THIRD EDITION

Restraint and Handling of Wild and Domestic Animals

MURRAY FOWLER

WILEY-BLACKWELL

Restraint and Handling of Wild and Domestic Animals

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AND Handling Domestic ANIMALS

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WILEY-BLACKWELL
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CONTENTS

P R E F A C E to the First Edition

The original intent in this book was to deal only with wild animal restraint. However, upon deliberation, it was realized that fundamental principles of restraint apply to both domestic and wild animals, so it was decided to include both groups to present a more comprehensive picture of the subject.

The objectives of this book are to collect under one cover discussions and illustrations of the principles of animal restraint and handling and to describe some restraint practices for diverse species of vertebrate wild and domestic animals. Heretofore no single source has offered information for handling such diverse animals as a 2.5-g hummingbird and an elephant weighing 5,000–6,000 kg. It is hoped that this book will satisfy that need for all who handle animals—particularly veterinarians; animal caretakers; wildlife biologists; wildlife rehabilitators; personnel of zoos, research, and humane society facilities; and any others who deal with animals.

Government regulatory agencies require humane treatment and proper care and handling of all animals in captivity. It is legally necessary for those maintaining wildlife to provide adequate restraint facilities and personnel trained in satisfactory handling techniques to prevent or minimize injuries.

Restraint and handling techniques for domestic animals have long been well documented and described. Although the most recent text[1] was written in 1954, the principles outlined in that excellent publication are still valid.

Wild animal restraint and handling techniques are not as well known nor as widely publicized except in those notorious instances when inhumane and torturous methods used in capture and transport attract the attention of the news media. Some people feel that all wildlife should be returned to the native habitat and left to live and die undisturbed by human beings. This attitude is naive in this day and time. Wild animals have become an integral part of society and will continually be handled. It behooves us to know and use techniques safe for both animal and handler.

The need for understanding restraint principles, particularly for wild animals, is exemplified by the statement of an experienced zoo veterinarian in a recent publication: "It is all very well to plan an operation on a tiger, but the problem that arises is how to catch the beast, and once having caught it, how safely to secure it. Nor is this difficulty restricted to the tiger, it applies in a lesser or greater degree to every type of wild animal in captivity. Not one of them will cooperate in your well-meaning efforts to help them, and no such thing as gratitude exists in their primitive makeup."[2]

This book is not, nor is it meant to be, an exhaustive encyclopedia on animal restraint. The author is well aware that certain individual researchers or biologists may favor one or more techniques or special tools not mentioned here. It is impossible for any individual to acquire a personal knowledge of all possible combinations of restraint and handling procedures for every species or even for groups of species. However, the techniques presented have proved successful in the hands of experienced individuals and should serve as guides for anyone faced with similar problems.

It is only through an enlightened understanding of restraint principles that humane handling with the least amount of stress will be possible for any animal. It is hoped that by bringing all this information together in one source, more people will be able to share in saving wild animals for posterity.

1. Leahy, J.R., and Barrow, P. 1954. Animal Restraint. Ithaca, N.Y.: Comstock.
2. Graham-Jones, O. 1973. First Catch Your Tiger. New York: Taplinger.

P R E F A C E to the Second Edition

The concluding paragraph of the preface to the first edition states, "It is only through an enlightened understanding of restraint principles that humane handling with the least amount of stress will be possible for any animal. It is hoped that by bringing all this information together in one source, more people will be able to share in the saving of wild animals for posterity."

I have been gratified at the reception of the first edition of *Restraint and Handling of Wild and Domestic Animals*, by animal health technicians, zookeepers, animal owners, wildlife rehabilitators, animal husbandry students, and veterinarians. In the nearly 20 years that have elapsed since the first edition was written, some described procedures and techniques have changed but slightly. Many aspects of physical restraint remain valid. In some other aspects, there have been material changes.

One of the more significant changes in general restraint has been the greater attention paid to avoiding and minimizing stress during restraint. I would like to believe that the first edition contributed to a greater understanding of the absolute need to minimize stress. The design of livestock handling yards, chutes, and loading ramps has become a sophisticated art. Public sentiments demand, even more vociferously than two decades ago, humane care in all aspects of maintaining animals in captivity.

Chemical restraint had been coming to the fore in the decade prior to publication of the first edition, but the two intervening decades have seen the development and marketing of many new drugs. Investigations into the pharmacodynamics of drugs now allow more logical combination of certain drugs, which are used more frequently to capitalize on the desirable effects of each while counteracting undesirable effects. Extensive clinical usage has demonstrated the desirability, and in many cases the necessity, of using drug combinations. There is still no single drug that is the drug of choice for immobilizing all species of animals. Furthermore, no individual has the time or opportunity to deal with more than a few drugs and species of animals, hence the need for sharing.

Now, more than ever, persons contemplating chemical restraint of unfamiliar animals must take the time to communicate with experienced restrainers. Even a review of the literature may fail to provide the most current techniques being used, particularly for sensitive species like giraffe or hippopotamuses. Currently available restraint drugs are discussed at length in this edition. Furthermore, promising drugs that are currently unavailable in the United States but are being used effectively in other countries have been included, with the expectation that they may soon become available here.

South African veterinarians and biologists are leaders in advancing the art of chemical restraint, particularly in free-ranging African mammals, and the literature from South Africa has been freely used to augment the experiences from North America and other countries of the world.

Effective drugs used and methods for chemical restraint of animal groups have been included in this volume. No pretense is made that all suitable procedures have been described. The techniques included have been used by me or by respected colleagues. The literature citations bring chemical restraint up to the present.

Some sections of this volume remain virtually unchanged because the methods described previously are still valid. Other sections have been modified extensively in keeping with new developments in the field, particularly in regard to the increased importance played by private owners and how they handle their animals (camelids, ratites).

No one begins a restraint procedure with the expressed purpose of failing, but failure is the result for many who fail to apply basic principles that determine success. In all facets of my life, I have utilized a formula (5 Ps) for success that has a direct application to restraint. Perhaps it may help others focus on important issues.

Success = Plan + Prepare + Practice + Produce + Persist

You may try to eliminate some aspects of the formula or shortcut the process, but I feel that this formula provides the most efficient and effective pathway for success. There must be a plan. Too often there is no plan, rather the idea seems to be "Let's just go do it." The questions remain, who is to do what and when? Preparation is essential. In preparation, the questions to be answered are: Are all the tools and equipment ready? Has transportation been arranged? Have emergency procedures been planned and necessary equipment provided? What of alternate plans if the situation suddenly changes? If the animal is to be darted, when was the last time target practice was held? Every possible complication or problem should be anticipated. Then the restrainer must carry out the procedure as planned (produce). When the procedure has been completed, the whole process should be evaluated. Setbacks and failures must be offset by persistence in applying fundamental principles.

P R E F A C E to the Third Edition

The third edition is illustrated in color. Modern technology allows printing in color without materially adding to the cost. New chapters added to the third edition include animal behavior, animal welfare, training for restraint procedures, camelidae, and megavertebrates. Several sections have been given chapter status or moved to be consistent with reorganization of sections. For instance, camelidae has been given chapter status and moved to the domestic animal section, and chemical restraint has been moved to the nondomestic animal section. The methods of delivery of chemical restraint agents have been given chapter status.

The chemical restraint chapter has been expanded and new chemical restraint agents added. Each chapter in the wild animal section has a discussion of chemical immobilization for that group of animals, including tables and current references.

Animal welfare must be a constant concern of those who restrain animals. The well-being of an animal should be given the highest priority. Although modern chemical restraint agents have made it possible to accomplish many procedures more efficiently and safely, take time to contemplate all of the effects that may impinge on the animal. Will the animal's condition be improved with the intended procedure? Are there alternative methods to accomplish the same goal? Are all of the needed equipment and supplies to work safely and efficiently ready? Are restraint personnel adequately trained and experienced to deal with any contingency?

Government regulations require that animals receive humane care at all times. It is too bad that regulations must direct us to do what should be our moral obligation and desire to accomplish.

Animals may become overstimulated with an epinephrine rush during restraint procedures. They may be inclined to, and capable of, feats of athleticism beyond imagination. I have seen a giant eland *Taurotragus oryx* jump, from a standing start, an 8-foot fence that had easily contained the animal for years. Furthermore, an American bison *Bison bison* cow climbed a 6-foot fence to avoid capture. A Grevy zebra *Equus grevyi* mare jumped out of a moated enclosure to avoid contact with a newly introduced stallion to the enclosure. Consider all aspects of the environment in which the restraint procedure is to be performed. Maintenance of facilities and equipment must be routine.

ACKNOWLEDGMENTS

I acknowledge the many individuals (colleagues, animal owners, keepers, zoo administrators) and institutions that have contributed to my experiences with procedures and methods for handling animals. I have utilized all of the procedures discussed and illustrated in this volume over a professional lifespan of 5 decades. There may be other methods that accomplish the same purposes, but these work in my hands and I can recommend them.

Once again I am indebted to my wife Audrey for her unfailing support and encouragement. Her copy reading skills were vital to the success of this project. I lovingly dedicate this edition to her.

Restraint and Handling of Wild and Domestic Animals

PART 1

General Concepts

CHAPTER 1

Introduction

Restraint varies from confinement in an unnatural enclosure to complete restriction of muscular activity or immobilization (hypokinesia).[4] Both physical and chemical restraint are now practiced. Anciently only physical restraint was utilized. Just when man learned of chemical immobilization (poison arrows) is not known, but it antedates recorded history.

The physiological effects of restricted movement have been studied. For centuries, extended bed rest for ill or post-surgical human patients was practiced—to the detriment of the patient. Now it is known that many deleterious effects result from this type of immobility. Solitary confinement is known to be extremely devastating for a human being. Similar confinement of social animals produces severe psychological stress.[4]

Restraint practices evolved with the domestication of animals for food, fiber, labor, sport, and companionship.[2,4,6,7,13] Domestication necessitated special husbandry practices. As people began to minister to animals' needs, they found it necessary to restrict activity by placing them in enclosures. If animals resisted when wounds were treated or medication administered, it was necessary to further restrain them. Trial and error combined with the shared experiences of fellow human beings ultimately produced satisfactory practices.[2,3]

A person who undertakes to restrict an animal's activity or restrain the animal is assuming a responsibility that should not be considered lightly.[4,10] Each restraint incident has some effect on the behavior, life, or other activities of an animal. From a humane and moral standpoint, the minimum amount of restraint consistent with accomplishing the task should be used. This should become a maxim for persons who must restrain animals.

Each time it is proposed to restrain an animal, the following questions should first be asked: Why must this animal be restrained? What procedure will produce the greatest gain with the least hazard? When will it be most desirable to restrain the animal? Who is the most qualified to accomplish the task in the least amount of time and with the least stress to the animal? What location would be best for the planned restraint procedure?

WHY RESTRAINT

Everyone must agree that domestic animals require transporting, medicating, and handling. Some contend that all wild animals should be free ranging, without human interference. This philosophy seems naive in the present time.

Wild animals kept in captivity require special husbandry practices. They must be transported, housed, and fed. If they become ill, they must be examined and treated.

Free-ranging animals may have to be translocated, as was necessary when the Kariba dam was built in Southern Rhodesia. The translocation of free-ranging wild animals has become a common method of wild animal management for reducing overpopulation or building a population in a new location. The reintroduction of captive-bred wild animals to a former native habitat or a revitalized habitat is now routine. All of these animals must undergo significant screening, which in turn requires restraint, transport, and eventual release. Diseases in wildlife populations must be monitored, since some have far-reaching consequences for the health of domestic livestock and human beings. Many wild populations are managed. As far as wild animals are concerned, any captive situation involves some form of restraint.[4]

GENERAL CONCEPTS

Four basic factors should be considered when selecting a restraint technique: (1) Will it be safe for the person who must handle the animal? (2) Does it provide maximum safety for the animal? (3) Will it be possible to accomplish the intended procedure by utilizing the suggested restraint method? (4) Can constant observation and attention be given the animal following restraint until it has fully recovered from the physical or chemical effects? Once these four factors are evaluated, a suitable technique can be selected.[4]

Many wild animals can inflict serious, if not fatal, injury. The first concern when dealing with wild animals should be the safety of human beings. To think otherwise is foolhardy, and those who grandstand or show off by manipulating dangerous animals without benefit of proper restraint may injure themselves or bystanders. Those who own or have administrative responsibility for wild animals must recognize that the animal, no matter how valuable, cannot be handled in such a way as to jeopardize the safety of those who must work around it. Techniques are known that when properly used can safeguard both animal and operator.

It is desirable to build proper facilities into areas where wild animals must be kept so that these handling procedures

can be safely carried out. It is foolish to pay thousands of dollars for a zoo specimen if facilities are not available in which to handle or restrain the animal for prophylactic measures or treatment of disease or injury.

Certain wildlife populations have become so depleted they are near extinction. We should not practice on these species. It is not economically feasible, nor is there sufficient animal life for each person to gain through personal experience the intimate knowledge of various behavioral patterns and characteristics to enable them to develop expertise in the successful use of restraint procedures. Therefore we must learn from the experiences of others who have dealt extensively with one species or family of animals and utilize their knowledge of the more successful techniques.

To be successful in working with animals, one must understand their behavioral characteristics and the aspects of their psychological makeup that will allow for provision of their best interests. Successful restraint operators must understand and have a working acquaintance with the tools of restraint. They must understand the use of voice, manual restraint, and chemical restraint. Special restraint devices and their application should be thoroughly understood. These are explained in the text, with a major emphasis on physical restraint methods. It has been my experience that an operator who really understands what can be done with physical restraint can build upon this information to carry out more successful chemical immobilization—if it is indicated.

The general principles of chemical restraint will be outlined and specific tables presented to give current usage of chemical restraint agents in various classes of animals. There is a marked swing toward the use of chemical restraint when working with wild animals. Pharmaceutical companies are carrying out research on newer and better restraint agents. This has led to the marketing of new products on a continuing basis. This ongoing activity may lead to the false assumption that applying physical restraint techniques is no longer necessary. Nothing could be further from the truth.

Just as the indiscriminate use of antibiotics may cloud test results and cause the inefficient clinician to make an inaccurate diagnosis, indiscriminate chemical restraint can likewise produce clinical aberrations and is often hazardous to the animal.

Chemical restraint is an extremely important adjunct to physical restraint practices, particularly in regard to wildlife. However, it is far from universally ideal and cannot replace special squeeze cages and other specially arranged facilities for wild animals, which allow them to be approached without imposing undue stress or hazard. Those who work extensively with wild animals know that no single chemical or group of chemical restraint agents fulfills all of the safety and efficacy requirements to qualify for universal application.

The decision whether to use chemical or physical restraint is based on the skill of the handlers, facilities available, and the psychological and physical needs of the species to be restrained. No formula can be given. If in doubt, someone who has had experience should be consulted.

WHEN TO RESTRAIN

One does not always have a choice of times when restraint should be carried out. Emergencies must be dealt with immediately. In the majority of instances, however, planning can be done.

Environmental Considerations

Thermoregulation is a critical factor in many restraint procedures. Hyperthermia and, more rarely, hypothermia are common sequelae. Heat is always generated with muscle activity. During hotter months of the year, select a time of day when ambient temperatures are moderate. Special cooling mechanisms such as fans may be required. Place restrained animals in the shade to avoid radiant heat gain. Conversely, use the sun's heat if the weather is cool. Avoid handling when the humidity is 70–90%. Cooling is difficult under such circumstances.

Take advantage of light and dark. Diurnal animals may best be handled at night when they are less able to visually accommodate. Nocturnal species may be more easily handled under bright lights.

Behavioral Aspects

An animal's response to restraint varies with the stage of life.[4,5,6] A tiger cub grasped by the loose skin at the back of the neck will curl up just as a domestic kitten does. Such a reaction is not forthcoming with adults.

A female in estrus or with offspring at her side reacts differently than at other times. Males near conspecific estrus females may be aggressive.

Male cervids (deer, elk, caribou) go into rut in the fall of the year. By this time the antlers are stripped of velvet and are no longer sensitive. Now the antlers are weapons. Although a handler may safely enter an enclosure of cervids during the spring or summer, it may be hazardous to do so during the rutting season.

Hierarchical Status

Most social animals establish a pecking order. A person trying to catch one animal in an enclosure may be attacked by other members of the group. Dominant male primates are especially prone to guard their band. I have seen similar responses in domestic swine and Malayan otters.

Animals removed from a hierarchical group for too long a time may not be accepted back into the group. At the very least they will have lost a favored position and must win a place in the order.

Infants removed from the dam and kept separated for more than a few hours may be rejected when reunited. Species vary greatly in this behavioral response. An infant Philippine macaque was accepted back by the mother after a 3-month separation. Some species may reject the infant if it has human scent on it. A further hazard of hours-long separation occurs if the dam has engorged mammary glands. The hungry infant may overeat and suffer from indigestion.

Health Status

Recently transported animals are poor restraint risks. Transporting in crates, trucks, and planes is a stressful event. The longer the journey, the more stress. The method of handling and type of accommodations used in transport are also important. If possible, allow the animal time to acclimate to a new environment before carrying out additional restraint.

Sick domestic animals are routinely handled for examination and treatment. It may be more difficult to evaluate the health status of wild animals. Standard techniques of measuring body temperature or evaluating heart and respiratory rate may yield meaningless results because of excitement. Even though a captive wild animal may exhibit some signs of a disease, it may be prudent not to handle it. The following incidents illustrate two such cases.

A nine-year-old child wrote a letter to the president of the United States following a visit to a small zoo. She told him the yak had long hair and long toenails and asked why the zoo didn't give it a haircut and trim its toenails. The letter was answered in an admirable way by a zoo director who explained that the long hair was normal and that it might be more dangerous to catch the yak than to let it be slightly uncomfortable with the long toenails.

In another situation a bison had dermatitis. A decision was made to catch it to check the lesion. The animal died of overexertion during the process.

Deciding when to intervene is difficult. Clinical experience may be the governing factor.

Territoriality

Domestic animals differ in response to handling depending on where they are. A veterinarian attempting to handle a dog in the owner's home will find a more defiant individual than if the same dog is placed in the strange environment of a hospital examining room. Cattle, horses, swine, and sheep likewise respond differently in their own corral or pen than if in a strange place. An animal can sometimes establish its territory rather quickly. A dog placed in a hospital cage may defend it as "home" within a few hours. After removal from the cage the dog may become more docile.

Many wild animals are highly territorial. In order to work on such animals they must be moved to a new enclosure.

HUMANE CONSIDERATIONS

It is incumbent upon a person who takes the responsibility of manipulating an animal's life to be concerned for its feelings, the infliction of pain, and the psychological upsets that may occur from such manipulation.[1,2,3,10,11] One must, however, be able to be objective about such manipulations and realize that the manipulation is for the best interests of the animal. Some feel that to restrict an animal's activity in any way is immoral and inhumane. At the opposite extreme is the person who has a total disregard for the life of animals.

Pain is a natural phenomenon that assists an animal to remove itself from danger in response to noxious influences. No animal is exempt from experiencing pain.[1] Pain is relative; individual persons and animals experience pain in varying degrees in response to the same stimulus. Pain can become so intense, however, that an animal may die from shock induced by pain. We should not minimize the effect of pain, nor should we overemphasize it. Some persons cannot cope with pain in themselves, their children, or their pets.

Working as a medical technologist while a student in veterinary school, I frequently saw mothers bring children into the laboratory for a blood count and tell them, "This isn't going to hurt." Nonsense, it does hurt. Why not face the fact and learn to cope with it? We all experience numerous painful stimuli every day. We live through it and so do animals.

Sensitive people do not like to inflict pain. Veterinarians and others who manipulate animals are morally and ethically obligated to minimize pain in the animals they handle. The animal under restraint is incapable of escaping from pain. The handler must perceive the feelings of the animal and take appropriate steps to alleviate pain.[1,4]

Some of the tools used in restraint practices involve the infliction of mild pain to divert the animal's attention from other manipulative procedures. The equine twitch is an example. The chain is placed over the nose of the horse and twisted down, causing a certain degree of pain. If the horse is preoccupied with the mild pain of the nose, nonpainful manipulative procedures can be carried out elsewhere on the body.

Every restraint procedure should be preceded by an evaluation as to whether or not the procedure will result in the greatest good for that animal. Animals have feelings. People should not look upon animals as machines to be manipulated at will.

It is interesting to peruse a 1912 book on the restraint of domestic animals.[12] One can not read the book without feeling that some of the procedures recommended would cause considerable unpleasantness to the animal and in some cases be inhumane. However, some of the techniques used 96 years ago for physical restraint are similar to those used currently, although modern considerations for behavior and training have diminished the necessity of "brute force."

Albert Schweitzer was one of the foremost proponents of the concept of reverence for life.[10] Human beings may have supreme power over other forms of life on this earth, but unless they recognize a dependence upon other life forms and have an appreciation for their position in the scheme of things, they will fail to develop an attitude that will result in humane care for animals under their charge.[11] Persons who seek to work in animal restraint would do well to read some of the literature of the humane movement so they might become more empathetic in their approach to procedures that involve the infliction of pain and understand the emotional trauma associated with restraint.[1–7]

Plan each restraint episode in detail. Anticipate potential problems. Provide equipment and facilities commensurate with the procedure. Time is crucial—get the job done fast. Follow through with observation and care until the animal is back to normal. If you lack experience in handling a given species, ask for help from someone who does have the experience.

Remember: (1) Safety to the handler. (2) Safety to the animal. (3) Will it do the job? (4) Get the animal back to normal.

DOMESTICATION

Approximately 35 of the nearly 50,000 species of vertebrates have adapted to humans' needs for food, fiber, work, sport, and beauty, and are considered to be domesticated (Tables 1.1, 1.2). All but three or four species were living in harmony with humans before the time of recorded history.[3,6,13]

Domestication is an evolutionary process that involves a gradual (thousands of years) change in the gene pool of a species to allow adaptation to an artificial environment. Domestic animals must cope with buildings, fences, crowding, confinement, lack of privacy, changed photoperiodicity, altered climatic conditions, and different food.

Genetic alteration during the evolutionary process took place by selection for specific characteristics that were economically or esthetically pleasing to humans. Docile animals were selected over aggressive individuals. This may require only a single gene mutation. Other economically important characteristics include higher fertility, rapid growth, efficient food conversion, higher milk production, and disease resistance. Farmers have often selected polled cattle over horned breeds to minimize injury.

There was definite selection to reduce or eliminate undesirable wild characteristics such as territoriality, intra-specific dominance, elaborate food identification and gathering mechanisms, intricate courtship behavior, and fear of humans. This constant selection yielded animals that are much easier to handle. They tolerate the presence of humans without a flight response. If physically restrained they rarely fight to the death, as do some wild species.

Mankind has been able to change the morphology and behavior of some domestic animals to the degree that it is difficult to determine what their wild counterpart might be like. Many breeds of livestock and companion animals have been produced. An overview, with excellent illustrations of breeds of livestock, is found in Sambraus.[8] He lists 55 breeds of cattle, 41 of sheep, 17 of goats, 62 of horses, 4 of donkeys and 15 of swine. There are more than 100 breeds of dogs and cats.

Asian elephants *Elephas maximus* were considered to be a domestic animal in years past. Surely the elephant has been in the service of humans for millennia, but it nevertheless lacks some of the criteria for domestication. Currently the elephant is classified as being in domesticity.

Two insect species are considered domestic animals, those being the European honeybee *Apis melifera* and the silkworm *Bombyx mori.*

TABLE 1.1. Domestic mammals

Common Name	Scientific Name	Family	Order
Mouse	*Mus musculus*	Muridae	Rodentia
Rat	*Rattus norvegicus*		
Guinea pig	*Cavia porcellus*	Cavidae	
Golden hamster	*Mesocricetus auratus*	Cricetidae	
Rabbit	*Oryctolagus cuniculus*	Leporidae	Lagomorpha
Dog	*Canis familiaris*	Canidae	Carnivora
Fox	*Vulpes fulva*		
Cat	*Felis catus*	Felidae	
Mink	*Mustela vdon*	Mustelidae	
Ferret	*Mustela furo*		
Horse	*Equus caballus*	Equidae	Perissodactyla
Ass (donkey)	*Equus asinus*		
Swine	*Sus scrofa*	Suidae	Artiodactyla
Bactrian camel	*Camelus bactrianus*	Camelidae	
Dromedary camel	*Camelus dromedarius*		
Llama	*Llama glama*		
Alpaca	*Llama pacos*		
Reindeer	*Rangifer tarandus*	Cervidae	
Cattle, European	*Bos taurus*	Bovidae	
Cattle, zebu	*Bos taurus*		
Yak	*Bos grunniens*		
Banteng	*Bibos banteng*		
Gayal	*Bibos frontalis*		
Water buffalo	*Bubalus bubalis*		
Musk-ox	*Ovibos moschatus*		
Sheep	*Ovis aries*		
Goat	*Capra hircus*		

TABLE 1.2. Domestic birds

Common Name	Scientific Name	Family	Order
Pekin duck	*Anas platyrhyncos*	Anatidae	Anseriformes
Muscovy duck	*Cairina moschata*		
Goose	*Anser anser*		
Canada goose	*Branta canadensis*		
Mute swan	*Cygnus olor*		
Chicken	*Gallus gallus*	Phasianidae	Galliformes
Ring-necked pheasant	*Phasianus colchicus*		
Coturnix quail	*Coturnix coturni*		
Peafowl	*Pavo cristatus*		
Guinea fowl	*Numida meleagris*	Numidae	
Turkey	*Meleagris gallopavo*	Meleagrididae	
Pigeon	*Columba liva*	Columbidae	Columbiformes
Budgerigar	*Melopsitticus undulatus*	Psittacidae	Psittaciformes
Canary	*Serinus canarius*	Fringillidae	Passeriformes

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CHAPTER 2

Tools of Restraint

Although some instances of tool use have been described in nonhuman vertebrates, only humans have developed a high degree of skill in the use of tools. Every vocation, profession, or activity in which man engages requires the use of tools. The animal restrainer must become acquainted with a wide variety of tools used to handle animals safely, humanely, and effectively.

Tools may make a job easier or more efficient. The degree of skill attained by the restrainer is directly proportional to the degree of proficiency achieved in the use of tools of the trade. Tools must be kept in good repair; the art and practice of their use must be kept toned up.

Restraint levels may vary from the level achieved by arousing the subordinate feelings of an animal by voice and/or force of personality to the level of complete physical or chemical immobilization (hypokinesia). The tools used in effecting a given degree of restraint vary greatly. Some tools may be desirable for dealing with one species and be contraindicated when working with another. Success in the art of restraint requires both experience and study to know when it is appropriate to use a specific type of restraint. Inappropriate use of certain techniques may be not only unwise but dangerous to animal or human being.

When skilled animal restrainers are asked to share their secrets of success in working with animals, they can seldom give a detailed description of techniques. They have learned and habituated various means of restraint and sometimes do not even recognize the use of a system of techniques and tools. Undoubtedly the use of the tools of restraint has become second nature or instinctive to them.

For ease of discussion, the tools have been placed into seven categories: (1) psychological restraint—understanding a certain biological characteristic enables more satisfactory manipulation of a given animal; (2) diminishing sense perceptions of animals; (3) confinement; (4) lending added strength to or extension of the arms; (5) physical barriers used to protect us or allow closer scrutiny of animals; (6) physical force—used to subdue animals; and (7) chemical restraint—used to sedate, immobilize, or anesthetize animals.

PSYCHOLOGICAL RESTRAINT

The successful restrainer must know a given species' particular behavioral patterns. For instance, to handle swine with a snout rope, one must know that it is the nature of the pig to pull back when the upper jaw is grasped. An elephant will also tend to pull backward from a rope secured around the trunk. This may be useful in directing an elephant to sit down rather than fall to its side during narcotic immobilization. The same technique would be dangerously unsuitable for handling a carnivore, because a carnivore would attack instead of pulling back on the rope.

Each species exhibits its own behavioral pattern, its own degree of nervousness, and other unique traits. (See Chapter 5 for more details.) Knowledge of these patterns enables restrainers to counteract or incorporate them into restraint practices.

Voice is an important tool, frequently overlooked by animal handlers because of its simplicity. Emotional states are reflected in the voice.

Both domestic and wild animals readily perceive fear or lack of confidence. Some scientists believe that a frightened person may actually exude odorous substances, which can be smelled by animals. Others believe that persons betray fear to animals through voice or other behavior, and that animals will not perceive fear hidden by self-confident behavior and voice control.

Students sometimes struggle for many minutes to halter a horse that whirls away each time the head is approached. Another person walks confidently into the box stall, speaks to the horse in a firm tone, then walks up to the animal and places the halter. This is extremely frustrating to students who can see essentially no difference between their mode of approach to the horse and that of the skilled person. They failed because the horse perceived their uncertainty.

Perhaps an excellent teaching tool could be developed by making an audiovisual presentation revealing the differences between the sound of the students' voices and their attitudes in approaching the animal and the voice and attitude of the skilled restrainer.

Voice differences were graphically demonstrated to me in a slightly different situation. I was anesthetizing an African puff adder while making a television teaching tape to demonstrate the restraint technique. Both video and audio recordings were made during the actual procedure. After the procedure was completed I listened to the playback. At the point in the procedure when I grasped the animal by hand at the back of the head, after pinning it, my voice jumped almost half an octave higher in pitch. This was a graphic illustration of an altered emotional pattern being reflected in the voice. Obviously I was somewhat concerned as I grasped this poisonous

snake. I did not recognize the change of voice at the time, but it was clearly heard on the playback.

Such subtle changes affect animal behavior in a given situation and signify confidence or lack of it. Perhaps the best advice that can be given is that a handler who lacks confidence in either self or procedure should remain silent.

Other mannerisms of the restrainer also reflect emotional state. Timidity when approaching the animal, the way the hands are held, quickness or slowness in using the hands, and general stance indicate confidence or lack of confidence to the animal.

Be sure animals are aware of your approach. As a boy I came alongside an old cultivating horse and threw a burlap sack over its back, intending to jump on and ride. The startled horse kicked out and flattened me. This was not so much a matter of restraint as failure to make contact with the animal. Contact may be by voice or through sight, but an unstartled animal is easier to manipulate. If the principle of surprise must be utilized to catch the animal, be prepared to cope with the results of fright.

Both domestic and wild animals can be trained to permit the carrying of certain manipulative procedures. Approaching a 5-year-old stallion that has run free on pasture or range since birth is much more difficult than approaching a 5-year-old stallion accustomed to people and trained for riding.

Likewise, wild animals can be trained to perform various acts or allow certain procedures to be carried out. Usually they cannot be trained to allow any procedure inflicting even minimal degrees of pain. Sometimes even this inhibition can be overridden under certain circumstances, at least to the extent of injecting medications or sedative agents to properly trained animals. A killer whale can be trained to lay its flukes on the bank at the side of a pool and lie quietly while a blood sample is withdrawn from a vein.

With wild animals, it is important to recognize that the training may involve establishing dominance over the animal by the trainer. This is a complex behavioral phenomenon, and it is unlikely that a casual person who comes in to manipulate that animal can acquire such dominance in a short time. Thus it is usually necessary for the trainer to perform the manipulative procedure for the clinician or veterinarian who must carry out an examination or make injections.

Hypnosis has been practiced on human beings for many years. Even surgery has been performed on individuals under hypnosis. The same technique has been effectively applied to animals. Many species of animals can be hypnotized. For instance, a chicken blindfolded and placed on its back will lie quietly in that position for a long period. Crocodilians can be manipulated in the same way, relaxing and entering a hypnotic state if placed on the back and stroked on the belly for a moment or two. Animals that "play dead," such as the opossum, enter a state essentially hypnotic. There is reason to believe that a horse may likewise become semihypnotized when the twitch is placed on its nose.

Many tales indicate that various animals hypnotize their prey when capturing food. It is unlikely that these states are bonafide representations of true hypnosis. It may be that entering this torpid state is a phenomenon that permits prey species to become free of the final pain of death when captured by a predator. It is not uncommon for a yet unharmed animal, chased by a predator, to give up and seemingly accept death without struggle. A zebra chased and grabbed by a lion will usually give up without a fight although in many instances the zebra may be fully capable of striking and killing the lion. Instead of doing so, the zebra becomes semicomatose, accepting the inevitable.

This response is utilized by those capturing such wild animals as zebras, giraffe, and some antelope species. For a few minutes immediately following capture by roping, they appear to be in a hypnotic state and can be approached and placed in crates without their kicking or striking. Those same animals, released from the crate into a holding pen, cannot be approached without dire consequences to the unwise person who makes that attempt.

Self-confidence is perhaps the single most important attribute that can be developed by the restrainer. This confidence can be acquired by experience, though some individuals seem to possess such ability almost innately. Some handlers develop the ability to manipulate or handle only one species or group of animals. Others handle many species with ease.

I am acquainted with one individual who possesses a phenomenal ability to work with the large wild felids. He had not worked with these animals extensively prior to a few years ago when, as an adult, he began to acquire an interest in some of the cats. I have seen him enter an enclosure containing mixed species of large, adult, untrained wild cats, including tigers and lions. These cats would wait in line to place their forepaws upon his shoulders and lick his face. He has such a degree of rapport, I am told, that he has entered an enclosure containing a half-dozen adult male African lions to successfully quell a fight.

This man has absolute confidence in his ability to work with these cats. There is no evidence of fear-mastery or dominance over the cats. He has studied their behavior sufficiently to know how to respond to the animals and how to get along with them, although many of the cats were adult when he acquired them. He has also taken lions known to be vicious toward other persons, studied them for a time, and safely entered an enclosure with them, feeling perfectly at ease.

To some this may appear a foolhardy and hazardous undertaking. Certainly it would be foolhardy for a person lacking the great confidence and behavioral skills of this individual to enter such an enclosure. Nonetheless it vividly illustrates what can be accomplished by someone with confidence and skill.

The successful restrainer must acquire detailed knowledge of the anatomy and physiology of the species to be manipulated, including the distance the limbs can reach to kick or strike. It is important to know the degree of agility and speed of the species in question. Techniques such as the use of a half-hitch chest rope to cast bovine species make use of a physiological response. The importance of gaining as

much knowledge as possible of the biology and physiology of any species to be restrained cannot be overstated.

The significance of the physiological and behavioral phenomena of social and flight distances must be understood. All animals, including human beings, live with certain social interactions. These interactions involve both intimate and casual relationships. Social distances are inherent in the evolutionary development of a species. Social distances are precise for a given species and cannot be encroached upon without adverse effects. The general relationship of social distance is illustrated in Figure 2.1.

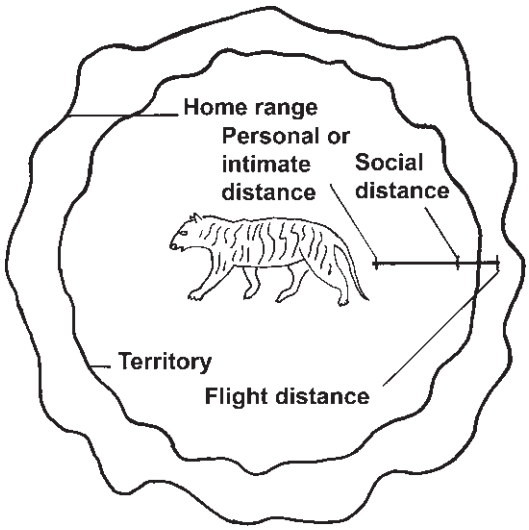

FIG. 2.1. Social distances of animals.

Domestic animals are less intensely affected by the lack of sufficient social distance than are wild species. The process of domestication necessitated that animals allow closer social contact with other individuals of the same species and with many other species.

Wild animals are habituated to social interactions and respond to violations of social distance in a prescribed manner. The usual response of the animal is to fight or flee. For example, a gazelle approached by a cheetah, though obviously aware of the cheetah's presence, stands quietly. But as soon as the cheetah approaches within a narrowly defined distance, the gazelle explodes into flight. This narrowly defined distance is "flight distance."

Flight distance varies among species according to agility, speed, and other behavioral traits and possibly the speed and agility of the enemy. A skilled keeper at a zoo gave me a vivid illustration of how an understanding of flight distance may be applied in restraint. He entered a cage to net some monkeys. As he approached the animals, he showed me that he could come within a certain distance without disturbing them. He then described and illustrated that if he moved one foot another few inches closer, the monkeys were startled and ran from him. This certain distance was the flight distance for that particular species in that situation.

He showed me that by using a long-handled net, he could reach out and catch one of the monkeys without startling it because the animal did not recognize the net as violating the flight distance. Thus by understanding this basic phenomenon, he was able to capture the animal without undue stress for the animal or himself.

Understanding flight and social requirements of various species is an important management tool for zoos and other institutions maintaining captive wild animals. Individuals of the antelope species in particular can be placed under continual severe stress if unable to maintain required social distances from other members of the group, from human beings, or from predator species. Sight barriers may meet these requirements as well as actual distance barriers. Flight distance can be modified by training. Furthermore, flight distance for animals raised in captivity differs from that of animals captured and brought into captivity as adults.

The response of an animal to a violation of flight distance is usually explosive; the animal either flees or attacks at full capacity. A wild animal may fling itself against a wall or into other barriers without regard for the consequences, once the flight response is initiated. An animal with no means of escape may attack without regard for its own safety.

Weapons Used against Humans

All animals have both defensive and offensive mechanisms enabling them to cope with encounters with enemies. In most restraint situations, the restrainer is the enemy, and the response of the animal to the manipulative procedure involves one or another of the mechanisms used by that animal to cope with danger. Thus the restrainer, in addition to understanding behavior, should know the defense and offense mechanisms operating in that species in order to modify or counter the effects of such responses.

Defense mechanisms may involve a display or demonstration of one sort or another, which warns the responsive handler that the animal intends to protect itself. Anatomical structures for defense and offense include claws, talons, feet and legs, teeth, bills or beaks of birds, special glands that exude scent, and the body itself.

Any animal with teeth and/or the ability to open the mouth widely enough to grasp some part of the restrainer's body is capable of biting. Not all who are capable will readily bite. All the carnivores, however, are prone to use the teeth, particularly the large canine teeth, to protect themselves and/or obtain food. The bite of many carnivores is serious and may be fatal. Birds, although not possessing teeth, are capable of biting or pecking. Some of the larger birds, such as the macaw, are able to crush bones with their heavy beaks, and large raptorial species (hawks, eagles) can severely tear tissue. Smaller birds can also inflict serious wounds. Birds with straight bills, such as fish-eating cranes and storks, may peck the eyes of the handler unless handled carefully.

Some animals, particularly invertebrate species, have special stingers with which to defend themselves, which may also be used in gathering food. Bees, wasps, some

coelenterates, some marine cones, mollusks, fish, and other species have developed stinging structures that inflict pain and can cause illness or even fatalities in handlers.

Animals possessing horns or antlers can seriously injure by goring. Horns and antlers are used for display in combat with one another and in defense against enemies. Therefore it may be necessary to protect the horns from injury, as well as to prevent injury to animal and handler.

Some animals without sharp horns or antlers are capable of using the head as a battering ram to severely bruise or crush a handler against the wall. The giraffe is particularly prone to butt in defense or offense. Wild sheep also use their heavy horns and heads as battering rams, as do domestic goats and large domestic sheep. In fact, all horned animals, even if dehorned, are capable of crushing a person. Serious injury may result from failure to understand this characteristic.

Large animals such as the hippopotamus, elephant, and rhinoceros can cause serious damage by crushing a handler against walls or posts. Large constrictor snakes do not crush the bones of victims, but kill by suffocation. By throwing their coils around the body, snakes may cause serious injury or death. Even a small constrictor is dangerous if the coils become wrapped around the neck of a handler.

The teeth of most herbivores are not adapted to biting, nor is this a usual fighting technique for these species. Nonetheless these animals may become prone to bite when placed in a captive situation. Deer may reach out and grab a handler if frustrated or frightened. The hippopotamus, which is a grazer, bites in both offense and defense. The teeth of the hippo are formidable, and many persons have succumbed to a hippopotamus bite. Wallaroos often bite.

A few herbivorous species have large canines used for fighting. Male llamas and camels possess canine teeth that are used both in intra-species fighting and offensively against human restrainers. Likewise the small muntjac deer has enlarged canine teeth, used primarily in intra-species fighting but which can be used in defense against handlers.

Hoofed animals are capable of kicking, the only defense mechanism of some species. The response may be reflexive and is often elicited simply by touching the animal anywhere on the body. Knowledge of the length of the leg and the direction of the kick are important in such cases. The horse usually kicks straight backward. However, a few individuals kick forward and outward in a manner similar to the kick of the domestic bovine, referred to as "cow-kicking" by horsemen. As indicated, the cow does kick forward and out, so the most dangerous position for a handler may be just in front of the hind leg.

Novices may believe they can jump away when an animal initiates a kick, but experience will teach that this is not possible. The strength of some animals is phenomenal, and one must keep this in mind at all times. A camel can kick a 10 cm × 10 cm (4 in. × 4 in.) support for a building and break it in two.

Front limbs primarily strike or paw in defense. Many species, including South American camelids (llamas, alpacas), camels, giraffes, and equines, are prone to strike or paw.

Some species, such as the shark, have very rough skin surfaces used to rub against an enemy, inflicting serious abrasions. The handler who does not recognize that the surface is rough may be injured when manipulating sharks, certain lizards, and pangolins.

Poisonous snakes and lizards and some poisonous mammals are capable of envenomating enemies or prey with potent toxins.[1] Handling such species requires the use of highly specialized techniques and should be restricted to those who are fully qualified to do so by experience and inclination.

Some animals utilize the technique of spraying the enemy with urine or other substances. The octopus emits an inky fluid in which to hide itself as it escapes. Some primates, and other species such as the chinchilla, may urinate on the person who is trying to capture them. Such urination may also occur as an anger phenomenon or be used to delineate territory. Defecation may fit into the same category.

Numerous species have scent glands which produce materials objectionable to people. The skunk is the most noteworthy in this regard, but many other species, including carnivores and reptiles, have such glands. The musk gland is usually associated with the anus, and the material is often discharged under excitement. The scent glands sometimes serve purposes other than defense.

Spitting is a means of defense for some species. The expectorant may be composed of saliva, regurgitated stomach contents, or a specialized venom. Some cobra species are notorious for accurately projecting venom for distances up to 3 m (10 ft). Camelids and some apes are spitters. In one unique instance a shark in an aquarium surfaced and spit water on the author.

Regurgitation may occur in response to fright, but it is often a direct response to handling. Camels and llamas may deliberately spew foul-smelling material from the stomach on the handler. Cranes, storks, vultures, and pelicans may emit crop contents. Wolves and other carnivores may regurgitate as a stress response.

Although an elephant may use the tusks to gore or the trunk to grasp and fling an offender, it primarily tramples the enemy. Any large heavy mammal is capable of placing someone under its feet and trampling him. Fatalities from elephants, camels, rhinoceros, hippopotamuses, and other large animals have occurred.

Carnivores and other species may defend by clawing. Claws, whether sharp or dull, can inflict serious injury. Perhaps the worst injury I have received while manipulating animals was caused when a giant anteater drove its two blunted claws into the bone of my wrist. Clawing may result in infected scratches, or severe slashes transecting muscles, skin, blood vessels, and nerves, possibly incapacitating the handler permanently. In addition, the claws may grasp and pull a person into close contact within reach of teeth and strong forelimbs to bite and/or squeeze.

In short, the whole spectrum of the animal kingdom possesses abilities for self-protection. The restrainer must acquire

knowledge of these mechanisms and be able to counter them in the restraint procedure. There are safe places to stand next to domestic animals. There are proper distances to recognize in working with animals and many ways to counter offensive and defensive mechanisms. Some specific mechanisms possessed by various animal groups will be described in the appropriate sections.

DIMINISHING SENSE PERCEPTIONS

Reducing or eliminating an animal's visual communication with its environment is an important restraint technique. A parakeet experiences less stress when placed in a darkened room before it is grasped for examination and/or medication. Blindfolding the domestic horse may make it possible to introduce it into a new environment, such as a trailer or a new stall, without engendering fright. Obviously it is impossible to blindfold most wild animals until the animal is already in hand. However, one can frequently place animals in a darkened environment.

If a herd of flighty and nervous black buck antelope are placed in a darkened room, the keeper can usually enter and grasp one animal without causing the pandemonium that develops if such an attempt is made from a herd in a lighted enclosure. It is important to recognize that manipulation of animals in such a restricted environment is somewhat hazardous if the herd includes males with horns.

This technique is contraindicated for species that possess excellent nighttime vision; in a darkened enclosure nocturnal species may well have better eyesight than the handler. It is therefore obvious that a detailed knowledge of the behavior and biology of a species is necessary before attempting any manipulation.

It may be necessary to blindfold an ostrich before it can be approached. Special devices can be constructed to place a blindfold over the head of such an individual. (See Chapter 29.) Most wild animals cannot be blindfolded until after capture. However, subsequent to capture, much stress can be relieved if the animal is blindfolded. A blindfolded animal may lie quietly for a long period while nonpainful manipulations are carried out. Sedation and anesthesia are required for painful procedures. Sedated animals handled in sunlight should be blindfolded to prevent damage to the retina by direct rays of the sun on an eye that cannot accommodate properly.

Sound is important in restraint. The importance of tone and quality of the voice as a restraint technique has already been described. Conversely, excessive sounds of people talking, motors, noisy vehicles, and other strange noises may seriously upset a wild animal. Restraint is easier to achieve if sounds can be dampened and harsh tones of voice eliminated or diminished in proximity to the animal. Cotton plugs in the animal's ears may suffice; however, it is extremely important that they be removed before the animal is released.

The skilled handler of domestic animals can accomplish much by proper use of the hands on the animal. Soothing, by stroking in the proper direction in the proper areas of the body, can be very valuable. Placing a hand firmly on the neck or shoulder of a horse and stroking it elicits desirable responses, while a lighter touch in the flank area may induce kicking. Most trained lions and tigers will frequently rub up against an individual; if one recognizes this as a friendly gesture, much can be accomplished. However, the handler who perceives it as a threat or is frightened will be unable to take advantage of this behavior in restraint.

Most untrained wild animals respond negatively to the touch of a person and institute defense mechanisms in response. Once such an animal is in hand, stress on the animal will be diminished if touching is kept at a minimum.

Cooling diminishes an animal's ability to respond to stimuli, particularly with poikilothermic species. My first experience in handling a large snake involved treating a large python for tail rot. I experienced much trepidation until I arrived at the ranch and found that the animal had been placed in a walk-in refrigerator some 2 hours previously. The animal was torpid and easily manipulated. Hypothermia has been used in the past to render nonvenomous species of snakes and lizards immobile for purposes of surgery, but this technique cannot be recommended. The potential hazard of the development of respiratory infections following prolonged cooling must be recognized. Sedative techniques are available to replace cooling as a technique.

CONFINEMENT

Confinement is a tool of restraint, but the acceptable degree of confinement may vary considerably, depending on the species and the situation. To the free-ranging wild animal, being placed in a large fenced-in area represents confinement, resulting in a certain degree of stress on the adult wild animal. Confinement can be progressively intensified by smaller enclosures. In a zoo situation this may be in an alleyway; for a domestic animal it may be confinement in a stall or shed. Close confinement makes it easier to evaluate clinical signs. The closest and most stressing confinement is that requiring an animal to be placed into a special cage, such as a transfer cage (Fig. 2.2) in a zoo, a special night box or bedroom, a shipping crate, or one of the many different types of squeeze cages (Figs. 2.3 to 2.7).

Squeeze cages are an extremely valuable restraint tool for wild animals. It is important to recognize that no squeeze cage can be adapted for universal use. Animals vary in both anatomical conformation and physiological requirements; the design of the squeeze cage must accommodate these to be safe and useful for carrying out various procedures. Squeeze cages designed for use in particular wild species will be described under those groups. Commercial squeeze chutes are available for domestic sheep, cattle, and swine.

Confinement may likewise be carried out by the use of special bags. The cat bag is useful for handling domestic species and can be adapted for use with many different species of small wild mammals. Similar bags can be constructed for