

# captive display, maintenance and propagation

*A Draft Chapter from a forthcoming book "A Gathering of Waterfowl".*

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Birds of all varieties, but particularly waterfowl, pheasants, parrots, as well as some exotic finches, have for centuries fascinated man to such a point that he has been moved to painstakingly provide for them in captivity, strictly for aesthetic or ornamental purposes. Of the 8,650 surviving species of birds in the world, the wildfowl perhaps best lend themselves to captive display and propagation; not only because many are colorful and strikingly patterned, but also because of their dispositions, habits and minimal maintenance requirements. However, the role of propagation in a controlled environment did not become significant as a major conservation consideration until the 20th century.

The accomplished aviculturist is a highly motivated and dedicated specialist. For some endangered avian species, this is most fortunate because these birds were, or are, either extinct in the wild or are so close to the brink of extinction that it is unlikely that they could survive without human assistance. Certainly such is the case with the Hawaiian Ne-ne goose, the Hawaiian duck or koloa, the Laysan teal, and the Aleutian Canada goose to cite but a few of the endangered waterfowl. The decline and apparent subsequent recovery of the Ne-ne is perhaps the most dramatic example of the importance of captive propagation and serves to illustrate the role of a skilled aviculturist in a modern, rapidly changing, highly mechanized society.

In the late nineteen forties biologists estimated that no more than 40 Ne-ne geese survived in the wilds of Hawaii; hardly a viable population. They were probably never overly numerous but may have numbered as many as 25,000 in the 1800's. Just why they declined so drastically is not known for certain but it is possible that the geese were unable to cope with the pressures of introduced non-native terrestrial predators such as feral dogs and pigs. Generally, insular or island species are highly specialized organisms and are unable to alter their lifestyles. Thus they are extremely susceptible to any unnatural catastrophe because they have evolved in an environment free of land predators. As a result, they have developed few, if any, defenses. Some species, lacking terrestrial predator pressure, have degenerated to the flightless state and are remarkably trusting. Unfortunately, man's interference has repeatedly adversely affected the ecological balance on remote oceanic islands. The introduced mongoose has been most detrimental to many Hawaiian species and there are few food items a mongoose craves more than a fresh bird egg. If the

reproductive potential of any species is seriously curtailed, sooner or later, that population must decline and will ultimately disappear.

In an effort to preserve the species, three Ne-ne were sent to the Wildfowl Trust in England in 1950. This unique institution is dedicated to the preservation of the world's waterfowl and is well known internationally for its excellent achievements in the conservation of ducks, geese and swans. At first, breeding success with the Ne-ne was limited, but over the years quite a number were reared and ultimately some 200 were sent back to Hawaii. At the present time the U.S. Fish and Wildlife Service, the Hawaii Division of Fish and Game as well as numerous zoological institutions and private aviculturists throughout Europe and America are producing hundreds of Ne-ne annually. Without the assistance of captive propagation, the Hawaiian goose would undoubtedly long ago have joined the extinct dodo.

The same tragic situation is echoed with other endangered species. At one time the Laysan teal was reduced to but seven individuals. Rabbits were introduced to tiny Laysan Island in 1903 and within 20 years they had consumed most of the native vegetation. The ducks rapidly disappeared as a consequence. Laysan Island is merely a dot in the Pacific and is only two miles long and one mile wide. The island consists of just over 700 acres and contains but a single stagnant pond. However, due to the dedication of avicultural propagationists, today there are hundreds of Laysan teal in waterfowl collections all over the world. But, this success should not be construed to imply that captive breeding is the answer to the plight of all endangered species. Nor does the breeding success achieved thus far even suggest that it is the total answer to preserving a species in the wild. Tremendous numbers of captive reared Ne-ne, Aleutian Canada geese, masked bobwhite quail and Swinhoe pheasant have been reintroduced back into their natural habitats. This has been a slow, long-term experiment and the evidence presently available leads biologists to believe that it has not been as successful as initially hoped. But there are signs that success will ultimately be achieved in some cases. This is particularly true in the case of the Ne-ne.

One of the initial problems overcome is the condition of the original habitat itself. If the habitat has been completely destroyed or significantly altered, it must be restored to its former condition prior to a successful reintroduction. Obviously if non native predators were responsible

for the decline of a species in the first place, it is unlikely that they can be reestablished until the unwanted competitors are removed, or at best, controlled. The governments of the foreign countries involved must be committed to the project, because without local support a reintroduction is doomed to failure. But, at least until these environmental and political problems can be solved, a captive reservoir of wildlife can be maintained and held in trust for future human generations until such time as their native homelands are suitable for their return.

It is ironic that many of the people doing the most good in this regard are presently under unjustified, albeit well meaning, attack. There are those individuals and groups in our modern society who complain bitterly that there can be no justification whatsoever for maintaining an animal in captivity. As a result of the organized activities of these extremely vocal special interest pressure groups, sometimes acting strictly on emotion and often without scientific fact, the sensitive legislators and federal bureaucrats have tended to overact and, as a consequence, a great deal of overly restrictive animal oriented legislation has surfaced in recent years. While it is difficult to fault the concept and philosophy of the new laws, the endless miles of bureaucratic red tape which are required to continue the maintenance and propagation of animals in captivity is making it increasingly difficult for many individuals and institutions to carry on the essential work. Therefore, some legislation which was initially proposed to help preserve and protect wildlife, may in fact, be detrimental to the survival of a number of species. Extinction is a dirty obscene word and once it occurs, it is irreversible and the void is left for an eternity. Since life first appeared on this planet, millions of species of animals have come and gone, but it would be a sad commentary on our times if some life forms were actually legislated out of existence. It is most tragic that many of these protectionist groups, while meaning well, may be doing more harm than good in some instances.

In the meantime, the serious business of captive breeding continues. Numerous specialized techniques are utilized. Proper management of a waterfowl collection is most important if a high level of success is to be achieved. Obviously, such factors as water quality, exhibit size, habitat within an exhibit, mixing of compatible species, proper diet, adequate nesting facilities, etc., must all be seriously considered. Care must be exercised to see to it that closely related species are not

*continued on next page*

maintained together in an effort to prevent hybridization. Hybrids are significant taxonomically because they provide important clues in determining evolutionary relationships. However, from a propagation standpoint, the breeder has a greater obligation to maintain pure blood lines. Waterfowl are very prone to hybridize and more than 400 instances of inter species hybrids have been reported. Non-related birds of the same species must occasionally be brought into the collection to prevent the problems associated with inbreeding. If not, the offspring will become genetically weaker, generation by generation, and the reproductive potential will fall off considerably.

There are many methods used to propagate and rear waterfowl. In fact, there are probably as many techniques as there are breeders. Some aviculturists prefer to leave the eggs with the adults and allow them to hatch and rear their own young. Others remove the young after they hatch and hand rear them. The level of success obtained utilizing these methods depends entirely upon the circumstances and the species involved. Swans, for example, are usually quite reliable and can be depended upon to be good parents. On the other hand, smaller species are not always as dependable and the risk of predation is ever present. Frequently, eggs and young are lost merely by carelessness on the part of the adults or due

to interference from exhibit-mates. Therefore, most experienced breeders remove the eggs as soon as the complete clutch is set and incubate them artificially, either under specially bred bantam chickens or in mechanical incubators. While this method requires a great deal more work, it significantly increases the hatch potential. If a hen loses a clutch early during incubation, she often will lay another. The removal of a clutch often stimulates this action. This is most important with the rarer birds because theoretically twice as many birds can be reared. In some cases, three clutches may result.

Hand rearing the young can be a long, time-consuming process. Often, very sophisticated techniques are required. Some young commence eating right away while others can be most troublesome to get started. Such specialized species as scoters, harlequins and oldsquaw ducks are extremely difficult and often must be pampered and hand fed for months. However, if successful, the end result is most gratifying. New techniques are developed each breeding season and the rapidly advancing field of captive avian propagation can truly be regarded as a science.

Most waterfowl in a collection are pinioned. This reduces the bird's flight ability by creating an unstable aerodynamic condition. Pinioning is accomplished by merely removing the distal portion of one wing. It is usually done

at one or two days of age. Some birds in many collections are kept in a full winged state and they usually tend to stay around the grounds. To prevent the possible introduction of an exotic species into the surrounding local environment, it is advisable to maintain only those species which occur naturally in the area in a full winged condition.

The countless problems associated with properly maintaining a waterfowl collection are endless. Disease, predation, adverse weather, vandals, thieves, etc., can all be troublesome one way or another. All breeders will sooner or later experience losses due to one or more of these factors. Unpredictable weather, disease and even predation can be dealt with, but the wanton barbaric actions of vandals is extremely difficult to accept. Fortunately, the ultimate successes achieved usually triumph over the all too numerous frustrations which plague the modern propagator.

Aviculturists, as custodians of nature, have assumed a serious responsibility. In addition to the tremendous maintenance and breeding commitments, many of these individuals are frequently called upon to treat and repair sick or injured birds. Some of these casualties can be attributed to natural causes such as outbreaks of botulism or other diseases, but all too often, they are the results of unfortunate encounters with man. Thou-

*Chilean Flamingos, San Diego Sea World*



sands of stricken birds are treated annually for such maladies as gunshot wounds, injuries resulting from flying into power lines, entanglements with fishlines or fish hook damage, poisoning, and an increasing number that have been trapped in oil spills or other pollutants. Even nestlings are not secure and many are stolen from the nest each spring, particularly birds of prey by would-be falconers. Some of these young are confiscated by the authorities and brought in for rehabilitation. Fortunately, some can be restored to a condition where returning them to the wild is feasible, but more often than not, the injury or ailment is such that it permanently precludes a release attempt.

The problems associated with captive maintenance and propagation are shared by both private aviculturists and public zoological institutions. However, the public facilities face many additional challenges which are not of great concern to those with private collections. The individual breeder's prime responsibility is that of a successful breeding program and the overall visual impact of such an operation is relatively unimportant. On the other hand, both propagation and aesthetic surroundings are of equal importance at a public institution. Unfortunately, quite frequently public display and breeding are just not compatible, although this is less of a problem with wildfowl than most other avian groups. Even so, some compromises may be necessary. These compromises, however, should not be construed to imply that imaginative and innovative exhibit techniques should be abandoned. Although most public zoological institutions maintain and propagate large numbers of ducks, geese, and swans, seldom are the exhibits such that they visually present the birds under the optimal aesthetic conditions. In the past, some zoos have been guilty of constructing either cage-like aviaries or merely providing huge concrete ponds or lakes for their wildfowl. Some of these lakes contained tremendous numbers of individuals and species. All too often this was done because of necessity; a result of having to compromise.

As zoological institutions become more sophisticated, new philosophies and modern exhibit techniques continually emerge. However, just as Rome was not built in a day, zoos cannot be expected to change traditional techniques and thinking overnight. But zoological gardens are changing, and much more rapidly than many specialists in the field believed was possible. Most zoo specialists will agree that captive wildlife must be presented under the best possible aesthet-

ic conditions if the public is to appreciate and learn from the exhibit. Contrary to the opinion of many zoo critics, television animal documentaries are just not enough. Man needs to see, hear, smell, feel and experience the presence of an organism to truly understand and respect it.

The challenges involved in creating aesthetic exhibits which at the same time will facilitate efficient propagation programs are multifold. Many of the problems encountered have yet to be solved, although they should not be considered insurmountable. There are countless numbers of techniques and philosophies regarding what constitutes a proper waterfowl exhibit. While it is quite possible that all of my professional colleagues may not fully agree with my personal preferences, I am inclined to believe that the naturalistic approach is the most logical and effective. If the birds are displayed in tasteful surroundings which are absent of wire, concrete, fences, unsightly feeding devices and nest boxes, etc., the exhibit potential is significantly increased. The various display techniques must, by necessity, vary according to climatic conditions and topography.

When housing and exhibiting wildfowl, water quality and water supply warrants a great deal of serious consideration. This unfortunately is often neglected and, as a consequence, many public exhibits frequently are unsanitary and unsightly. A high water turnover rate is a major factor in maintaining clear water as well as reducing the incidence of contagious diseases. If a ready source of fresh water is not available, high quality filters and heavy duty pumps may be utilized to maintain good water quality.

Clean water is an absolute necessity in most cases. To stimulate water movement, small waterfalls can be most effective. Sonaran desert rock is aptly suited for small waterfall construction because of the numerous holes and indentations that characterize it. Water collects in these pockets, providing small bathing and drinking pools. These little waterfalls can greatly enhance the exhibit potential. The design or shape of the exhibit itself is also of great importance. Generally, a free form unit is much more desirable than a symmetrical round, square or oblong pool. It is also much more effective to have a number of small well done exhibits, rather than one or two huge ones.

One of the most difficult aesthetic problems to overcome is that of the physical barriers which surround the total exhibit. Barriers of some sort are necessary not only to contain the birds,



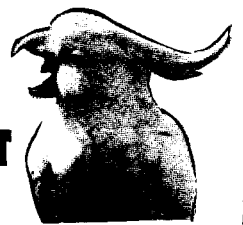
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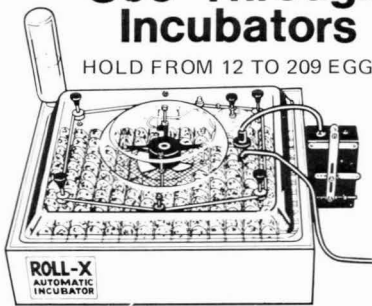
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but also to restrict public entry into the exhibit area. Frequently the latter problem is of greater concern. One of the most effective methods from an aesthetic standpoint, is the use of "psychological barriers"; plants rather than an artificial device such as a wire or wood fence. A closely planted compact hedge has proven to be very effective for this purpose if it is thick enough, high and wide enough (to prevent the public from stepping over it), and is bird proof (unpalatable to the birds). In warmer climates natal plum (*Carissa*) is one of the more effective plants for this purpose because the birds do not attempt to eat it and *Carissa* possesses small thorns, thus discouraging the public from attempting to get through it. Inevitably there are places in the hedge that birds can escape through, but they tend to rapidly become conditioned to stay within the exhibit area. When they become so conditioned as to remain where they belong, the barrier becomes psychological.

Commencing with the largest and fullest plant specimens possible is most advantageous; five gallon specimens, for example, require a great deal of time to mature and produce the desired effect. If larger plants are not available, some low unobtrusive fencing material woven between the shrubs will be beneficial until they mature. A great deal of patience is required if this technique is utilized as the creation of barriers of this type is a long term project. In addition, hedges require constant attention and maintenance. The greatest challenge will be to get the public "conditioned" to stay where they belong. If visitors continue to violate exhibits, the judicious use of obnoxious plants such as yuccas or holly in certain areas can be helpful in discouraging passage. Even though the creation of psychological barriers is most difficult initially, the end result is spectacular and well worth the trauma required to get it established.

Whenever a zoological facility is open to the general public, there are certain unavoidable problems which must be contended with daily, such as visitors entering the exhibits or feeding unauthorized food items, throwing objects at the birds (these objects frequently are coins because clear water in some exhibits apparently stimulates the "wishing well" phenomenon), stealing eggs, etc. However, if the aesthetic atmosphere of the institution is high the aforementioned difficulties will not be as serious as they could be. Therefore, to minimize vandalism etc., it is urgently recommended that exhibits be maintained in the best possible condition. Some institutions encour-

age public contact and the visitors are allowed to feed the birds. Feeding machines with specially prepared waterfowl food can be provided for that purpose. It should be pointed out that the public will feed the animals anyway (usually their unwanted garbage), so by providing food, those zoos are able to control what (and how much) the birds are fed and the public responds enthusiastically. A desired side effect of public feeding is that the ducks, geese and swans will tend to become reasonably tame and therefore the agonizing problems associated with psychological stress are minimized.

In most cases, high quality wildfowl exhibits will also be botanical showcases. Over the years, zoo horticultural personnel have experimented with numerous plant species and have discovered, generally the hard way, which species can withstand unrelenting avian pressure. As a general rule, the larger the waterfowl, the larger and hardier the plants must be. Geese appear to be the worst offenders, although swans can be most troublesome as well. These larger species are compatible with relatively few plants. Sweet tasting soft succulent plants are usually doomed from the start. Flowers do not fare well either with most species. Junipers, pines, palms, bird of paradise plants, cycads, coral trees, etc., have proved to be at least partially bird proof. However, even under the best of conditions, constant upkeep and replacement is a necessity.

It is best to attempt to maintain captive wildlife in areas that best suit their temperaments and requirements; i.e., heavily planted exhibits for those species that tend to be secretive, grass for grazers, etc. For the smaller more delicate species, Korean grass (*Zosia*) has proven to be most durable, at least in warm climates. Once established, this grass is beautiful and lush and is an excellent ground cover. Interestingly enough, the birds are not inclined to eat it. *Zosia* has a tendency to cover everything such as the edge of a pool, rocks, base of larger plants, etc. In warm climates it remains green year round. Unfortunately, Korean grass is fairly expensive and requires a great deal of time to mature. Once established, however, it is hardy and has a pleasing appearance.

For geese and other grazers, a sturdy lawn grass of golf fairway grass, such as hybrid bermuda, is excellent. The birds graze constantly and if the correct number of birds are maintained, it is not necessary to mow the lawn. If exhibits are designed properly and contain enough lawn space, it is also possible to success-

fully maintain relatively large flocks of those species which are colonial, such as black brant. Gregarious species thrive in flocks and the breeding potential is increased significantly. However, even in the more open grassed exhibits, dense planted areas should be available for the birds, providing them not only with nesting areas but with retreats as well.

Depending on the exhibit area and the species involved rocks, sand, river stone, logs, wood, bark, etc., can be used to increase the aesthetic appeal. The use of large rocks in the water is often effective as some rocks can be most attractive and will provide secure roosting sites. Due to the weight involved, feather rock has been utilized in many zoological gardens. Of course, wherever practical, naturalistic islands should be provided. The islands will do much to improve the overall visual impact of the exhibit while providing excellent nesting and roosting sites. Birds which nest and roost on islands are fairly secure from terrestrial predators, such as feral cats. Obviously the cement lips of ponds and islands should be faced with natural rock or other appropriate material.

The judicious use of driftwood can also be very effective, but if a great deal of care is not exercised in the selection of the appropriate piece, the desired effect can be lost. The acquisition of wood and logs with character is possibly one of the most difficult tasks. There are three basic methods of wood utilization; land use, water use and both land and water use. Any of the three methods or perhaps a combination, can effectively pull an exhibit together. The "in the water" pieces are also beneficial to the diving duck species as the divers tend to pick over the underwater portions once aquatic plants, such as moss, begin to appear.

The use of wood also allows for exhibition of other avian species, such as macaws and cockatoos, within the wildfowl exhibit. This can be overdone of course, but a touch of color and noise in certain areas can do a great deal to improve the total visual impact of an exhibit. Generally, wood in the water is most suited for this purpose as it prevents the parrots from departing the perch. If the parrots do manage to get to the shore, it should be understood that they can be disastrous in a planted area. Psittacines which are used in this manner are usually tame and are taken in and out daily. Other bird species can easily be maintained with waterfowl such as ibis, spoonbill, egrets, etc. Naturally, flamingos lend themselves perfectly to some exhibits.

When designing or modifying an exhibit

for waterfowl, there are a number of factors to be considered. For example, how deep should the water be? Generally, if a high water turnover rate is available, no more than 18" is necessary, although for swans and some divers a greater depth may be desired. Exhibits with underwater viewing windows have some merit. Within each exhibit, a variety of habitats or ecological niches should be provided. This consideration allows the exhibits to be much more flexible and therefore, they are not restricted to monotypic use. Heavily planted areas are required for nesting and security. Some zoos exhibit fish in the wildfowl displays. From personal experience, in the interest of maintaining departmental harmony, it is most advisable not to place mergansers or eiders in units that contain fish.

Disguising the feeding devices is also beneficial in improving the appearance of an exhibit. Birds feeding from an inverted garbage can lid should be looked upon with disfavor. Many zoological institutions are plagued with large numbers of unwanted domestic pigeons. To prevent these opportunists from monopolizing feeding areas, some consideration should be given to feeding the waterfowl underwater. This action also keeps the wildfowl active and the public greatly enjoys seeing the dabblers dabbling and the divers diving. Of course, with clear water the visual effect is intensified. A constant pigeon control program is strongly recommended. Pigeons should be viewed as a definite health threat to any exotic bird collection. In addition, they can detract from a high quality exhibit by their mere presence.

Unfortunately, pigeons are not the only unwanted intruders. No avian collection is totally free of predators. Aside from mice and rats, the most dangerous terrestrial predators are feral cats. They must be removed immediately. In my own experience, a single cat is one too many. Wild dogs should also be considered as a definite threat. Zoos in coastal areas also attract many gulls, black-crowned night herons, great blue herons, etc. Although normally not thought of as waterfowl predators, these species can be most detrimental. Not only are they a definite threat to fish in open ponds, but they have been responsible for the loss of a number of young birds. On one occasion, I observed a black-crowned night heron kill a month old black-necked swan. Western gulls are particularly competitive and will take young waterfowl without hesitation the moment they emerge from the nesting site. I have many times observed a western gull snatch up a baby wood duck and con-

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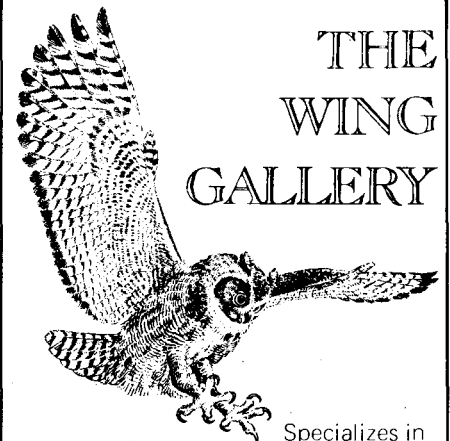
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impossible since they had automatic feed and water.

Then to his horror and mounting rage, Steve noticed each cage door was open, the individual padlocks having been cut loose. The flights were empty.

This tale has a familiar ring as more and more aviculturists are experiencing the theft of their birds. However, in Steve's circumstances, such was not the case. The birds were CONFISCATED!

The year is 1977 and H.R. 6631 has been enacted by Congress. This could happen to you.

Under H.R. 6631, all owners of one or more animals, with the possible exception of dogs and cats, will be required to obtain a federal license. Further, to obtain such a license, each animal/bird owner will have to pass a comprehensive written examination proving he/she has sufficient knowledge and experience to justify the federal government's granting permission to keep the animal(s).

Steve and Sue had obtained a federal license to keep their birds and had even acquired the "zoo license" under H.R. 6631, which cost \$1,000.00 a year. However, H.R. 6631 allows any citizen (in fact encourages) to file a complaint claiming the animals are not being cared for properly. Of course, the neighbor who filed the complaint against the Ornison's knew nothing about birds or their care, but he did know that their constant singing was a nuisance, and this was a good way to get rid of them.

The scenario above is somewhat simplistic and fictional. Unfortunately, it may soon be a reality — one that could happen to you!

The A.F.A. is deeply concerned about H.R. 6631 and will be watching it closely. It has not been scheduled for a hearing yet, but will likely be heard in June, according to Mr. James Spensley, Counsel for the House Sub-committee on Fisheries, Wildlife and the Environment ■

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## RETRIEVAL PROGRAM SEES RESULTS

by Hal M. Koontz

The A.F.A. Exotic Bird Retrieval Program is working in conjunction with the California Department of Food and Agriculture to recapture escaped aviary birds. Although all feral exotic birds are of interest to the program, three species have been specified by the State as possible agricultural pests: the Indian Ringneck Parrakeet, the Canary Wing Bee and the Nanday Conure. Unless the program is successful, the State may prohibit possession of any of these birds. The program has been given until the end of June to demonstrate its ability to recapture some of these birds. The State is apparently not concerned with the presence of other species of escaped birds such as Amazon Parrots and consequently, the program's major effort is in retrieving the three above-mentioned species.

The program has recently seen results. Sixteen Indian Ringneck Parrakeets were trapped in the Chino-Pomona-Ontario area during December, January and February. They were caught in a trap which will be described in this column, in the next issue of the Watchbird. A Ringneck was caught in the Silverlake area of Los Angeles by luring the bird into a carrying cage containing fruit, and quickly shutting the door of the cage. Still another Ringneck was captured in North Hollywood by covering the nesting hole, with

the hen inside, with a board and then lowering a noose over her head and pulling her out of the hole.

These successes help prove our ability to recapture these birds. Our regular meetings with the State biologists, discussions with more experienced breeders and our own attempts have taught us much about the different traps which are successful. More people are becoming involved in the program all the time. The State biologists were impressed by the 81 hours in the field put in during February by the program. They have seen the program's development and success and have indicated that the proposed prohibition of the three species of birds will likely not go into effect this July. More likely, the program will either be extended for another year or the proposal will be dropped completely. We should continue to endeavor, however, to capture as many of these birds as we can to guarantee this result.

Please report any sightings, all man-hours spent working on the program, and especially all captures of birds. The capture of any exotic bird should be reported. Please send this information to:

Hal M. Koontz  
441 S. Commonwealth Avenue  
Los Angeles, California 90020  
(213) 389-4355 ■

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sume it immediately. The public is not impressed with this type of avian interaction. These skilled opportunists are quick to take eggs as well.

A great deal of knowledge of a specific species breeding behavior is also necessary as often avian dispositions will alter drastically during the nesting season. Aggressive species such as whooper swans, Egyptian, Andean, Abyssinian blue-winged and Cape Barren geese must be closely observed during the breeding season if they are exhibited with species of comparable size. If they are to be maintained in a mixed exhibit, the unit must be relatively large. It is also desirable from an exhibit potential standpoint to attempt to maintain species of varying sizes, colors, shapes, and habit, such as whistling swans with ruddy ducks.

The final and perhaps most important consideration, is that of breeding potential. Not only is an effective breeding program part of proper management of a collection, it is becoming increasingly important due to the plights of many species, as well as due to increasing restrictions relative to avian importation and quarantine. For the sake of aesthetic appeal, a great deal of thought should be given to providing natural appearing nesting logs, rather than the traditional nesting boxes which, although effective, are not visually appealing. Appropriate hollow logs of this type are difficult to acquire. Many zoos are now creating their own "natural" logs and quite frequently the fiberglass reproductions are impossible to tell from the real logs and the birds are not hesitant to use them. Palm logs also make excellent nesting hollows as well. They can be hollowed out with a chainsaw and an appropriate sized entrance hole cut. The upright log should then be partially buried and sphagnum moss can be used as nesting material. The moss serves to keep the humidity up and is an excellent substrate for the eggs and incubating hen.

Zoological institutions have great social, cultural and biological potential. Some changes in contemporary zoo management thinking will be required if that potential is to be realized. If an institution elects to display a species, it is obligated to provide the best exhibit possible without compromising breeding potential. The ultimate goal, of course, is to have all species in zoological institutions exhibited under natural or semi-natural conditions. Once this is accomplished, the outspoken zoo critics probably will fade away, institutional education programs will improve significantly and the reproduction potential will be even greater ■