	3.90	54	19.15	60	21.28	98	34.75	59	20.92	282	94.00	MI
Animal Restraint	10	3.52	48	16.90	54	19.01	95	33.45	77	27.11	284	94.67	MA
Animal Tools and	15	5.56	43	15.93	74	27.41	88	32.59	50	18.52	270	90.00	MI
Animal Transportation	15	5.34	58	20.64	78	27.76	80	28.47	50	17.79	281	93.67	MI
Cleaning and Sanitation	11	4.03	38	13.92	54	19.78	93	34.07	77	28.21	273	91.00	MA
Waste Management	16	5.78	62	22.38	94	33.94	65	23.47	40	14.44	277	92.33	MI

Note: Other topics mentioned were HVAC Fish Life Support System, On the Job Training (2), and Product Safety Data.
*Preferred Level – NE=No Emphasis, I=Introductory Unit, MI=Minor Unit, MA=Major Unit, E=Entire Course.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The purpose of this chapter is to present a summary of the study problem and its environment, the design and conduct of the study, and the major findings. Also presented are conclusions and recommendations which were based upon analysis and summarization of data collected and upon observations and impressions resulting from the design and conduct of the study.

Summary

Problem

At the time of this study there were no standards for educational curriculum, level of education, or years and types of practical experience required for people seeking careers in the field of zoological care and management. Those looking for a career in this field have had difficulty preparing for jobs in this field. In addition to this, it has been difficult for institutions who train people for entry-level positions in zoological care because of the lack of information about education and experience preferred by zoo

management. Thus there was a need to conduct research to determine what zoo and aquarium management preferred in the way of training and expertise.

Purpose

The purpose of this study was to determine the curricular topics, educational level, and practical experiences needed for entry-level positions in the area of zoological care.

Objectives

Objectives were:

1) To determine selected demographic information on respondents filling out the instrument in relation to educational levels and years of experience.
2) To determine the need for trained personnel for entry-level positions in the area of zoological care.
3) To determine the level of training needed to meet the entry-level requirements of zoological parks and aquariums.
4) To determine the amount of practical animal care experience most desirable for employing personnel in the area of zoological care.
5) To determine preferred levels of training for curricular and topical areas for entry-level positions in zoological care.

Design and Conduct of the Study

Several methods of data collection were considered and the mail questionnaire was determined best to meet the needs to satisfy the objectives of this study. This was due to the fact that the study population was located throughout the United States, Canada and Bermuda, a reliable address list was available, money and qualified staff was relatively scarce and immediate turnaround time was not a major point to this study. The population consisted of those individuals who were in charge of the operation of the institution (Directors) and those directly responsible for the institution's animal collection (General Curators). One hundred eighty-two institutions were included in the study with a possible population of 365 individuals. All institutions were accredited as of 1997, with the American Zoo and Aquarium Association (AZA).

The survey consisted of four parts. The survey was reviewed for content, construct, and face validity by the authors' graduate committee, sent for approval to the University's Institutional Review Board for compliance and then sent to a national validation committee for review of content and construct validity. The national validation committee represented members of the population, industry, and agricultural and science educators from high school, two-year and four-year college institutions. The instrument was then reconstructed, reviewed by the author's graduate committee, printed and sent.

The first part of the survey contained both closed and open-ended questions regarding the demographics of the population being studied. These questions center around the education and experience of the population both at the start of their career and at the time in which they completed the survey. The first part of the survey also included

one question on the individual's present job title and the number of years served in their present position.

The second part of the survey instrument examined the type of education and experience that best prepared those individuals for positions in entry-level zoological care. Both open- and closed-ended questions were used.

The third part of the instrument centered on which curricular and topical areas should be part of an animal keeper preparation program. These items were taken from material covered in the Review of Literature portion of this report and suggestions from the validation committee. Individuals were asked to check one of the following answers:

1. No emphasis in this area is needed through academic training.
2. Introductory information in this area should be included in academic training programs.
3. A minor unit in this area should be included in academic training programs.
4. A major/in-depth unit in this area should be included in academic training programs.
5. A course in this area should be included in academic training programs.

Individuals also had an opportunity to add topical areas.

The last section of the survey contained a list of careers from the AZA national website. Individuals were asked to check a level of education and write a number in the "Years of Experience" column. Individuals had the opportunity to list additional careers.

A postcard informing the population was sent the last week of January 1998, followed with the survey packet being sent the first week of February 1998. A reminder postcard was sent two weeks later, followed by a second packet, which was sent to non-

respondents the second week of March 1998. A second follow-up was done in the early summer by use of the University's fax machine. August 1, 1998 was used as a cutoff date for data collection.

All data collected was then entered into an Excel spreadsheet and analyzed. Since the entire population was surveyed, descriptive statistics were used to analyze the data of the study. Means, frequencies, standard deviations, range and percentages were calculated.

Major Findings of the Study

Since there was very little difference between Directors and General Curators in comparing the questions directly related to the objectives of this study, the major findings were used from the total group of respondents.

Demographic Information

Of the 182 institutions accredited by the AZA, 165 (89.7%) institutions returned at least one survey.

Of the 365 members of the selected population, 300 (82.20%) individuals responded. The majority (44.14%) of these individuals had a bachelors degree, with the next highest level of education being a high school diploma (17.59%) at the time of beginning their careers in the zoo and aquarium industry. At the time of the study, 37.49% had a bachelors degree followed by 21.72% with a masters degree. The majority of both groups had a major and/or specialization in Biological Sciences both at the start of their careers as well as at the time of the study. Most individuals had animal experience by

the time they began their careers. This experience consisted of predominately unpaid animal experience with domestic animal experience being the greatest. At the time of the survey, most individuals responded as having most of their experience in the area of management. This included both animal management and zoological management experience. Respondents had a mean of 7.70 years of experience at their present position.

Preferred Pre-Service Education and Experience for Positions in Entry-Level Zoological Care

Over 97% of the respondents said that there was a need for academically trained individuals for entry-level zoological care positions. The majority of the respondents (63.54%) suggested that individuals seeking entry-level zoological care positions should have a bachelors degree before beginning their career in the zoo and aquarium industry. The second level of education that was selected was an associate degree (26.83%).

Respondents said that a major in Animal Husbandry (83.11%), Animal Science (72.11%), Conservation Biology (67.91%), or Zoology (82.43%) were acceptable. They also listed many other majors. These other majors were scattered and not consistent among respondents. When asked if the major and/or specialization for those entering positions in zoological care was important, 86.5% of the respondents said yes.

Experience for those preparing for positions in zoological care is important. According to the perceptions of the respondents, both paid and volunteer experience is preferred. The participants of this study suggested a range of 0 to 10 years of experience preferring at least 1 to 3 years of experience. Those who had paid practical experience

were preferred. Also those who had paid zoological experience needed fewer years practical experience than those with domesticated animal experience.

Preferred Curriculum for Pre-Service Training for Entry-Level Positions in Zoological Care

The preferred curriculum, for entry-level positions in zoological care, is listed in Table XXIX . The topical areas for this preferred training program range from introductory to major units of content, skill and practical experience training. Major topical areas include those pertaining to the knowledge of the environment, animal behavior, the management of mammals, general animal nutrition, sanitation, sanitation, ethics, communication skills and the safe handling and restraint of animals. A practical experience component integrating all of the topical areas should also be a major component of this curriculum. It is important that individuals being trained have the opportunity to practice what is being learned in the content and skill areas of instruction. The ability to work and communicate with others is also a major part of this training program.

This training program should have a large portion of instruction in the care and management of animals. Students taking part in this curriculum have the opportunity to develop a well-rounded scientific background that can be applied to the management of the animals under their care. Minor units of instruction should concentrate on the curricular areas of animal anatomy and physiology, animal behavior, animal health, animal management, animal nutrition, animal reproduction, general animal science, enclosure design, leadership development, occupational skills, plant sciences, safety and tools

equipment, and handling. Entry-level zoological care personnel can use this information, with the experience they have obtained, to make informed suggestions about the better care of animals under their supervision.

In addition to the above curricular/topical areas of content, skill and experience, entry-level zoological care personnel are introduced to areas which will broaden their understanding of how zoos and aquariums fit into the society in which they live. Introductory units related to natural resource management, agriculture, career development and horticulture. This program fits together by linking science to husbandry and applying this linkage with skills and experiences, as well as preparing future employees with interpersonal skills needed to obtain and keep a job with the ability to communicate with fellow workers, management and the general public.

After completing this program of instruction, prospective employees for positions in zoological care, will have a well-rounded background in the science and management of animal care, the ability to work and communicate with people and the ability to seek entry-level employment. Overall this training program provides prospective employees with the ability to work both with people as well as the animals under their charge.

TABLE XXIX

PREFERRED CURRICULUM FOR PRE-SERVICE TRAINING
FOR ENTRY-LEVEL POSITIONS IN ZOOLOGICAL CARE

Curricular Area	Topical Area	Preferred Level of Instruction
	CONTENT CURRICULAR/TOPICAL AREAS	
Agricultural Sciences and Natural Resources	Agriculture and Society	Introductory Unit
	Agriculture and the Environment	Introductory Unit
	Agricultural Business and Technology	Introductory Unit
	Non-renewable Resources	Introductory Unit
	Renewable Resources	Introductory Unit
	Ecology	Major Unit
	Conservation Biology	Major Unit
Animal Anatomy and Physiology	Central Nervous System	Minor Unit
	Circulatory System	Minor Unit
	Comparative Anatomy	Minor Unit
	Endocrine System	Minor Unit
	External Anatomy	Minor Unit
	Major Body Systems	Minor Unit
	Muscular System	Minor Unit
	Reproductive System	Minor Unit
	Respiratory System	Minor Unit
	Skeletal System	Minor Unit
	Urinary System	Minor Unit
Animal Behavior	Animal Training	Minor Unit
	Behavior Management	Minor Unit
	Ethograms for Observation	Minor Unit
	Principles of Learning	Minor Unit
	Operant Conditioning	Minor Unit
	Animal Behavior	Major Unit
	Behavior Enrichment	Major Unit
Animal Health	Causes of Death	Minor Unit
	Disease Fighting Agents	Minor Unit
	Health Evaluation	Minor Unit
	Health Practices	Minor Unit
	Infectious and Non-infectious Diseases	Minor Unit
	Internal and External Parasites Life Cycles	Minor Unit

TABLE XXIX - continued

Curricular Area	Topical Area	Preferred Level of Instruction
	Neonatal Care	Minor Unit
	Normal Values	Minor Unit
	Nutritional Diseases	Minor Unit
	Pathogenic Classification	Minor Unit
	Terminology	Minor Unit
	Vaccination and Administration of Biological Agents	Minor Unit
	Zoonosis	Minor Unit
Animal Management	Animal Regulations/Laws	Minor Unit
	Amphibian Species	Minor Unit
	Avian Species	Minor Unit
	Fish Species	Minor Unit
	Invertebrate Species	Minor Unit
	Reptile Species	Minor Unit
	Mammal Species	Major Unit
Animal Nutrition	Diet Development and Evaluation	Minor Unit
	Digestion and Absorption	Minor Unit
	Energy Metabolism	Minor Unit
	Feed Additives	Minor Unit
	Feed Identification/Quality	Minor Unit
	Neonatal Nutrition	Minor Unit
	Nutrient Needs	Minor Unit
	Nutritional Evaluation	Minor Unit
	Obtaining/Storage of Feed Stuffs	Minor Unit
	Preparation and Delivery	Minor Unit
	General Nutrition	Major Unit
Animal Reproduction	Artificial Insemination and Embryo Transfer	Introductory Unit
	Breeding Systems and Genetics	Minor Unit
	Estrous Cycles and Breeding Capacities	Minor Unit
	Environmental Care of Reproducing Animals	Minor Unit
	Genetics	Minor Unit
	Gestation	Minor Unit
	Parturition	Minor Unit
	Population Management (Captive)	Minor Unit
	Reproductive Physiology	Minor Unit

TABLE XXIX - continued

Curricular Area	Topical Area	Preferred Level of Instruction
General Animal Science	Meat and Processing	Introductory Unit
	Animals and Society	Minor Unit
	Animal Identification	Minor Unit
	Animal Selection (General)	Minor Unit
	Animal Species Classification	Minor Unit
	Animal Welfare	Minor Unit
	Hormones and their Influence	Minor Unit
Enclosure Design	Enclosure Design	Minor Unit
	Enclosure Specifications	Minor Unit
	Planning	Minor Unit
Leadership Development	Industry Associations/Organizations	Minor Unit
	Team Building	Minor Unit
	Ethics	Major Unit
Plant Sciences	Plant Growth and Functions	Introductory Unit
	Plant Nutrition	Introductory Unit
	Management of Plant Populations	Introductory Unit
	Plant Physiology	Introductory Unit
	Plant Identification	Minor Unit
	Toxicity of Plants	Minor Unit
Safety	Facility Safety	Minor Unit
	Responding to Emergencies	Minor Unit
	Safe Handling of Drugs and Equipment	Minor Unit
	Vehicle Safety	Minor Unit
	Safe Handling of Animals	Major Unit
Tools, Equipment, and Handling	Animal Manipulation	Minor Unit
	Animal Tools and Equipment	Minor Unit
	Animal Transportation	Minor Unit
	Waste Management	Minor Unit
	Animal Restraint	Major Unit
	Cleaning and Sanitation	Major Unit
SKILL CURRICULAR/TOPICAL AREAS		
Animal Behavior	Observation and Record Keeping	Major Unit

TABLE XXIX - continued

Curricular Area	Topical Area	Preferred Level of Instruction
Leadership Skills	Management Skills	Minor Unit
	Meeting/Procedure Skills	Minor Unit
	Public Speaking/Communication	Major Unit
	Interpersonal Skills	
Occupational Skills	Career Counseling	Introductory Unit
	General Accounting	Introductory Unit
	Higher Education Preparation	Introductory Unit
	Personal Grooming	Introductory Unit
	Portfolio Preparation	Introductory Unit
	Computing Skills	Minor Unit
	Interviewing Job Preparation	Minor Unit
	Organizational Structures	Minor Unit
	Research Skills	Minor Unit
	Resumes/Job Applications	Minor Unit
	Writing Skills	Major Unit
EXPERIENCE CURRICULAR/TOPICAL AREAS		
Practical Experience	Animal Care	Major Unit
	Animal Health	Major Unit
	Animal Management	Major Unit
	Animal Reproduction	Major Unit
	Animal Restraint	Major Unit
	Record Keeping	Major Unit

Conclusions

Examination and analysis of the major findings provided the basis for the following conclusions:

1. With the importance of managing plants and animals in a healthy environment and promoting the application of science, research, education,

recreation and business, zoological management has had to keep up-to-date with the ever-changing needs of their industry. In keeping up-to-date, those who manage zoos and aquariums and the animals kept within these institutions, have increased their knowledge both through formal and informal training since beginning their careers in the zoo and aquarium industry. This advanced training has predominately been in the areas of biological sciences and business management.

2. Knowledgeable husbandry and scientific care has become vital to the ability to successfully maintain a viable genetic animal population in captivity for an extended period of time. This will only be able to continue with the support of properly trained zoological care personnel who take care of these animals. Almost all respondents agreed with this need.
3. Zoological programs in the United States are present at many different educational levels. Entry-level personnel need to have at least a four-year degree in animal husbandry, animal science and/or zoology to be properly prepared for this industry.
4. Since many of the animals kept in zoological institutions are rare and/or in need of special care it is important that entry-level zoological care personnel have experience working with animals (both domestic and wild). This will allow those individuals to be able to apply what they have experienced to situations which will develop as they do their daily duties. According to the perceptions of the respondents, both paid and volunteer

experience is preferred. Those who had paid zoological experience needed fewer years of practical experience than any other category.

5. In caring for animals kept in zoological institutions there are objectives and goals which are similar to those in the care and management of domestic animals and wildlife as well as those which are quite different. It is for this reason that perspective personnel need to be trained in those topical areas identified as being important by management who both hire and manage zoological care personnel. Thus perspective employees need to seek training with an educational institution which is targeting their curriculum towards the needs and desires of the zoological industry which should include introductory, minor and major topical units pertaining to the curriculum areas of agricultural science and natural resources, animal anatomy and physiology, animal behavior, animal health, animal management, animal nutrition, animal reproduction, general animal science, enclosure design, leadership development, plant science, safety, occupational skills, practical experiences and tools, equipment, and handling.

Recommendations

It is recommended:

1. That zoo management personnel, through a process of life-long learning, continue to increase their knowledge base through both training and specialized experiences as related to their specific management duties. This

should be done through training provided by both private and public institutions, industry training and experiential opportunities and collaboration between zoological institutions and organizations.

2. That since management personnel were strongly focused on the need for trained entry-level personnel in zoological care, that more programs need to be developed which will cater to training for entry-level personnel for this industry.
3. That zoological institutions insist that entry-level personnel for zoological care positions have at least a four-year degree in a major related to animal husbandry, animal science and/or zoology.
4. That four-year training institutions work and articulate with high school and junior/community college zoological vocational programs in meeting the desired curriculum content, experiences and skills for preparing entry-level zoological care personnel.
5. That zoological institutions insist that entry-level personnel for zoological care positions have varied experiences working with animals or related to animals which they will be in contact with.
6. That management who hire and manage entry-level zoological care personnel insist that new employees be trained by educational institutions which prepare graduates with the proposed curriculum including the topical areas identified important by the zoological industry.

7. That educational training institutions align their curriculum to include topical areas identified as being important in preparing entry-level zoological care personnel.
8. That entry-level zoological care personnel be able to communicate both in an oral and written format.
9. That the zoological industry, with the help of educational institutions, determines curriculum content, experiences, and skills desired on a regular basis so that educational institutions can keep up to date in preparing graduates for this industry.
10. That the zoological industry, institutions and training programs reevaluate their promotional and educational materials to reflect the research data which has been collected and see that it is properly disseminated to educational counselors.

Recommendations for Further Research

It is further recommended that research be done:

1. To determine what training and experience requirements best meet the needs of Directors and General Curators in Zoo and Aquariums.
2. To determine training and experience requirements for other careers in the Zoological Industry.
3. To determine if training and experience requirements differ for the size of the institution based on the number of full time employees.

4. To determine objectives and learning outcomes for the topical areas specified in this study.
5. To determine specific examples and directives for experience specified in this study.
6. To evaluate curriculum in the majors of Animal Husbandry, Animal Science, Conservation Biology and Zoology against recommended topical areas to see if they meet the needs of the zoological industry.
7. To examine the needs of post-service training needs in the zoological industry and provide suggested guidelines for this training program.

BIBLIOGRAPHY

AAZK, (1996). American Association of Zookeepers - Zookeeping as a Career http://aazk.ind.net:80/AAZK/Zookeeping.html. Topeka, KS.

AZA, (1997). American Zoo and Aquarium Association; Zoo and Aquarium Careers. http://aza.org/aza/career.html. Bethesda, MD.

Boyd, L. (1996). Directory of Zoological Parks and Aquariums. Bethesda, MD: American Zoo and Aquarium Association.

Brown, J. (1993). Instant Zookeeper, Just add water...not!! American Association of Zoological Parks and Aquariums 1993 Regional Proceedings, pp. 245-247. Bethesda, MD.

Carr, B. (1997). Message from the board of regents: express training on beyond management; AZA Communique, May 1997. Wheeling,WV: American Association of Zoological Parks and Aquariums.

Chepko-Sade, D. (1997). Zoo Technology; A cooperative program with the Sante Fe Community College; http://www. oswego.edu/ Acad_Dept/a_...logy/ programs/zootech /zootech.html. Sante Fe, NM.

Craft, R., Martch, T., & Hatfield, D. (1991). Developing a skilled zoo workforce through the school-community network. American Association of Zoological Parks and Aquariums 1991 Regional Proceedings, pp. 315-321. Bethesda, MD.

Croke, V. (1997). The modern Ark; the story of zoos, past, present and future. New York, NY: Scribner.

Dillman, D. (1978). Mail and Telephone Surveys: The total design method. New York, NY: John Wiley & Sons, Inc.

Friends University, (1997). http://www.friends.edu/NatSci/Require.html Wichita, KS.

Giron, R. & Vandiver, M. (1973). A Keeper training programme-one approach. International Zoo Yearbook 1973 (13), pp. 265-267. London, UK: The Zoological Society of London.

Gray, B. (1991). The San Diego Zoo. San Diego, CA: Zoological Society of San Diego.

Hayford, J. (1991). Spirit Filled Life Bible; New King James Version. Nashville, TN: Thomas Nelson Publishers.

Herren, R. (1994). The Science of Animal Agriculture. Albany, NY: Delmar Publishers.

Hirshberg, C. (1997). Miracle Babies. Life Magazine. March 1997. pp. 30-42. New York, NY: Time Incorporated.

Hoage, R., & Deiss,W. (1996). New Worlds, new animals: from manger to zoological park in the nineteenth century. Baltimore, MD: The Johns Hopkins Press. Copyright by Smithsonian Institute.

Hutchins, M. & Conway, W. (1995). Beyond Noah's Ark; the evolving role of modern zoological parks and aquariums in field conservation. International Zoo Yearbook; 1995; Vol. 34-117-130. London, UK: The Zoological Society.

Iliff, W. (1972). A Keeper Training Project at the National Zoological Park, Washington DC. International Zoo Yearbook 1972(12) pp. 157-160. London, UK: The Zoological Society of London.

Karsten, P. (1975). Inservice Training program for Apprentice Zookeepers. American Association of Zoological Parks and Aquarium 1975 Annual Conference Proceedings, pp. 123-131. Bethesda, MD.

Kirts, C. (1990). Linking Agriculture and Environmental Education by integrating environmental concepts and vocational skills. National Agriculture College Teachers Association Journal, pp. 31-35. March 1990.

Koebner, L. (1994). The evolution of wildlife conservation centers. New York, NY: Tom Doherty Associates, Inc.

Koontz, F. (1990). An Investment in the Future; Keeper Training at the New York Zoological Park. American Association of Zoological Parks and Aquariums 1990 Annual Conferences Proceedings. Bethesda, MD.

Kleiman, D., Aleen, M., Thompson, K., Lumpkin, S. & Harris, H. (1996). Wild Animals in Captivity; principles and techniques. Chicago, IL: The University of Chicago Press.

Kreger, M. (1997). The compatibility of zoo conservation programs and animal welfare issues. Zoo Biology Vol.16, pp.95-97 (1997) New York, NY: Wiley-Liss, Inc.

Lanan, K (1991). High school students learning to make a difference or our school is a real zoo. American Association of Zoological Parks and Aquariums 1991 Regional Proceedings, pp. 789-791. Bethesda MD.

Ledder, D. (1993). Keeper Training and Development at the Zoological Society of San Diego. American Association of Zoological Parks and Aquariums 1975 Annual Conference Proceedings, pp. 344-347. Bethesda, MD.

Leedy, P. (1997). Practical Research: planning and designing. 6th edition. Columbus, OH: Merrill Publisher.

Litzenberg, K., Stebenne, S., & Scamardo, J. (1991). 1991 U.S. Enrollment for Agriculture and Renewable Natural Resources. National Agricultural College Teachers Association Journal. pp. 4-7, June 1992.

Maher, S. (1996). Personal Letter dated May 13, 1996; regarding keeper training classes at Lincoln Park Zoo.

Marshall, A. (1994). Zoo. New York, NY: Random House, Inc.

Miegs, J. (1986). Trevor Teaching Zoo. American Association of Zoological Parks and Aquarium 1986 Regional Proceedings, pp. 612-615. Bethesda, MD.

Millbrook (1997). http://www.millbrook.pvt.k12.ny.us/sci.html Millbrook, NY.

Moorpark Community College, (1996). EATM Program; http://www.vcccd.cc.ca.us/htdocs/div/tech/eatm/eatm.html. Moorpark, CA.

National Research Council, (1988). Understanding Agriculture. New Directions for Education. Washington, DC: National Academy Press.

Niagara County Community College, (1997). One success story at a time. San Born, NY:1997/1998 Catalog.

Nichols, M. (1996). Keepers of the kingdom: the new American Zoo. Charlottesville, VA: Thomasson-Grant and Lickle

Norton, B., Hutchins, M., Stevens, E., & Maple, T. (19). Ethics on the Ark: zoos, animal welfare, and wildlife conservation. Washington, DC: Smithsonian Institute Press.

Oklahoma State University (1998). 1998-1999 Oklahoma State University university catalog. Stillwater, OK: Oklahoma State University.

Pensacola Junior College (1997). http://www.PJC.cc.fl.us/ Pensacola, FL.

Pensacola Junior College (1997). Pensacola Junior College Department of Biological Sciences. Zoo Animal Technology Program. Pensacola, FL.

Peterson, R. (1995). Collaboration in Agricultural Education: The future is now. p 3-4, 8; The Agricultural Education Magazine.(68)5, pp. 3-4,8. The Agricultural Education Magazine Inc.

Ray, B. (1996a). AZA Communique; American Zoo and Aquarium Association. Wheeling, WV; Employment Opportunities (section); January issue through December Issue.

Ray, B. (1997b). AZA Communique; American Zoo and Aquarium Association. Wheeling, WV; Employment Opportunities (section); January issue through December Issue.

Roxby, J. (1986). High School Credit for zoo education. Animal care and behavior. American Association of Zoological Parks and Aquarium 1986 Regional Proceedings, pp. 588-593. Bethesda, MD.

Rutledge, B. (1983). Cost effectiveness in captive management. Zoo Biology. Vol. 2, pp. 259-262. Alan R. Liss, Inc.

Salant, P., & Dillman, D. (1994). How to conduct your own survey. New York, NY: John Wiley & Sons, Inc.

Sausman, (K. 1982). Zoological Park and Aquarium Fundamentals. Wheeling, WV: The American Association of Zoological Parks and Aquariums

Schmitt, E. (1990). The Surplus Question: ageneral review of the problem. American Association of Zoological Parks and Aquariums 1990 Annual Conference Proceedings, pp. 320-323. Bethesda, MD.

Sea World, (1996). Sea World of Florida. Zoological Park Careers Introduction. http://www.bev.net/education/Sea World/zoo-Careers/zcintro.html. Copyright 1995. Sea World Inc.

Shea, J. (1993). Making on-the-job training effective. American Association of Zoological Parks and Aquariums 1993 Annual Conference Proceedings. Bethesda, MD.

Shea, J. (1994). ZooTech International Keeper Job Skill Training Program. New Boston, NH: ZooTech International Ltd.

Sherman, K. (1996). Center for Agricultural Science and Technology Handbook. Pioneer High School; San Jose Unified School District; San Jose, CA.

Soukhanov, A. (1992). The American Heritage Dictionary of the English Language. 3rd Edition. Boston, MA: Houghton Miffin Company.

Sunquist, F. (1995). End of the ark? International Wildlife. Vol. 25,11-1-95. p. 22. National Wildlife Federation.

Thurston, B. (1995). Zoo-do Economics Pittsburgh Business Times.1-1-95 p. 1.

Van Dalen, D. (1979). Understanding Educational Research: an introduction. 4th edition. New York, NY: McGraw-Hill, Inc.

Vandiver, M. (1978). Keeper training at Sante Fe Community College: a program Report. International Zoo Yearbook 1978(18) pp. 237-240; London, UK: The Zoological Society of London.

Veachio, T. (1991). Animal Welfare Organization and Zoos: Is there common ground or just thin ice? American Association of Zoological parks and Aquariums Regional Proceedings; 1991. pp.538-540. Bethesda, MD.

Warren, D. (1995). Small Animal Care and Management. Albany, NY: Delmar Publishers.

APPENDIXES

APPENDIX A

AZA ACCREDITED INSTITUTIONS

SORTED BY STATE

Zoo/Aquarium	City	State	Employees
Birmingham Zoo	Birmingham	AL	65
Montgomery Zoo	Montgomery	AL	53
Calgary Zoo, Botanical Garden and Prehistoric Park	Calgary	Alberta, Canada	150
Arizona-Sonora Desert Museum	Tucson	AZ	89
Little Rock Zoological Garden	Little Rock	AZ	33
Reid Park Zoo	Tucson	AZ	23
The Phoenix Zoo	Phoenix	AZ	154
Wildlife World Zoo	Litchfield Park	AZ	21
Bermuda Aquarium, Museum and Zoo	Flatts FL BX	Bermuda	34
Vancouver Aquarium	Vancouver	British Columbia, Canada	105
Chaffee Zoological Gardens of Fresno	Fresno	CA	30
Charles Paddock Zoo	Atascadero	CA	5
Happy Hollow Zoo	San Jose	CA	9
Los Angeles Zoo	Los Angeles	CA	190
Marine World Africa USA	Vallejo	CA	199
Micke Grove Zoo	Lodi	CA	8
Monterey Bay Aquarium	Monterey	CA	273
Sacramento Zoo	Sacramento	CA	39
San Diego Zoo and Wild Animal Park	San Diego	CA	1550
San Francisco Zoological Gardens	San Francisco	CA	125
Santa Ana Zoo	Santa Ana	CA	14
Santa Barbara Zoological Gardens	Santa Barbara	CA	42
Sea World of California	San Diego	CA	651
Sequoia Park Zoo	Eureka	CA	4
Steinhart Aquarium; California Academy of Sciences	San Francisco	CA	15
The Living Desert	Palm Desert	CA	59
The Oakland Zoo	Oakland	CA	50
Cheyenne Mountain Zoological Park	Colorado Springs	CO	54
Denver Zoological Gardens	Denver	CO	161
Pueblo Zoo	Pueblo	CO	18
Beardsley Zoological Gardens	Bridgeport	CT	13
Mystic Marinelife Aquarium	Mystic	CT	86
National Zoological Park - Smithsonian Institution	Washington	DC	300
Brandywine Zoo	Wilmington	DE	7
Brevard Zoo	Melbourne	FL	33
Busch Gardens	Tampa	FL	135
Central Florida Zoological Park	Lake Monroe	FL	36
Discovery Island Zoological Park	Lake Buena Vista	FL	45
Disney's Animal Kingdom	Lake Buena Vista	FL	
Jacksonville Zoological Gardens	Jacksonville	FL	92
Lowry Park Zoological Garden	Tampa	FL	83
Miami Metrozoo	Miami	FL	87
Palm Beach Zoo at Dreher Park	West Palm Beach	FL	37

Zoo/Aquarium	City	State	Employees
Parrot Jungle and Gardens	Miami	FL	69
Sea World of Florida	Orlando	FL	1200
St. Augustine Alligator Farm	St. Augustine	FL	27
The Florida Aquarium	Tampa	FL	120
The Living Seas, WDW Resort	Lake Buena Vista	FL	28
The ZOO	Gulf Breeze	FL	30
Chehaw Wild Animal Park	Albany	GA	23
St. Catherine's Wildlife Conservation Center	Midway	GA	7
Zoo Atlanta	Atlanta	GA	120
Honolulu Zoo	Honolulu	HI	74
Sea Life Park Hawaii	Waimanalo	HI	92
Waikiki Aquarium	Honolulu	HI	41
Blank Park Zoo	Des Moines	IA	18
Brookfield Zoo	Brookfield	IL	450
Glen Oak Zoo	Peoria	IL	8
Henson Robinson Zoo	Springfield	IL	14
John G. Shedd Aquarium	Chicago	IL	232
Lincoln Park Zoological Gardens	Chicago	IL	154
Miller Park Zoo	Bloomington	IL	9
Fort Wayne Children's Zoo	Fort Wayne	IN	40
Indianapolis Zoo	Indianapolis	IN	137
Mesker Park Zoo	Evansville	IN	33
Potawatomi Zoo	South Bend	IN	16
Emporia Zoo	Emporia	KS	3
Lee Richardson Zoo	Garden City	KS	18
Sedgwick County zoo	Wichita	KS	92
Sunset Zoological Park	Manhattan	KS	13
Topeka Zoological Park	Topeka	KS	25
Louisville Zoological Garden	Louisville	KY	116
Alexandria Zoological Park	Alexandria	LA	12
Aquarium of the Americas/Audubon Park and Zoological Garden	New Orleans	LA	155
Audubon Park and Zoological Garden	New Orleans	LA	195
Greater Baton Rouge Zoo	Baker	LA	33
New England Aquarium	Boston	MA	166
Zoo New England	Boston	MA	64
National Aquarium in Baltimore	Baltimore	MD	243
Salisbury Zoological Park	Salisbury	MD	8
The Baltimore Zoo	Baltimore	MD	151
Belle Isle Aquarium and Zoo	Royal Oak	MI	16
Binder Park Zoo	Battle Creek	MI	50
Detroit Zoological Park	Royal Oak	MI	113
John Ball Zoological Garden	Grand Rapids	MI	30
Potter Park Zoological Gardens	Lansing	MI	23
Lake Superior Zoological Gardens	Duluth	MN	17
Minnesota Zoological Garden	Apple Valley	MN	170
St. Paul's Como Zoo	St. Paul	MN	19
Dickerson Park Zoo	Springfield	MO	26
Kansas City Zoological Gardens	Kansas City	MO	140

Zoo/Aquarium	City	State	Employees
St. Louis Zoological Park	St. Louis	MO	230
Jackson Zoological Park, Inc.	Jackson	MS	35
North Carolina Aquarium at Fort Fisher	Kure Beach	NC	15
North Carolina Aquarium at Pine Knoll Shores	Atlantic Beach	NC	16
North Carolina Aquarium at Roanoke Island	Manteo	NC	15
North Carolina Zoological Park	Asheboro	NC	287
Chahinkapa Zoo	Wahpeton	ND	5
Dakota Zoo	Bismarck	ND	7
Roosevelt Park Zoo	Minot	ND	8
Folsom Children's Zoo and Botanical Gardens	Lincoln	NE	12
Omaha's Henry Doorly Zoo	Omaha	NE	171
Riverside Zoo	Scottsbluff	NE	13
Bergen County Zoological Park	Paramus	NJ	13
Cape May County Park Zoo	Cape May Court House	NJ	30
New Jersey State Aquarium at Camden	Camden	NJ	85
Alameda Park Zoo	Alamogordo	NM	5
Alburquerque Biological Park	Albuquerque	NM	150
Aquarium for Wildlife Conservation	Brooklyn	NY	100
Bronx Zoo/Wildlife Conservation Park	Bronx	NY	480
Buffalo Zoological gardens	Buffalo	NY	74
Burnet Park Zoo	Syracuse	NY	41
Central Park Wildlife Center	New York	NY	73
Prospect Park Wildlife Center	Brooklyn	NY	67
Queens Wildlife Center	Flushing	NY	59
Ross Park Zoo	Binghamton	NY	15
Seneca Park Zoo	Rochester	NY	27
Staten Island Zoo	Staten Island	NY	26
Trevor Zoo	Millbrook	NY	3
Utica Zoo	Utica	NY	19
African Safari Wildlife Park	Port Clinton	OH	10
Akron Zoological Park	Akron	OH	17
Cincinnati Zoo and Botanical Garden	Cincinnati	OH	260
Cleveland Metroparks Zoo	Cleveland	OH	124
Columbus Zoological Gardens	Powell	OH	171
Columbus Zoological Gardens	Powell	OH	171
Sea World of Ohio	Aurora	OH	140
The Wilds	Cumberland	OH	23
Toledo Zoological Gardens	Toledo	OH	114
Oklahoma City Zoological Park	Oklahoma City	OK	123
Tulsa Zoo and Living Museum	Tulsa	OK	72
Metropolitan Toronto Zoo	Scarborough	Ontario, Canada	252
Metro Washington Park Zoo	Portland	OR	98

Zoo/Aquarium	City	State	Employees
Wildlife Safari	Winston	OR	30
Clyde Peeling's Reptiland Ltd.	Allenwood	PA	5
Erie Zoo	Erie	PA	23
Philadelphia Zoological Garden	Philadelphia	PA	165
Pittsburgh Zoo	Pittsburgh	PA	85
The National Aviary in Pittsburgh, Inc.	Pittsburgh	PA	21
ZOOAMERICA North American Wildlife Park	Hershey	PA	11
Jardin Zoologique de Granby	Granby	Quebec, Canada	60
Roger Williams Park Zoo	Providence	RI	55
Brookgreen Gardens	Murrells Inlet	SC	4
Greenville Zoo	Greenville	SC	18
Riverbanks Zoological Park and Botanical Garden	Columbia	SC	100
Bramble Park Zoo	Watertown	SD	6
Great Plains Zoo and Delbridge Museum of Natural History	Sioux Falls	SD	20
Knoxville Zoological Gardens, Inc.	Knoxville	TN	73
Memphis Zoological Garden and Aquarium	Memphis	TN	122
Tennessee Aquarium	Chattanooga	TN	155
Abilene Zoological Gardens	Abilene	TX	19
Caldwell Zoo	Tyler	TX	131
Cameron Park Zoo	Waco	TX	25
Dallas Zoo and Dallas Aquarium at Fair Park	Dallas	TX	173
El Paso Zoo	El Paso	TX	76
Ellen Trout Zoo	Lufkin	TX	16
Fort Worth Zoological Park	Fort Worth	TX	147
Fossil Rim Wildlife Center	Glen Rose	TX	35
Gladys Porter Zoo	Brownsville	TX	77
Houston Zoological Gardens	Houston	TX	192
San Antonio Zoological Gardens and Aquarium	San Antonio	TX	165
Sea World of Texas	San Antonio	TX	200
The Dallas World Aquarium	Dallas	TX	13
The Rainforest at Moody Gardens Inc.	Galveston	TX	195
The Texas State Aquarium	Corpus Christi	TX	51
The Texas Zoo	Victoria	TX	8
Tracy Aviary	Salt Lake City	UT	16
Utah's Hogle Zoo	Salt Lake City	UT	70
Mill Mountain Zoo	Roanoke	VA	11
National Zoological Park Conservation and Research Center	Front Royal	VA	53
Virginia Zoological Park	Norfolk	VA	27
Northwest Trek Wildlife Park	Eatonville	WA	23
Point Defiance Zoo and Aquarium	Tacoma	WA	57
The Seattle Aquarium	Seattle	WA	44

Zoo/Aquarium	City	State	Employees
Woodland Park Zoological Gardens	Seattle	WA	119
Henry Vilas Zoo	Madison	WI	16
International Crane Foundation, Inc.	Baraboo	WI	25
Milwaukee County Zoological Gardens	Milwaukee	WI	130
North Eastern Wisconsin Zoo	Green Bay	WI	4
Racine Zoological Gardens	Racine	WI	16
Oglebay's Good Zoo	Oglebay Park	WV	20

APPENDIX B

IRB APPROVAL FORM

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 10-27-97 **IRB#:** AG-98-009

Proposal Title: EDUCATIONAL TRAINING AND EXPERIENCE REQUIRED FOR PERSONNEL DESIRING ENTRY-LEVEL CAREERS IN ZOOLOGICAL CARE AND MANAGEMENT IN THE UNITED AND CANADA

Principal Investigator(s): James P. Key, Kevin S. Sherman

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING, AS WELL AS ARE SUBJECT TO MONITORING AT ANY TIME DURING THE APPROVAL PERIOD.
APPROVAL STATUS PERIOD VALID FOR DATA COLLECTION FOR A ONE CALENDAR YEAR PERIOD AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

==========

Comments, Modifications/Conditions for Approval or Disapproval are as follows:

Signature: _____ Date: October 28, 1997
Chair of Institutional Review Board
cc: Kevin S. Sherman

APPENDIX C

FINAL INSTRUMENT

ZOOLOGICAL CAREER PREPARATION PROJECT

Oklahoma State University; Department of Agricultural Education, Communications, & 4-H Development

Educational Training and Experience Required for Those Desiring Entry-Level Careers in Zoological Care and Management within the United States and Canada

1. What **educational level** had you obtained when you **began** your career in the Zoo and Aquarium Industry (Please mark only one)?

Major/Specialty

❍ Less Than High School Diploma _____

❍ High School Diploma _____

❍ Junior/Community College Graduate - Associate Degree _____

❍ Four year College Graduate - Bachelor Degree _____

❍ Bachelors Degree + Graduate Work _____

❍ Graduate Degree - Masters Degree _____

❍ Graduate Degree - Ph. D. or Ed. D. _____

❍ Professional Degree - D.V.M. _____

2. What is the highest educational level that you have achieved up to the date of this survey (Please mark only one)?

Major/Specialty

❍ Less Than High School Diploma _____

❍ High School Diploma _____

❍ Junior/Community College Graduate - Associate Degree _____

❍ Four year College Graduate - Bachelor Degree _____

❍ Bachelors Degree + Graduate Work _____

❍ Graduate Degree - Masters Degree _____

❍ Graduate Degree - Ph. D. or Ed. D. _____

❍ Professional Degree - D.V.M. _____

Survey Code

ZOOLOGICAL CAREER PREPARATION PROJECT

Oklahoma State University; Department of Agricultural Education, Communications, & 4-H Development

3. How many **years** had you worked with animals **before beginning** your career in the Zoo and Aquarium Industry?

Unpaid Domestic Animal Experience	Unpaid Exotic Animal Experience	Paid Domestic Animal Experience	Paid Exotic Animal Experience

4. How many **years of paid work experience do you currently** have in the Zoo and Aquarium Industry?

Other	Animal Care	Animal Management	Zoo Management

5. How many **years of experience** do you have at your **present position** in the Zoo and Aquarium Industry?

Present Position Title	Number of Years

6. **In your opinion**, is there a need for academically trained individuals for careers in the area of zoological care as directly related to the Zoo and Aquarium Industry? **If no go to question number 8 and then to the last page.**

❍ Yes ❍ No

7. **In your opinion**, which level of academically trained individuals best meet the needs of those preparing for entry-level employment in the area of zoological care as directly related to the Zoo and Aquarium Industry?

❍ Less Than High School Diploma

❍ High School Diploma/Certificate

❍ Junior/Community College - Certificate

❍ Junior/Community College Graduate - Associate Degree

❍ Four Year College Graduate - Bachelor Degree

❍ Greater Than Bachelor Degree

❍ Academic training is not important, since our institution can properly prepare individuals after they have been hired.

Should the individual's education be related to any of the following:
(✓ all those that apply)

❍ Zoology
❍ Conservation Biology
❍ Animal Husbandry
❍ Animal Science
Other:_____

or

❍ Degree Does not matter.

8. **In your opinion**, how many years of experience working with animals should an individual have in order to be prepared for entry-level employment in the area of zoological care as directly related to the Zoo and Aquarium Industry (Please write a number of years needed for each blank [0 to ...])?

Experience Type	Pet/Hobby Domestic and/or Exotic Animals	Domestic Animals	Exotic Animals	Zoological and/or Aquarium
Volunteer				
Paid				

ZOOLOGICAL CAREER PREPARATION PROJECT

Oklahoma State University; Department of Agricultural Education, Communications, & 4-H Development

9. What level of training in each curricular area is **needed** to prepare individuals for entry-level positions in zoological care as directly related to the Zoo and Aquarium Industry.

> ○ = No emphasis in this area is needed through academic training.
> ① = Introductory information, in this area, should be included in academic training programs.
> ② = A minor unit in this area should be included in academic training programs.
> ③ = A major/In-depth unit in this area should be included in academic training programs.
> ④ = A course in this area should be included in academic training programs.

1. Agricultural Sciences and Natural Resource Management:

a) Agriculture and Society ○ ① ② ③ ④
b) Agriculture & the Environment ○ ① ② ③ ④
c) Agricultural Business and Technology ○ ① ② ③ ④
d) Renewable Resources ○ ① ② ③ ④
e) Ecology ○ ① ② ③ ④
f) Non-Renewable Resources ○ ① ② ③ ④
g) Conservation Biology ○ ① ② ③ ④
h) Other:_____

2. Animal Anatomy and Physiology:

a) Central Nervous System ○ ① ② ③ ④
b) Circulatory System ○ ① ② ③ ④
c) Comparative Anatomy ○ ① ② ③ ④
d) Endocrine System ○ ① ② ③ ④
e) External Anatomy ○ ① ② ③ ④
f) Major Body Systems ○ ① ② ③ ④
g) Muscular System ○ ① ② ③ ④
h) Reproductive System ○ ① ② ③ ④
i) Respiratory System ○ ① ② ③ ④
j) Skeletal System ○ ① ② ③ ④
k) Urinary System ○ ① ② ③ ④
l) Other:_____

3. Animal Behavior:

a) Animal Behavior ○ ① ② ③ ④
b) Animal Training ○ ① ② ③ ④
c) Behavior Management ○ ① ② ③ ④
d) Behavior Enrichment ○ ① ② ③ ④
e) Ethograms for Formal Observation ○ ① ② ③ ④
f) Learning (Principles of) ○ ① ② ③ ④
g) Observation and Record Keeping ○ ① ② ③ ④
h) Operand Conditioning ○ ① ② ③ ④
i) Other:_____

4. Animal Health:

a) Causes of Disease ○ ① ② ③ ④
b) Disease-Fighting Agents ○ ① ② ③ ④
c) Health Evaluation ○ ① ② ③ ④
d) Health Practices ○ ① ② ③ ④
e) Infectious and Non-Infectious Diseases ○ ① ② ③ ④
f) Internal and External Parasite Life Cycles ○ ① ② ③ ④
g) Neonatal Care ○ ① ② ③ ④
h) Normal Values ○ ① ② ③ ④
i) Nutritional Diseases ○ ① ② ③ ④
j) Pathogenic Classification ○ ① ② ③ ④
k) Terminology ○ ① ② ③ ④
l) Vaccination and Administration of Biological Agents ○ ① ② ③ ④
m) Zoonosis ○ ① ② ③ ④
n) Other:_____

5. Animal Management:

a) Animal Regulations/Laws ○ ① ② ③ ④
b) Amphibian Species ○ ① ② ③ ④
c) Avian Species ○ ① ② ③ ④
d) Fish Species ○ ① ② ③ ④
e) Invertebrate Species ○ ① ② ③ ④
f) Mammals ○ ① ② ③ ④
g) Reptile Species ○ ① ② ③ ④
h) Other:_____

6. Animal Nutrition:

a) Diet Development and Evaluation ○ ① ② ③ ④
b) Digestion and Absorption ○ ① ② ③ ④
c) Energy Metabolism ○ ① ② ③ ④
d) Feed Additives ○ ① ② ③ ④
e) Feed Identification/Quality ○ ① ② ③ ④
f) General Nutrition ○ ① ② ③ ④
g) Neonatal Nutrition ○ ① ② ③ ④
h) Nutrient Needs ○ ① ② ③ ④
i) Nutritional Evaluation ○ ① ② ③ ④
j) Obtaining/Storage of Feed Stuffs ○ ① ② ③ ④
k) Preparation and Delivery ○ ① ② ③ ④
l) Other:_____

7. Animal Reproduction

ZOOLOGICAL CAREER PREPARATION PROJECT

Oklahoma State University; Department of Agricultural Education, Communications, & 4-H Development

a) Artificial Insemination and Embryo Transfer ❍ ① ② ③ ④
b) Breeding Systems and Genetics ❍ ① ② ③ ④
c) Estrous Cycles and Breeding Capacities ❍ ① ② ③ ④
d) Environmental Care of Reproducing Animals ❍ ① ② ③ ④
e) Genetics ❍ ① ② ③ ④
f) Gestation ❍ ① ② ③ ④
g) Parturition ❍ ① ② ③ ④
h) Population Management (Captive) ❍ ① ② ③ ④
i) Reproductive Physiology ❍ ① ② ③ ④
j) Other:_____

8. Animal Science (General):

a) Animals and Society ❍ ① ② ③ ④
b) Animal Identification ❍ ① ② ③ ④
c) Animal Selection (Genetics) ❍ ① ② ③ ④
d) Animal Species Classification ❍ ① ② ③ ④
e) Animal Welfare ❍ ① ② ③ ④
f) Hormones and their Influence ❍ ① ② ③ ④
g) Meat and Processing ❍ ① ② ③ ④
h) Other:_____

9. Enclosure Design:

a) Enclosure Design ❍ ① ② ③ ④
b) Enclosure Specification ❍ ① ② ③ ④
c) Planning ❍ ① ② ③ ④
d) Other:_____

10. Leadership:

a) Ethics ❍ ① ② ③ ④
b) Industry Associations/Organizations ❍ ① ② ③ ④
c) Public Speaking/Communication ❍ ① ② ③ ④
d) Management Skills ❍ ① ② ③ ④
e) Meeting/Procedure Skills ❍ ① ② ③ ④
f) Team Building ❍ ① ② ③ ④
g) Interpersonal Skills ❍ ① ② ③ ④
h) Other:_____

11. Occupational Skills:

a) Computing Skills ❍ ① ② ③ ④
b) Career Counseling ❍ ① ② ③ ④
c) General Accounting ❍ ① ② ③ ④
d) Higher Education Preparation ❍ ① ② ③ ④
e) Interviewing/Job Preparation ❍ ① ② ③ ④
f) Organizational Structures ❍ ① ② ③ ④
g) Personal Grooming ❍ ① ② ③ ④
h) Portfolio Preparation ❍ ① ② ③ ④
i) Research Skills ❍ ① ② ③ ④
j) Resumes/Job Applications ❍ ① ② ③ ④
k) Writing Skills ❍ ① ② ③ ④
l) Other:_____

12. Plant Science:

a) Plant Growth and Functions ❍ ① ② ③ ④
b) Plant Identification ❍ ① ② ③ ④
c) Plant Nutrition ❍ ① ② ③ ④
d) Management of Plant Populations ❍ ① ② ③ ④
e) Plant Physiology ❍ ① ② ③ ④
f) Toxicity of Plants ❍ ① ② ③ ④
g) Other:_____

13. Practical Experience:

a) Animal Care ❍ ① ② ③ ④
b) Animal Health ❍ ① ② ③ ④
c) Animal Management ❍ ① ② ③ ④
d) Animal Reproduction ❍ ① ② ③ ④
e) Animal Restraint ❍ ① ② ③ ④
f) Record Keeping ❍ ① ② ③ ④
g) Other:_____

14. Safety:

a) Facility Safety ❍ ① ② ③ ④
b) Responding to Emergencies ❍ ① ② ③ ④
c) Safe Handling of Animals ❍ ① ② ③ ④
d) Safe Handling of Drugs and Equipment ❍ ① ② ③ ④
e) Vehicle Safety ❍ ① ② ③ ④
f) Other:_____

15. Tools, Equipment and Handling:

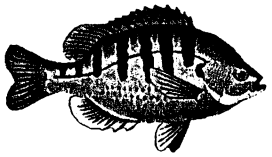
a) Animal Manipulation ❍ ① ② ③ ④
b) Animal Restraint ❍ ① ② ③ ④
c) Animal Tools and Equipment ❍ ① ② ③ ④
d) Animal Transportation ❍ ① ② ③ ④
e) Cleaning and Sanitation ❍ ① ② ③ ④
f) Waste Management ❍ ① ② ③ ④
g) Other:_____

ZOOLOGICAL CAREER PREPARATION PROJECT

Oklahoma State University; Department of Agricultural Education, Communications, & 4-H Development

10. For each of the following career positions (taken from the AZA List of Zoo and Aquarium Career Positions) please mark the circle indicating the educational level needed. Also, write in the years of experience in the industry needed in the column on the right.

AZA List of Careers	Educational Level								Years of Experience
	No Ed.	HS	AS/A	BS/A	MS/A	Ph.D.	DVM	NA	
Director/Chief Operating Officer	○	○	○	○	○	○	○	○	
Assistant Director	○	○	○	○	○	○	○	○	
Finance Manager/Director	○	○	○	○	○	○	○	○	
General Curator	○	○	○	○	○	○	○	○	
Animal Curator	○	○	○	○	○	○	○	○	
Veterinarian	○	○	○	○	○	○	○	○	
Veterinary Technician	○	○	○	○	○	○	○	○	
Registrar	○	○	○	○	○	○	○	○	
Curator/Coordinator/Director of Research	○	○	○	○	○	○	○	○	
Curator Coordinator/Director of Conservation	○	○	○	○	○	○	○	○	
Conservation Biologist/Zoologist	○	○	○	○	○	○	○	○	
Head Keeper/Aquarist	○	○	○	○	○	○	○	○	
Senior Keeper/Aquarist	○	○	○	○	○	○	○	○	
Keeper/Aquarist	○	○	○	○	○	○	○	○	
Operations Director/Manager	○	○	○	○	○	○	○	○	
Curator of Exhibits	○	○	○	○	○	○	○	○	
Curator of Horticulture	○	○	○	○	○	○	○	○	
Curator of Education	○	○	○	○	○	○	○	○	
Public Relations/Affairs Manager/Director	○	○	○	○	○	○	○	○	
Development Director/Officer	○	○	○	○	○	○	○	○	
Marketing Director/Manager	○	○	○	○	○	○	○	○	
Special Events Manager/Coordinator	○	○	○	○	○	○	○	○	
Membership Director/Manager	○	○	○	○	○	○	○	○	
Visitor Services Manager	○	○	○	○	○	○	○	○	
Personnel Manager/Director	○	○	○	○	○	○	○	○	
Volunteer Coordinator	○	○	○	○	○	○	○	○	
Other:	○	○	○	○	○	○	○	○	
	○	○	○	○	○	○	○	○	
	○	○	○	○	○	○	○	○	
	○	○	○	○	○	○	○	○	



APPENDIX D

PRE-SURVEY AND REMINDER POSTCARD

ZOOLOGICAL CAREER PREPARATION PROJECT
Oklahoma State University

After February 1, 1998 you will be receiving a special survey on the needs of pre-training and pre-experience of individuals wanting to enter the Zoo and Aquarium Industry. Thank you, in advance for your support of this project. The goals of this project are to provide both educational training facilities and zoo and aquarium education departments with current information in regard to entry-level employment requirements. If you have any questions about this project or do not receive your survey by February 15, 1998 please feel free to contact me at (405) 744-1595. Thank you for you time and support.

Sincerely;.

Kevin Sherman; Project Director

ZOOLOGICAL CAREER PREPARATION PROJECT
Oklahoma State University

After February 1, 1998 you will be receiving a special survey on the needs of pre-training and pre-experience of individuals wanting to enter the Zoo and Aquarium Industry. Thank you, in advance for your support of this project. The goals of this project are to provide both educational training facilities and zoo and aquarium education departments with current information in regard to entry-level employment requirements. If you have any questions about this project or do not receive your survey by February 15, 1998 please feel free to contact me at (405) 744-1595. Thank you for you time and support.

Sincerely;.

Kevin Sherman; Project Director

ZOOLOGICAL CAREER PREPARATION PROJECT
Oklahoma State University

After February 1, 1998 you will be receiving a special survey on the needs of pre-training and pre-experience of individuals wanting to enter the Zoo and Aquarium Industry. Thank you, in advance for your support of this project. The goals of this project are to provide both educational training facilities and zoo and aquarium education departments with current information in regard to entry-level employment requirements. If you have any questions about this project or do not receive your survey by February 15, 1998 please feel free to contact me at (405) 744-1595. Thank you for you time and support.

Sincerely;.

Kevin Sherman; Project Director

ZOOLOGICAL CAREER PREPARATION PROJECT
Oklahoma State University

After February 1, 1998 you will be receiving a special survey on the needs of pre-training and pre-experience of individuals wanting to enter the Zoo and Aquarium Industry. Thank you, in advance for your support of this project. The goals of this project are to provide both educational training facilities and zoo and aquarium education departments with current information in regard to entry-level employment requirements. If you have any questions about this project or do not receive your survey by February 15, 1998 please feel free to contact me at (405) 744-1595. Thank you for you time and support.

Sincerely;.

Kevin Sherman; Project Director

ZOOLOGICAL CAREER
PREPARATION PROJECT
Oklahoma State University
70 South University Place; #7
Stillwater, Oklahoma 74075

ZOOLOGICAL CAREER
PREPARATION PROJECT
Oklahoma State University
70 South University Place; #7
Stillwater, Oklahoma 74075

ZOOLOGICAL CAREER
PREPARATION PROJECT
Oklahoma State University
70 South University Place; #7
Stillwater, Oklahoma 74075

ZOOLOGICAL CAREER
PREPARATION PROJECT
Oklahoma State University
70 South University Place; #7
Stillwater, Oklahoma 74075

ZOOLOGICAL CAREER
PREPARATION PROJECT
Oklahoma State University

Thank you in advance, for your support of this project. This is a reminder that we need to receive your survey, if at possible, by the 1st of March. This will allow us time to analyze the surveys and put the final report together for distribution this fall. If you have not received your survey packet in the mail as of yet, or if you need a new copy, please leave a message at 405-744-1594 with your fax number and we will fax you out another copy. If you have all ready returned your survey, please disregard this card. Thank you for you time and support.

Sincerely;.

Kevin Sherman; Project Director

ZOOLOGICAL CAREER
PREPARATION PROJECT
Oklahoma State University

Thank you in advance, for your support of this project. This is a reminder that we need to receive your survey, if at possible, by the 1st of March. This will allow us time to analyze the surveys and put the final report together for distribution this fall. If you have not received your survey packet in the mail as of yet, or if you need a new copy, please leave a message at 405-744-1594 with your fax number and we will fax you out another copy. If you have all ready returned your survey, please disregard this card. Thank you for you time and support.

Sincerely;.

Kevin Sherman; Project Director

ZOOLOGICAL CAREER
PREPARATION PROJECT
Oklahoma State University

Thank you in advance, for your support of this project. This is a reminder that we need to receive your survey, if at possible, by the 1st of March. This will allow us time to analyze the surveys and put the final report together for distribution this fall. If you have not received your survey packet in the mail as of yet, or if you need a new copy, please leave a message at 405-744-1594 with your fax number and we will fax you out another copy. If you have all ready returned your survey, please disregard this card. Thank you for you time and support.

Sincerely;.

Kevin Sherman; Project Director

ZOOLOGICAL CAREER
PREPARATION PROJECT
Oklahoma State University

Thank you in advance, for your support of this project. This is a reminder that we need to receive your survey, if at possible, by the 1st of March. This will allow us time to analyze the surveys and put the final report together for distribution this fall. If you have not received your survey packet in the mail as of yet, or if you need a new copy, please leave a message at 405-744-1594 with your fax number and we will fax you out another copy. If you have all ready returned your survey, please disregard this card. Thank you for you time and support.

Sincerely;.

Kevin Sherman; Project Director

ZOOLOGICAL CAREER
PREPARATION PROJECT
Oklahoma State University
70 South University Place; #7
Stillwater, Oklahoma 74075

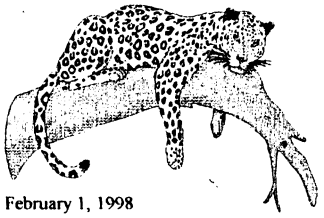
ZOOLOGICAL CAREER
PREPARATION PROJECT
Oklahoma State University
70 South University Place; #7
Stillwater, Oklahoma 74075

ZOOLOGICAL CAREER
PREPARATION PROJECT
Oklahoma State University
70 South University Place; #7
Stillwater, Oklahoma 74075

ZOOLOGICAL CAREER
PREPARATION PROJECT
Oklahoma State University
70 South University Place; #7
Stillwater, Oklahoma 74075

APPENDIX E

COVER LETTERS



ZOOLOGICAL CAREER PREPARATION PROJECT

Oklahoma State University
Department of Agricultural Education, Communications, & 4-H Youth Development
Department of Zoology

February 1, 1998

«Sal_1» «Directors_First_Name» «Directors_Last_Name»
«Position_1»
«Zoo»
«Street_Address»
«City», «State» «Zip_Code»

Dear: «Sal_1» «Directors_Last_Name»

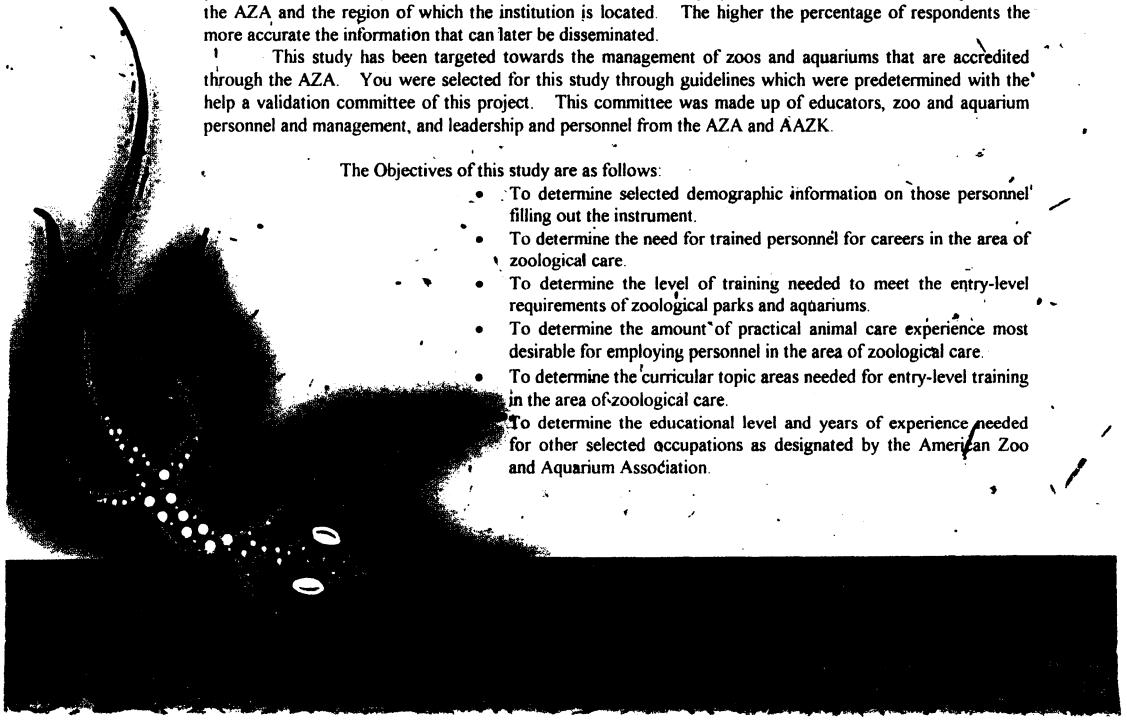
Each year many individuals try to prepare themselves for entry-level positions in the Zoo and Aquarium industry. It is often difficult to determine the requirements needed for entrance into this industry, since requirements differ from institution to institution throughout the country. The following survey was developed to help determine the entry-level needs for pre-training and pre-experience of zoos and aquariums which are accredited through the American Zoo and Aquarium Association (AZA). The information collected will be used to help academic institutions that prepare students for this work force to better plan and develop curriculum. It will also be of use for zoo and aquarium education departments to be able to better educate the public about the needs of the industry in regards to the employment of zoo and aquarium staff.

It is vital to have each institution participate in this study regardless of size or location. Information provided will be directly tied to both the number of full time employees which an institution has reported to the AZA and the region of which the institution is located. The higher the percentage of respondents the more accurate the information that can later be disseminated.

This study has been targeted towards the management of zoos and aquariums that are accredited through the AZA. You were selected for this study through guidelines which were predetermined with the help a validation committee of this project. This committee was made up of educators, zoo and aquarium personnel and management, and leadership and personnel from the AZA and AAZK.

The Objectives of this study are as follows:

- To determine selected demographic information on those personnel filling out the instrument.
- To determine the need for trained personnel for careers in the area of zoological care.
- To determine the level of training needed to meet the entry-level requirements of zoological parks and aquariums.
- To determine the amount of practical animal care experience most desirable for employing personnel in the area of zoological care.
- To determine the curricular topic areas needed for entry-level training in the area of zoological care.
- To determine the educational level and years of experience needed for other selected occupations as designated by the American Zoo and Aquarium Association.



Please take some time to fill out this instrument and send it back in the enclosed stamped self-addressed envelope. The information used to create this instrument came from educational institutions from around the United States that are presently teaching course-work in zoo and aquarium career preparation as well as a group of over twenty individuals from through out the United States who were asked to evaluate the instrument for validity. It is important to receive your response back by March 1st. With your help we will be able to prepare and present a report at the 1998 AZA National Meeting in Tulsa, Oklahoma. All responses returned will be coded and kept under lock and key. All responses will be reported in aggregate form and no individual responses will be identified. The coded list will be kept in a different geographical location in order to maintain confidentiality of those individuals participating in the study.

After the national survey has been completed, the following groups will be receiving results of this study:

- Participants of the Validation Committee
- Participants of this Study
- Educational Institutions Identified as being involved in Zoo and Aquarium Career Preparation

The results of the study will also be sent to the American Zoo and Aquarium Association, the American Association of Zoo Keepers, the International Zoo Yearbook, The Agricultural Education Magazine, and the American Association of Agricultural Educators for possible information dissemination. It is the intent of this study to provide both those educational institutions as well as the zoo and aquarium community in the United States and Canada, information on the needs of training and experience for the industry's incoming work-force.

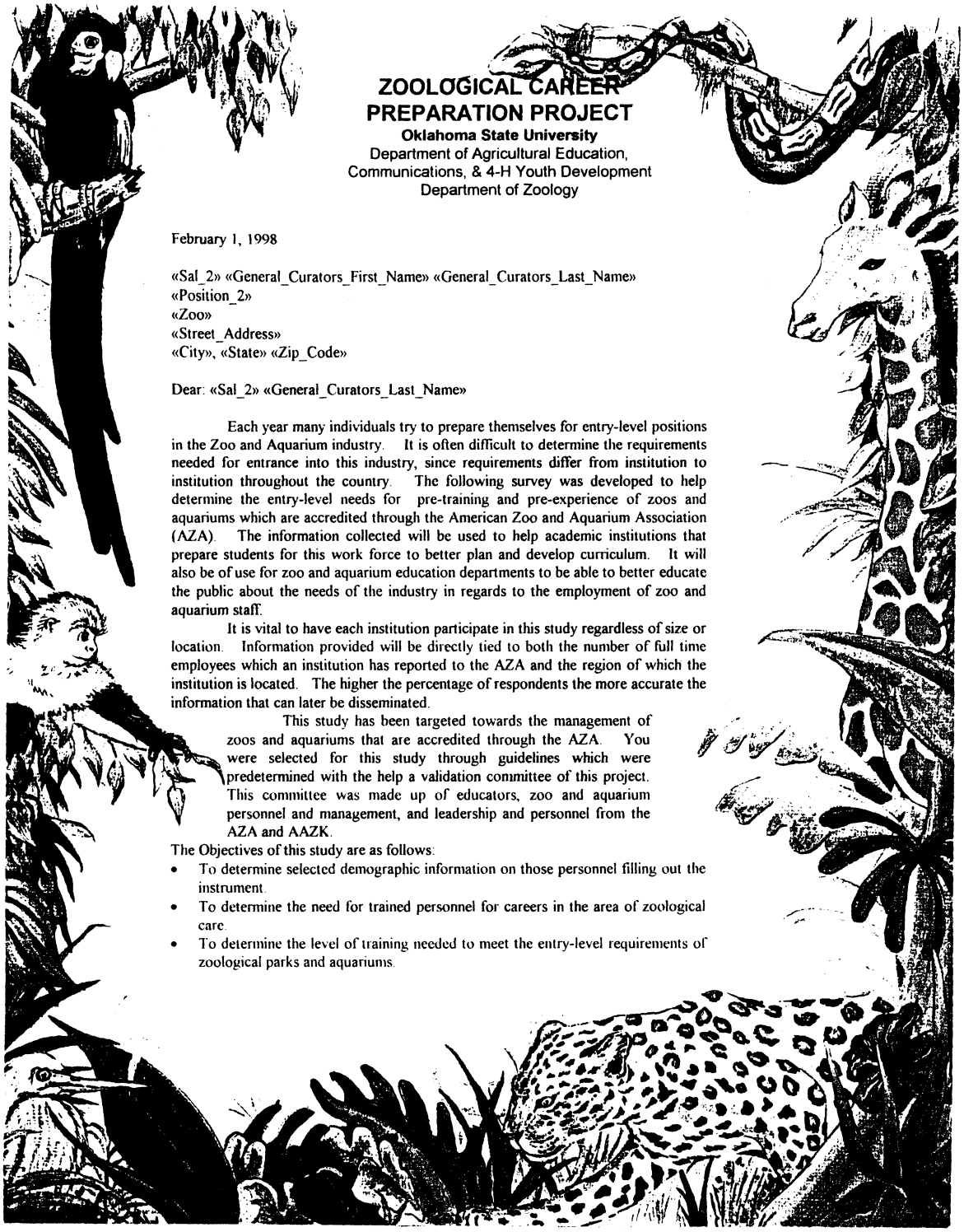
We would like to thank you for your support and understand that your participation is voluntary, and that there is no penalty for refusal to participate, and you are free to withdraw your consent and participation in this project at any time. You may contact Kevin Sherman at (405) 744-1595 or Dr. James Key at (405) 744-8136 if you have any questions. You may also contact Gay Clarkson, Executive Secretary, Institutional Review Board; 305 Whitehurst, Oklahoma State University, Stillwater, OK 74078; telephone number: (405) 744-5700.

Again thank you for your time and effort, Sincerely;

Kevin Sherman
Project Director
(405) 744-1595
Oklahoma State University
Dept. of Agricultural Education
70 South University Place; #7
Stillwater, Oklahoma 74075
shermak@okstate.edu

Rob Terry, Ph.D.
Associate Professor
(405) 744-8141
Oklahoma State University
Dept. of Agricultural Education
442 AG Hall
Stillwater, Oklahoma 74078

Tracy C. Carter; Ph.D.
Associate Adjunct Professor
(405) 744-9675
Oklahoma State University
Dept. of Zoology
415 Life Science West
Stillwater, Oklahoma 74078



ZOOLOGICAL CAREER PREPARATION PROJECT

Oklahoma State University
Department of Agricultural Education,
Communications, & 4-H Youth Development
Department of Zoology

February 1, 1998

«Sal_2» «General_Curators_First_Name» «General_Curators_Last_Name»
«Position_2»
«Zoo»
«Street_Address»
«City», «State» «Zip_Code»

Dear: «Sal_2» «General_Curators_Last_Name»

Each year many individuals try to prepare themselves for entry-level positions in the Zoo and Aquarium industry. It is often difficult to determine the requirements needed for entrance into this industry, since requirements differ from institution to institution throughout the country. The following survey was developed to help determine the entry-level needs for pre-training and pre-experience of zoos and aquariums which are accredited through the American Zoo and Aquarium Association (AZA). The information collected will be used to help academic institutions that prepare students for this work force to better plan and develop curriculum. It will also be of use for zoo and aquarium education departments to be able to better educate the public about the needs of the industry in regards to the employment of zoo and aquarium staff.

It is vital to have each institution participate in this study regardless of size or location. Information provided will be directly tied to both the number of full time employees which an institution has reported to the AZA and the region of which the institution is located. The higher the percentage of respondents the more accurate the information that can later be disseminated.

This study has been targeted towards the management of zoos and aquariums that are accredited through the AZA. You were selected for this study through guidelines which were predetermined with the help a validation committee of this project. This committee was made up of educators, zoo and aquarium personnel and management, and leadership and personnel from the AZA and AAZK.

The Objectives of this study are as follows:

- To determine selected demographic information on those personnel filling out the instrument.
- To determine the need for trained personnel for careers in the area of zoological care.
- To determine the level of training needed to meet the entry-level requirements of zoological parks and aquariums.

- To determine the amount of practical animal care experience most desirable for employing personnel in the area of zoological care.
- To determine the curricular topic areas needed for entry-level training in the area of zoological care.
- To determine the educational level and years of experience needed for other selected occupations as designated by the American Zoo and Aquarium Association.

Please take some time to fill out this instrument and send it back in the enclosed stamped self-addressed envelope. The information used to create this instrument came from educational institutions from around the United States that are presently teaching course-work in zoo and aquarium career preparation as well as a group of over twenty individuals from through out the United States who were asked to evaluate the instrument for validity. It is important to receive your response back by March 1st. With your help we will be able to prepare and present a report at the 1998 AZA National Meeting in Tulsa, Oklahoma. All responses returned will be coded and kept under lock and key. All responses will be reported in aggregate form and no individual responses will be identified. The coded list will be kept in a different geographical location in order to maintain confidentiality of those individuals participating in the study.

After the national survey has been completed, the following groups will be receiving results of this study:

- Participants of the Validation Committee
- Participants of this Study
- Educational Institutions Identified as being involved in Zoo and Aquarium Career Preparation

The results of the study will also be sent to the American Zoo and Aquarium Association, the American Association of Zoo Keepers, the International Zoo Yearbook, The Agricultural Education Magazine, and the American Association of Agricultural Educators for possible information dissemination. It is the intent of this study to provide both those educational institutions as well as the zoo and aquarium community in the United States and Canada, information on the needs of training and experience for the industry's incoming work-force.

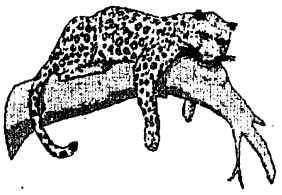
We would like to thank you for your support and understand that your participation is voluntary, and that there is no penalty for refusal to participate, and you are free to withdraw your consent and participation in this project at any time. You may contact Kevin Sherman at (405) 744-1595 or Dr. James Key at (405) 744-8136 if you have any questions. You may also contact Gay Clarkson, Executive Secretary, Institutional Review Board; 305 Whitehurst, Oklahoma State University, Stillwater, OK 74078; telephone number: (405) 744-5700.

Again thank you for your time and effort, Sincerely;

Kevin Sherman
Project Director
(405) 744-1595
Oklahoma State University
Dept. of Agricultural Education
70 South University Place; #7
Stillwater, Oklahoma 74075
shermak@okstate.edu

Rob Terry, Ph.D.
Associate Professor
(405) 744-8141
Oklahoma State University
Dept. of Agricultural Education
442 AG Hall
Stillwater, Oklahoma 74078

Tracy C. Carter; Ph.D.
Associate Adjunct Professor
(405) 744-9675
Oklahoma State University
Dept. of Zoology
415 Life Science West
Stillwater, Oklahoma 74078



ZOOLOGICAL CAREER PREPARATION PROJECT

Oklahoma State University
Department of Agricultural Education,
Communications, & 4-H Youth Development
Department of Zoology

March 8, 1998

«Sal_2» «General_Curators_First_Name» «General_Curators_Last_Name»
«Position_2»
«Zoo» «Code2»
«Street_Address»
«City», «State» «Zip_Code»

Dear «Sal_2» «General_Curators_Last_Name»;

Last month, surveys to zoo leadership were sent out to determine the educational and training needs of entry-level personnel for the zoo and aquarium industry. As of this mailing we have not received your response. It is very important that all surveys be received so that accurate information can be provided to those institutions offering educational training. You were selected based on your expertise as related to the goals and objectives of this study. We need to be able to include your information with those who have already responded. As of March 6th we had received the following surveys:

47% (86) of Institution Directors
57% (105) of Institution General Curators
Total of 52% (191) of Surveys sent out Received

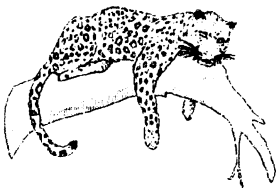
69% (124) of all Institutions sent in at least one Survey
32% (53) Institutions sent in Multiple Responses

It is vital to have each institution participate in this study regardless of size or location. Information provided will be directly tied to both the number of full time employees, which an institution has reported to the AZA, and the region of which the institution is located. The higher the percentage of respondents, the more accurate the information which can later be disseminated.

This study has been targeted towards the management of zoos and aquariums that are accredited through the AZA. You were selected through guidelines which were predetermined with the help of a validation committee for this project. This committee was made up of educators, zoo and aquarium management, and leadership from AZA and AAZK.

Again thank you for your time and effort, Sincerely;

Kevin Sherman; Project Director
(405) 744-1595
Oklahoma State University; Department of Agricultural Education
70 South University Place; Stillwater, Oklahoma 74075
shermak@okstate.edu



ZOOLOGICAL CAREER PREPARATION PROJECT
Oklahoma State University
Department of Agricultural Education,
Communications, & 4-H Youth Development
Department of Zoology

March 8, 1998

«Sal_1» «Directors_First_Name» «Directors_Last_Name»
«Position_1»
«Zoo» «Code1»
«Street_Address»
«City». «State» «Zip_Code»

Dear «Sal_1» «Directors_Last_Name»;

Last month, surveys to zoo leadership were sent out to determine the educational and training needs of entry-level personnel for the zoo and aquarium industry. As of this mailing we have not received your response. It is very important that all surveys be received so that accurate information can be provided to those institutions offering educational training. You were selected based on your expertise as related to the goals and objectives of this study. We need to be able to include your information with those who have already responded. As of March 6th we had received the following surveys:

47% (86) of Institution Directors
57% (105) of Institution General Curators
Total of 52% (191) of Surveys sent out Received

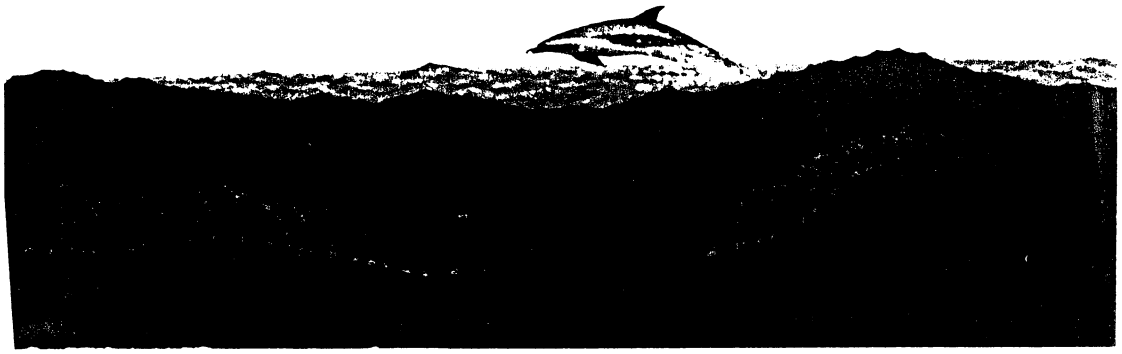
69% (124) of all Institutions sent in at least one Survey
32% (53) Institutions sent in Multiple Responses

It is vital to have each institution participate in this study regardless of size or location. Information provided will be directly tied to both the number of full time employees, which an institution has reported to the AZA, and the region of which the institution is located. The higher the percentage of respondents, the more accurate the information which can later be disseminated.

This study has been targeted towards the management of zoos and aquariums that are accredited through the AZA. You were selected through guidelines which were predetermined with the help of a validation committee for this project. This committee was made up of educators, zoo and aquarium management, and leadership from AZA and AAZK.

Again thank you for your time and effort, Sincerely,

Kevin Sherman; Project Director
(405) 744-1595
Oklahoma State University; Department of Agricultural Education
70 South University Place; Stillwater, Oklahoma 74075
shermak@okstate.edu



APPENDIX F

JOB DESCRIPTIONS AND PREFERRED LEVELS OF EDUCATION AND EXPERIENCE FOUND IN AZA ACCREDITED INSTITUTIONS

On the AZA Website is a list of occupations associated with zoos and aquariums (AZA, 1997). This list was furnished to the study participants. Each participant was asked to select a level of education and the number of years of experience which best represented each occupation. Following is a table listing a job title, job description, education level, and range of preferred years of experience per recommendations of the respondents. Since not every participant who filled out the first part of the question wrote in a number in the second part of the question, there were two separate response rates.

TABLE GI

ZOOLOGICAL CAREERS AND CORRESPONDING
JOB DESCRIPTIONS

AZA List of Zoological Careers	Job Descriptions – As listed on the American Zoo and Aquarium Association Web page
Director/Chief Operating Officer	Executes policies as directed by the governing authority. Responsible for the institution's operation and plans for future development.
Assistant Director	Assists the director and assumes charge in the director's absence.
Finance manager/Director	Manages the institution's finances, including payment of bills, purchasing, investments, and the preparation of financial statements.
General Curator	Oversees an institution's entire animal collection and animal management staff. Responsible for strategic collection planning.
Animal Curator	Manages a certain portion of an institution's animal collection; i.e., mammals, birds, fish, reptiles, etc.
Veterinarian	Responsible for the healthcare program for the animal collection and the maintenance of health records.
Veterinary Technician	Assists the veterinarian and provides care to the animals under the supervision of the veterinarian.
Registrar	Maintains computer records on the animal collection and applies for permits and licenses to hold or transport animals.
Curator/Coordinator/Director of Conservation	Oversees the institution's conservation activities, including field projects. Serves as liaison with government wildlife agencies and other conservation organizations.
Conservation Biologist/Zoologist	Provides scientific and technical assistance in the management of the animal collection and assists in conducting various research or field conservation projects.
Head Keeper/Aquarist	Supervises a section or department of the institution; provides training and scheduling for keepers.
Senior Keeper/Aquarist	Provides primary animal care for a department
Keeper/Aquarist	Provides daily care to the institution's animals, including diet preparation, cleaning, general exhibit maintenance, and record keeping.

TABLE GI - continued

AZA List of Zoological Careers	Job Descriptions – As listed on the American Zoo and Aquarium Association Web page
Operations Director/Manager	Responsible for the daily operation of the institution's physical plant and equipment.
Curator of Exhibits	Creates exhibits and assists in the design of graphics.
Curator of Horticulture	Responsible for the botanical collection and its application to the animal collection, as well as daily maintenance of the institution's grounds.
Curator of Education	Plans and implements the institution's education programs.
Public Relations/Affairs Manager/Director	Promotes the institution, its mission, and its programs to the public via the media.
Development Director/Officer	Develops and manages fund-raising activities which can include writing grant proposals and attracting corporate sponsors, as soliciting private donations.
Marketing Director/Manager	Creates advertising campaigns and other activities to increase public awareness of the institution.
Special Events manager/Coordinator	Develops and implements events to attract visitors throughout the year.
Membership Director/Manager	Responsible for maintaining and increasing institution memberships for families and individuals and designing special events for members only. May also be in charge of "adopt-an-animal" programs to raise funds.
Gift Shop Manager	Manages staff and all aspects of gift shop operation from buying products to designing shops.
Visitor Services Manager	Supervises the staff and facilities that cater to the visiting public including concessions and restrooms.
Personnel Manager/Director	Responsible for all personnel matters including payroll, insurance, and tax matters.
Volunteer Coordinator	Responsible for recruiting and maintaining a staff of volunteers/docents. Duties include scheduling docents for on- and off-grounds activities and keeping docents abreast of new developments to relate to the public.
Docent/Volunteer	Duties may include diet preparation, small animal care, teaching educational programs, leading group tours, and staffing special events.
Junior Keeper	Some institutions offer a summer program for high school students who wish to volunteer in a zoo or aquarium setting. Duties are often similar to those of other volunteers, but they are supervised much more closely.

TABLE GII

PREFERRED LEVELS OF EXPERIENCE AND YEARS OF EXPERIENCE FOR CAREERS FOUND IN AZA ACCREDITED INSTITUTIONS

Career Area	Education Level	n	%	Range of Suggested Years of Experience
Director/Chief Operating Officer	Bachelors	164	59.64	5 to 13
Assistant Director	Bachelors	184	67.40	3 to 10
Finance manager/Director	Bachelors	169	65.50	1 to 8
General Curator	Bachelors	179	64.86	4 to 10
Animal Curator	Bachelors	208	75.36	3 to 8
Veterinarian	D.V. M.	283	98.61	1 to 6
Veterinary Technician	Associates	162	59.56	1 to 3
Registrar	Associates	132	50.38	1 to 3
Curator/Coordinator/Director of Research	Masters	146	54.48	2 to 7
Curator/Coordinator/Director of Conservation	Masters	99	38.67	2 to 7
Conservation Biologist/Zoologist	Masters	141	53.21	1 to 6
Head Keeper/Aquarist	Bachelors	178	64.96	2 to 6
Senior Keeper/Aquarist	Associates	167	60.95	2 to 5
Keeper/Aquarist	Associates	127	46.52	0 to2
Operations Director/Manager	Bachelors	181	71.83	2 to 7
Curator of Exhibits	Bachelors	140	66.35	2 to 7
Curator of Horticulture	Bachelors	195	74.43	2 to 6
Curator of Education	Bachelors	174	64.68	2 to 6
Public Relations/Affairs Manager/Director	Bachelors	202	79.84	1 to 6
Development Director/Officer	Bachelors	201	82.40	1 to 6
Marketing Director/Manager	Bachelors	198	81.82	1 to 6
Special Events Manager/Coordinator	Associates	126	49.22	0 to 4
Membership Director/Manager	Associates	137	53.52	0 to 4
Visitor Services Manager	Associates	127	50.40	1 to 5
Personnel Manager/Director	Bachelors	190	74.51	1 to 7
Volunteer Coordinator	Associates	107	42.46	0 to 4

VITA

Kevin Scott Sherman

Candidate for the Degree of

Doctor of Philosophy

Thesis: EDUCATION AND EXPERIENCE PREFERRED FOR ENTRY- LEVEL POSITIONS IN ZOOLOGICAL CARE

Major Field: Agricultural Education

Biographical:

Personal Data: Born in San Pablo, California, On December 5, 1960, the son of Gordon and Darla Sherman. Lived in San Jose, California from 1961 through 1996.

Education: Graduated from Calvary Community Christian School, San Jose, California in June 1979; received Bachelor of Science degree in Agricultural Education and completed credential course requirements from California State University, Fresno, Fresno, California in May 1986 and June 1987, respectively; received Masters of Agriculture degree in Agricultural Education from Oklahoma State University, Stillwater, Oklahoma in August 1997. Completed the requirements for the Doctor of Philosophy degree with a major in Agricultural Education at Oklahoma State University in May, 1999.

Experience: Taught vocational agriculture at Soquel High School for two years, Leland High School for three years, Pioneer High School for four years. Employed by both the Department of Biosystems and Agricultural Engineering as a Graduate Teaching Assistant and Agricultural Education, Communications & 4-H Youth Development as a Graduate Teaching Associate and a Graduate Research Associate.

Professional Memberships: California Agricultural Teachers Association; American Association of Agricultural Education, American Zoo and Aquarium Association, Phi Delta Kappa.