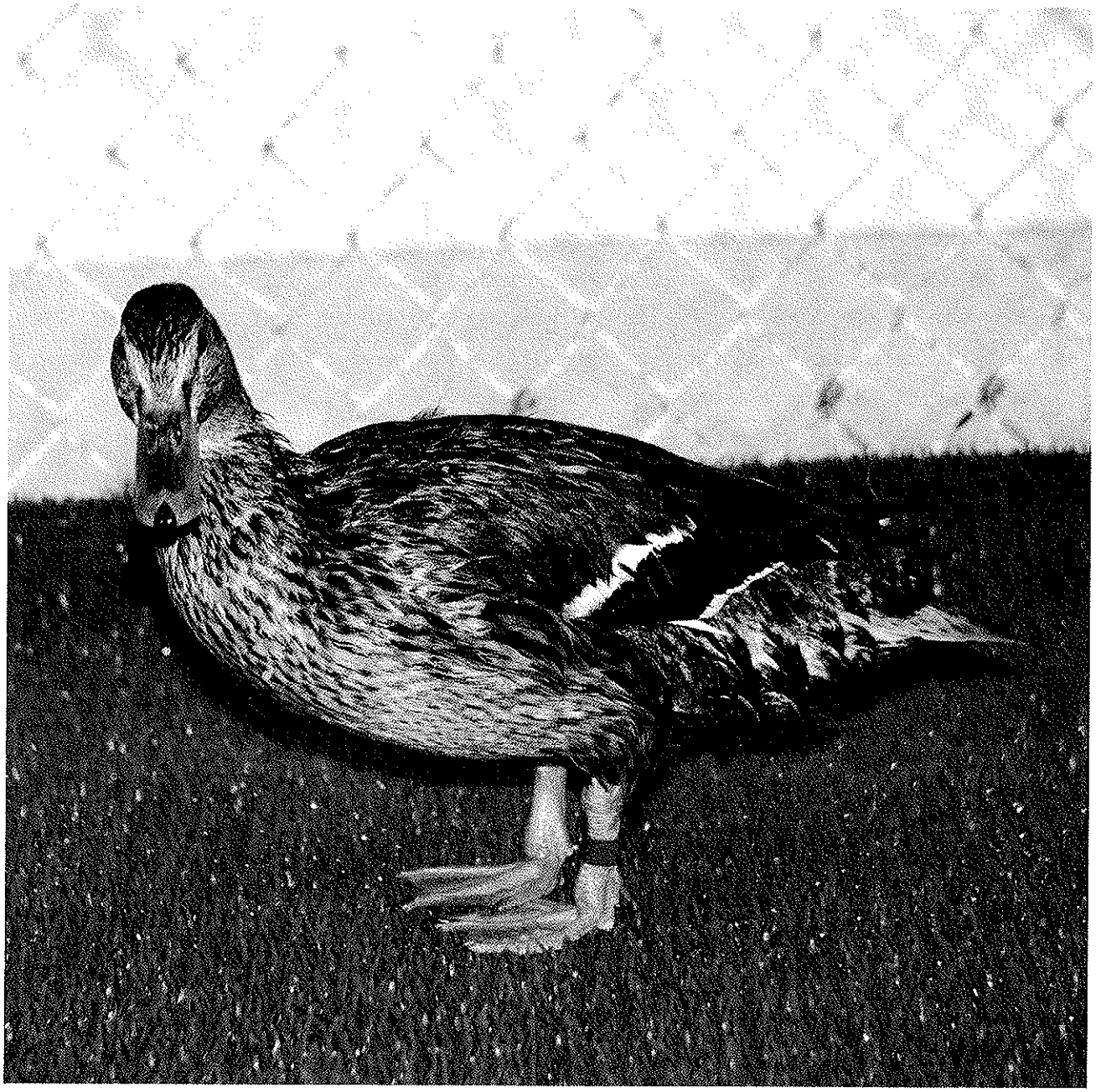
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JOURNAL of Wildlife Rehabilitation

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The *Journal of Wildlife Rehabilitation* is designed to provide useful information to wildlife rehabilitators and others involved in the care and treatment of native wild species with the purpose of returning them to the wild. All feature articles are subject to a review process, and our staff and reviewers work with authors to produce the most accurate information possible in our ever-changing field.

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Editorial . . .

Forging New Ground: Our Collective Voice Being Heard

Over the past 18 months or so wildlife professionals, from a cross-section of the United States, have been invited to a series of brainstorming sessions, focusing on wildlife related issues. Both IWRC and NWRA were represented at these sessions. The topics included a wide range of issues, from offering workshops to improving communication, not only between rehabilitators themselves, but between us and the agencies that regulate wildlife rehabilitation.

The original group evolved into an exciting cohesive unit. These individuals laid aside organizational differences in order to form a stronger base from which to emphasize common goals and push wildlife rehabilitation forward, gathering respect as a needed and desired profession.

The voices of our collective membership have come through loud and clear at these meetings. The needs you have expressed to us, were in turn expressed to the group. It is in that context we felt it was time for you to hear from us about our involvement, on your behalf; thus, this editorial.

At one recent gathering, several representatives of state wildlife agencies, as well as USFWS, were asked to come and bring their comments and suggestions. For two days we met. Our first question to the representatives was, "What would you need from us to assist you in developing the best possible connection with wildlife rehabilitators?" The fruits of this meeting are what we will share with you here.

It quickly became evident that a host of problems come into play when agencies consider wildlife rehabilitation issues. Most were out of our control. Virtually every state, as well as the federal representative, cited financial cut-backs, downsizing and commitments that required more time be spent in historic wildlife areas (such as hunting and fishing). This issue appears to be of national proportions. It was evident our focus

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Oiled Seabird Rescue at the J.V. Fitzgerald Marine Reserve, San Mateo County, California, 1968-1995

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Abstract

Records of oiled and injured seabirds at the J.V. Fitzgerald Marine Reserve, San Mateo County, California, were collated from the daily log at the Reserve for the period 1968-1995. These records serve to demonstrate that oil spills and chronic oiling have occurred frequently in this area, just south of San Francisco. Common Murres (*Uria aalge*) were the most frequently-oiled species rescued at the Reserve. Greater efforts should be made by wildlife rehabilitators to collate large volumes of past data (prior to the early 1990s) on oiled and injured seabirds for similar documentation of large or moderate oil spills (including undocumented or poorly-known spills), chronic oiling from small spills, and injuries from other sources.

Key Words: Oil pollution, oil spill, California, seabird, Common Murre, *Uria aalge*, rehabilitation, restoration

Introduction

When moderate or large-sized marine oil spills occur near shore in central California, it is now well known that large numbers of seabirds probably will be oiled and live and dead oiled seabirds will swim or wash ashore (Smail et al. 1972, Carter et al. 1987, Ford et al. 1987, Page et al. 1990). Extensive efforts now occur to document the numbers of seabirds impacted and to arrange for rehabilitation at established and temporary facilities. Much less attention has been focused on chronic oiling mortality of seabirds when smaller numbers of oiled birds come ashore due to smaller or undocumented oil spills throughout the year. Often, evidence for such oiling is limited to single oiled birds or small numbers brought to established rehabilitation centers for care. While valuable information on the occurrence and magnitude of seabird injury from specific oil spills and chronic oiling over the past few decades can be gleaned from rehabilitation records, this task will require much effort, many past records are incomplete, and some records have been lost or destroyed. At present, it is difficult to assess the extent of chronic oiling over the past few decades, except for at a few coastal localities where records on oiled birds have been kept by other groups. One such area is the J.V. Fitzgerald Marine Reserve in San Mateo County, California, where reserve rangers have recorded rescues of oiled and injured birds since 1968 (Carter 1996a). In this article, I have summarized available Reserve records from 1968-1995. Although incomplete, these records provide general documentation for the frequency and related seabird impacts of specific oil spills, chronic oiling and other forms of seabird injury in this small coastal area, just south of San Francisco. The oiled-bird rescue story of this small section of coast reoccurs many times over, if you expand your viewpoint to consider the whole coast between Bodega Bay and Monterey. This story is interesting in terms of understanding the cumulative impacts of oil pollution on seabirds over time in this area. It is important for rehabilitators and other biologists to put their efforts in perspective with the problem at hand. Oil pollution is a problem which must be addressed from many viewpoints. Wildlife rehabilitators must remain an integrated part of the overall process of how our society deals with marine oil pollution.

Reserve Records

The J.V. Fitzgerald Marine Reserve (hereafter "Reserve") is located near Moss Beach (south of Pacifica and north of Half Moon Bay), is maintained by San Mateo County, and occurs within the northern part of the Monterey Bay National Marine Sanctuary. Since the Reserve was established in 1969, oiled and injured seabirds have been recovered along the 3 miles of shoreline and sent to rehabilitation centers (primarily the Peninsula Humane Society in Burlingame). The Reserve is located near oil tanker lanes which enter and leave San Francisco Bay through the Golden Gate. Both large and small oil spills occur regularly in this area and have killed large numbers of seabirds. Often, only small numbers of oiled birds struggle ashore before death while most die and either wash ashore or sink at sea. Seabirds also were killed in large numbers by entanglement in gill nets which were used extensively for fishing in this area from 1979-1987 but are now not permitted close to shore (Takekawa et al. 1990). Smaller numbers of seabirds also are caught on fishing lines or injured by other human activities.

From June 1968 to December 1995, rescues of live oiled and injured seabirds were recorded in the ranger's log at the Reserve as part of daily record keeping of activities. This set of data is unusual because of the length of time it spans, the specific years spanned (including several known oil spills), and the data appear to represent a fairly consistent attempt to record such rescues at the Reserve. Few other coastal localities maintain such records, with the exception of the South Farallon Islands, located about 20-25 miles off San Francisco, where the Point Reyes Bird Observatory (PRBO) has maintained a field station and daily log which also has recorded oiled birds since 1977 (Nur et al. 1995). While Reserve records help document the long-term problem of oil pollution on the central California coast (especially for Common Murres *Uria aalge*), these records also indicate that other forms of human impacts also result in injury to seabirds, especially capture on fishing lines. The central California population of Common Murres declined dramatically in the mid to late 1980's due mainly to gill-net and oil- spill mortality. However, in the 1990's, the population has been stable or increased slightly at lower population levels (Takekawa et al. 1990; Carter et al. 1995; Carter and Takekawa, unpubl. data). The efforts of Reserve rangers and the public in capturing oiled and injured birds and sending them to rehabilitation centers has served to help document these problems over time as well as to give individual birds a chance to survive. Without rehabilitation, most oiled birds on beaches are certain to die.

In the following chronological listing, I have listed seabird rescue efforts recorded in the Reserve log by year. The log has been maintained daily (except for a few missed days) by rangers and has been stored at the rangers' kiosk at the main northern entrance to the Reserve by the parking lot. These records were never meant to be the only documentation of these birds which are also recorded at various rehabilitation centers. For instance, on days when rangers had too many other duties or at times when no ranger was present, rescued birds were not always recorded. Also, some birds may have been removed from the beach at the path into the Reserve near the Distillery Restaurant. Thus, Reserve log records must be considered as a minimum of the actual rescue efforts. Also, dead birds usually were not recorded. Instead of simply listing rescues in a table, I have interspersed records with other information on the overall magnitude of spills (including live and dead birds) for comparison to the relatively small numbers of live oiled birds found and/or recorded at the Reserve. Live oiled birds were identified in the log whereas injured birds often were not described in detail. I presume that most or all injuries resulted from human impacts (most likely from fishing line entanglement or capture on fishing hooks) rather from natural causes because several instances of these specific impacts were recorded as noted.

Oiled and Injured Seabird Rescue, 1968-1995

1968: No rescue records made in the Reserve log. The daily log started 10 June 1968.

1969: No rescue records made in the Reserve log.

1970: Single oiled Common Murres on 8/15 and 9/4.

1971: From 1/19-1/28, rangers were involved in responding to the huge 1971 San Francisco oil spill when two oil tankers collided in the Golden Gate and oil spread from Point Reyes to San Mateo County beaches (HMBR 1971; Smail et al. 1972). Several tons of tar and straw were removed from the beach at the Reserve. Hundreds of live oiled birds were rescued (especially Common Murres, Western Grebes, loons, scoters and cormorants) and hundreds of dead birds were left on the beaches at the Reserve (B. Breen, pers. comm.). Over 20,000 seabirds were estimated to have been killed by the spill (Smail et al. 1972). In addition, an injured gull on 4/13.

1972: No rescue records made in the Reserve log.

1973: From 5/7-9, 6 Common Murres and two unidentified birds (all probably oiled). From 12/2-5, 8 oiled birds (2 Common Murres, 1 loon, 2 ducks and 3 unidentified birds). Both incidents appear to reflect un-

documented oil spills.
1974: Oiled Common Murre on 3/31, injured Common Murre on 8/24, and a shot Common Murre on 9/2.
1975: From 8/29-31, rangers responded to an oil spill off Point Montara (just north of the Reserve) and rescued at least 4 oiled birds (HMBR 1975). This spill of bunker oil was little documented, and probably killed at least 1,000 Common Murres; 635 Common Murres, 5 Brown Pelicans, and 1 Rhinoceros Auklet were interned at the International Bird Rescue Center in Berkeley by late September (Anonymous 1975). Another undocumented small spill apparently occurred from 11/10-13 when an oiled cormorant and other oiled birds were rescued. An oiled Common Murre on 6/29, injured Common Murre and injured Herring Gull on 6/28.
1976: No rescue records made in the Reserve log.
1977: No rescue records made in the Reserve log.
1978: On 4/21, an oil spill was reported in the Reserve log but no seabird rescues were recorded.
1979: No rescue records made in the Reserve log.
1980: Two oiled Common Murres on 7/31 and injured gull on 4/7.
1981: Injured gull on 8/12.
1982: Injured Common Murre tangled in fishing line on 7/7 and injured Common Murre (bleeding leg) on 8/26.
1983: On 8/22-23, rangers responded to an oil spill off Marin County and 2 oiled Common Murres were rescued at the Reserve. This spill was not documented well but over 500 birds (mainly Common Murres) were interned at the Marin Wildlife Center in San Rafael (Marin Wildlife Center, unpublished data). An injured Common Murre was found on the road on 2/4 and injured gull on 11/12.
1984: From 5/27-30, 3 oiled Common Murres were rescued, probably representing an undocumented oil spill. On 10/31, the T/V *Puerto Rican* exploded off the Golden Gate which later resulted in a large oil spill that killed 1,500-2,000 murres (PRBO 1985; Ford et al. 1987; Stenzel et al. 1988). Although there are no records of oiled birds in the Reserve log and most oil drifted north to Point Reyes and Bodega Bay, several live oiled birds were rescued at the Reserve and some dead oiled birds washed ashore at this time (B. Breen, pers. comm.).
1985: Injured gull on 1/12, injured duck on 3/4 and single injured Common Murres on 3/4 and 8/29.
1986: From 2/1-4, rangers responded to the barge *Apex Houston* oil spill which killed or debilitated over 10,000 birds between Sonoma to Monterey counties (HMBR 1986a,b; Page and Carter 1986; Carter et al. 1987; Ford et al. 1987; Page et al. 1990). Forty-nine live oiled birds were rescued at the Reserve (44 Common Murres, 2 Rhinoceros Auklets, 1 Cassin's Auklet, 1 Western/Clark's Grebe, and 1 White-winged Scoter) and 62 dead oiled birds were noted on 2/4 (53 Common Murres, 2 Rhinoceros Auklets, 2 Cassin's Auklets, 3 scoters, and 2 cormorants). An oiled Western Grebe also was rescued on 3/28 which may have been related to the spill.
1987: An oiled Common Murre on 3/7, injured gull on 6/25, injured Brown Pelican (severed wing) on 8/25, and injured Common Murre (broken wing) on 9/4. Local man reported that men shot a gull on 6/25.
1988: Single oiled Common Murres on 1/1, 6/30 and 12/26, plus an injured scoter on 1/24. An oil spill was reported off Pillar Point on 10/2 but no seabird rescues were reported in the Reserve log.
1989: Injured gull on 5/19 and gull with fish stuck in throat on 9/8.
1990: From 2/1-7, rangers responded to an oil spill which caused hundreds of oiled birds to beach between San Francisco and Monterey (HMBR 1990a,b) and rescued at least 5 oiled Common Murres. On 2/6, a total of 5 dead birds were noted (including 4 Common Murres and 1 Rhinoceros Auklet). This spill was poorly documented but at least 500 dead Common Murres were obtained from rehabilitation centers from Monterey to San Rafael (Carter, unpubl. data). From 12/18-23, 6 oiled Common Murres also were rescued during an apparently undocumented oil spill. In addition, 6 other oiled Common Murres were rescued on 2/18 (1), 3/26 (1), 4/2 (1), and 6/16 (3), as well as an oiled cormorant on 8/17, oiled Pigeon Guillemot on 12/2, and injured gull on 8/14. On 9/29, a sewer spill and several dead birds were reported in the Reserve log.
1991: Oiled Common Murre on 1/10.
1992: No rescue records in the Reserve log (records from 3/1-12/31 missing and not examined).
1993: Oiled unidentified bird on 7/8, a Common Murre tangled in fishing line on 7/16, single injured Common Murres on 8/10 and 8/26 (bad wing), and injured gull on 10/16.
1994: Oiled Common Murre on 3/26. On 9/3, the log noted a deformed murre found on the beach and Wildlife Rescue reported to the Reserve that murres were washing up on other beaches with feather problems and internal bleeding. However, no rescues or other data were noted in the log.
1995: Oiled Common Murres on 3/17 and 7/7 plus a Common Murre tangled in fishing line on 7/30. Single injured Surf Scoters on 7/7 and 7/30, single injured Brown Pelicans on 8/28 (puncture wounds) and 12/28 (broken wing), and injured Western Gull ("gull syndrome") on 9/1. No rescues were recorded in the Reserve log during a seabird die-off in the summer of 1995 when hundreds to thousands of birds were found on beaches in central California (Carter 1996b). However, birds were noted mainly in Monterey Bay and north of Point Reyes and small numbers of dead birds may have been recorded by the Beach Watch program at the Reserve (see later).

Documenting Oiled Bird Rescues

Recorded rescues of oiled and injured seabirds at the Reserve represent a tiny fraction of the impacts of oil pollution over the wider coastal area in central California. In known moderate to large spills that occurred in 1971, 1984, and 1986, only relatively small numbers were reported at the Reserve, compared to the hundreds to thousands estimated to have been impacted over wider areas (see above). Undocumented spills (or spills that are not widely known) that resulted in oiled bird rescues at the Reserve also apparently occurred in 1973, 1975, 1983, 1984, and 1990. Other spills were reported in the Reserve log in 1978 and 1988

but no rescues were noted. Due to the incomplete nature of rescue records and knowledge of oil spills, I have not tabulated the total numbers of birds reported at the Reserve. Nor have I tried to correlate rescue records with other records at the Peninsula Humane Society to try to determine what percentage of rescues were reported in the Reserve log. Such comparisons would be desirable but are not currently possible, given the nature of past records kept at rehabilitation centers. Instead, I have provided this summary of available information as a general indicator of the problem of oil spills and chronic oiling in this coastal area and the long-term issue of documenting this problem. Stenzel et al. (1988) also reported oil spills and significant chronic oiling rates for seabirds in central California based on beached bird surveys conducted by PRBO over 14 years from 1971-1985. Similarly, PRBO noted oil spills and significant chronic oiling in the daily log at the South Farallon Islands from 1977-1994 (Nur et al. 1995). Since the early 1990's, the California Department of Fish and Game (CDFG; Office of Oil Spill Prevention and Response or OSPR) has worked to better document oil spills, improve oiled wildlife rehabilitation, improve post- release survival, and help restore seabird populations. However, prior to the early 1990s, PRBO helped document several oil spills and their impacts on seabirds, especially during the 1971, 1984 and 1986 spills noted above. In fact, all available data on oiled seabirds are needed to fully determine the overall extent and impacts of oil spills over time. Oiled birds recorded at rehabilitation centers, the South Farallon Islands, the Reserve, and on beached bird surveys have represented the only available information on oil spills and chronic oiling in central California in the recent past. Until the early 1990s, smaller spills in central California did not receive expanded damage assessment or wildlife rehabilitation responses. Reserve records now serve to help identify the occurrence of undocumented seabird oiling and other mortality in this period which may have been substantial even for single events, let alone cumulatively. Hopefully, rehabilitation center data eventually will be collated to help further document past and future oil spills and chronic oiling. At the same time, CDFG-OSPR is working with rehabilitation centers and the Wildlife Health Center (University of California Davis) through the Oiled Wildlife Care Network to improve rehabilitation techniques and post-release survival of cleaned birds. Detailed record-keeping at rehabilitation centers is critical for these purposes as well.

Beach Watch

Since 1993, the Reserve has participated in the Beach Watch program, coordinated by the Gulf of the Farallones National Marine Sanctuary. This program involves beach surveys of birds, mammals, and oil along the Reserve's shoreline every 4 weeks and has provided better documentation of seabird injury and mortality events in the present and into the future. In particular, Beach Watch data on the numbers of dead oiled birds could be compared to live oiled birds rescued over time to better establish overall oiling rates at present and in the past. This program also will provide important information for addressing other human impacts to seabirds over time, including die-offs. Beach Watch is also coordinating with CDFG-OSPR relative to oil spill response.

Colony Restoration Efforts

In addition to rehabilitation efforts and documenting seabird impacts, restoration efforts are currently underway near the Reserve to attempt to partly repair some of the damages of oil pollution and other human impacts to seabirds. In January 1996, biologists Michael Parker, Elizabeth McLaren, Susan Schubel, Jan Boyce, Phil Capitolo, and Mary Ortwerth (U.S. Fish and Wildlife Service [USFWS], San Francisco Bay National Wildlife Refuge & Ecological Services - Sacramento) started to restore breeding Common Murres to the Devil's Slide Rock breeding colony, located a few miles north of the Reserve. Before the 1986 *Apex Houston* oil spill, this was the only murre colony between San Francisco and Monterey. The colony has not been active since the spill and no breeding has occurred in the last decade. Using decoys and tape recordings of murre vocalizations, biologists plan to attract murres back to the rock and encourage them to breed there once again (HMBR 1996). These techniques were pioneered in Maine for Atlantic Puffins (*Fratercula arctica*) and Common Murres by Steve Kress of the National Audubon Society who also is cooperating in this California restoration effort.

This project is funded from the 1994 settlement related to the *Apex Houston* oil spill and represents the joint efforts of three trustee agencies: USFWS, National Oceanic and Atmospheric Administration, and California Department of Fish and Game. During this spill, records of seabird rescue and mortality at the Reserve played an important role in assessing overall mortality, as did records from many rehabilitation centers in Central California (see Page and Carter 1986, Carter et al. 1987, Page et al. 1990). Restoration

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Rehabilitation Notes: The Mallard (*Anas platyrhynchos*)

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Abstract

This paper deals with the techniques and information needed to successfully raise, in a rehabilitation situation, orphaned, healthy Mallard ducklings for eventual rerelease into the wild.

Key Words: Mallard Duck, orphan duckling, identification features, captive rearing techniques

Introduction

The Mallard, is a medium-sized dabbling duck, 20" to 27" (50-71 cm) for the male, with the female averaging slightly smaller (Bellrose, 1976; Peterson, 1990). The average adult weight of a mallard drake is 2.75 pounds, and the hen 2.44 pounds (Bellrose, 1976). They are the most abundant and widespread of the dabbling ducks (Bellrose, 1976) and are generally found in the marshy, wetland areas of the Northern Hemisphere. The drake has a striking deep green head, and an obvious white neck ring. His breast is chestnut in color, his bill yellow, feet orange and speculum blue. The adult male has one or two curly black feathers at the base of his tail. The hen is a speckled brown with a speculum similar to the drake, although there is a line of white feathers on both sides of the blue stripe (Peterson, 1990). Breeding throughout its range, the Mallard can be found as a permanent resident in most areas, except the mid-to-northern sections of Canada. Some flocks overwinter in the southern United States in the same territory as the Mexican Duck.

Like the majority of ducks, the hens are the more vocal, uttering loud "quacks" while the drakes have more subdued voices. Without physically sexing the ducklings, it's impossible to tell whether they are male or female until they reach an age, at roughly seven to eight weeks, where their voices begin to change (Holderead, 1978). Occasionally, behavior will indicate the sex at an earlier age.

Natural Diet

Dabbling ducks are surface-feeders that upend in shallow waters for aquatic plants, insects and other small aquatic life (Peterson, 1990). Mallards prefer a diet high in fiber consisting primarily of grain-producing plants like corn and barley (Martin, Zim & Nelson, 1951). Supplementally, they will catch water beetles and their larva, dragonfly and damselfly nymphs as well as other aquatic insects (Martin, et al., 1951). There have been reports of Mallards catching and attempting to eat small fish but these have not been substantiated in the literature. However, mainstays of their diets such as duckweed, wild rice, pondweed, corn, smartweed and oats can be found in wetlands throughout the world (Martin, Zim & Nelson, 1951).

Behavior

Generally good-natured, mallards do maintain a distinct pecking order within their flocks (Holderread, 1978). There are dominant drakes as well as dominant hens (Armstrong, 1965). These dominant members do not normally fight with the opposite sex, but maintain their pecking order within their own sex. Ducklings will begin to demonstrate this pecking order behavior at a very young age - two to three days.

The most vociferous of all game ducks (Bellrose, 1976), the mallard has a variety of calls. Indeed, the hens, in particular, display a range of quacks and noises alerting the remainder of the

flock to good feeding locations and inner-flock disputes. Like other ducks, mallards recognize each other by way of certain "keys": colors, movements and sounds (Armstrong, 1965). Indeed, Armstrong cites observations of mallard hens responding to the distress call of any young duckling. However, once realizing it is not one of her own brood (incorrect coloration being the key here), she will drive it away or, conceivably, kill it (Armstrong, 1965).

Identification

It is not difficult to distinguish adult Mallards from other ducks nor to distinguish males from females. However, one of the more difficult tasks facing a rehabilitator is distinguishing between wild mallard ducklings, escaped domestics, hybrids and the young of other breeds.

Adult domestic mallards, for the most part, have longer bodies, longer tarsi (legs), shorter bills and heavier weights (Bellrose, 1976) than wild mallards. They also tend to be larger in size with a larger breast area. Adult weight can be deceptive, so additional criteria should be examined to achieve positive identification.

Because domestic ducklings closely resemble their wild counterparts (Bellrose, 1976), it can be very difficult to distinguish between domestic and wild. Wild ducks are, generally, smaller than domestics; but than is not a hard and fast rule and should not be the only guideline used for identification. Therefore, coloration and behavior are, in the author's opinion, the only consistent indicators of wild breeding.

Experience will show that although all ducklings behave similarly, wild ducklings are much warier than domestics. Indicators of this behavior will be fleeing, crouching, followed by freezing in place and general terror at the presence of humans, or at any time they feel in danger. This determination requires experience gained by close observation of known wild ducklings. Once seen, this behavior is quite easy to spot.

Coloration is a much easier key to wildness (Holderread, per. com). The wild duckling will have a longer and more slender bill than a domestic. Wild ducklings will generally be brighter in their coloration. That is, the black will be very black, the yellow very yellow. A pale yellow color and sooty black are good indicators of the dusky gene carried by many domestic mallards. In addition, most Northern Mallard ducklings will have a single ocular stripe whereas many domestics will have double stripes or one through the eye and one below (Nelson, 1993). Foot coloration is also a good indicator. Dark webbing and lighter toes will indicate a wild duckling whereas the reverse or a mottled appearance to the feet will indicate a domestic. A bit harder to see without ruffling the feathers of domestic ducklings, is a break in the black stripe that runs from the top of the head, down the neck to the back.

A common confusion arises in areas where Wood Ducks and Mallards are present, as the appearance of the downy young are very similar. The singular ocular stripe of the mallard will run from the bill to the back of the head, through the eye. The wood duck, however, has a singular eye stripe that runs from the back of the eye to the back of the head. In addition, the wood duck has a more musical peep, is generally smaller with highly excitable behavior. Although all young ducklings are quite good jumpers, the wood duck can leap much higher and will do so continuously in an effort to escape. By contrast, a young mallard will jump only when it perceives danger present, its jumping efforts ceasing, for the most part, as soon as the threat is no longer visible.

Nesting

Like the Gadwall (White, 1990) the Mallard hen holds primary responsibility for the incubation and rearing of the young ducklings (Nelson, 1993) and most mallards, with the exception of the latest born juveniles, breed their first year (Bellrose, 1976). Pairs begin to form in late fall/early winter, with the majority of ducks paired by late January (Bellrose, 1976). The hens look for secluded, quiet nesting locations that, although generally away from water (Udvardy, 1997), are located near marshy areas where food and cover is plentiful. They do, however, have a propensity to nest in unwanted areas of human habitation such as backyards where swimming pools are present, or on the edges or center dividers of highways. A primary nesting consideration seems to be the availability of cover for the nest (Bellrose, 1976).

Laying one egg each day, the female will begin brooding when her clutch reaches 8 to 10 eggs. Once brooding begins, the pair bond begins to dissolve and the hen will incubate her clutch for 26 to 30 days (Bellrose, 1976). She will continue to incubate unhatched eggs for up to 12 hours after the birth of the first duckling. At this time, the hen will lead her young to the nearest water, normally no farther than a few yards away. However, upon occasion, hens have been known to travel as far as 1 mile to reach a body of water (Bellrose, 1976). She may return to the nest for a day or two to brood the hatchlings at night or in foul weather (Bellrose, 1976). Hatched precocial and downy, the duck-

lings are unable to fully regulate body temperature; and their downy feathers offer little waterproofing. Subject to predation from air, water and land in the form of gulls, crows, ravens, fish, eagles and hawks, only one duckling, on average will survive to adulthood (Bellrose, 1976). Mammalian predation may include skunks, coyotes, raccoons, opossums and rats (Bellrose, 1976).

Feathering begins at about 18 days of age and by the 46th day, the head and body is fully feathered (Holderread, 1978). Preliminary flight ability is achieved by 60 days of age (Bellrose, 1976).

Care of Young

Although not difficult to raise, ducklings can become waterlogged and hypothermic quite easily. It is necessary, therefore, to keep them from becoming saturated the first few weeks. Using a specially designed brooding system (Rodgers, 1994), the author was able to keep the ducklings dry and warm. The first week, Mallard ducklings should be placed under a heat lamp with an enclosure temperature of 90°F (Rodgers, 1994). The lamp should be suspended over the enclosure so as to allow the birds access to cooler areas or corners, to prevent overheating (White, 1990; Rodgers, 1994). The temperature should be reduced five degrees each week thereafter until supplemental heat is no longer required (Holderread, 1978). Generally this is when they have substantial feathers at around five weeks.

Because entire broods often come in to rehabilitation due to the death of the mother, it's important to maintain a reasonable flock size within each brooder. The author has found that 10 to 12 ducklings in one 45" to 60" wading pool/brooder setup (Rodgers, 1994) will give the young birds sufficient room to move around without creating overcrowding, unsanitary conditions or incidents of trampling. Until the age of three weeks, ducklings can be kept in a minimum of .75 square feet per duckling (Holderread, 1978). Additionally, a feather duster positioned in the brooder can help comfort single or small numbers of ducklings. The author does not, however, recommend that a feather duster be used for broods consisting of more than three ducklings, as the duster can then become a hazard. Because all ducklings will run, en mass, to the farthest corner of the brooder from the perceived danger, any object placed within the brooder may present a roadblock for them to trip over. This can cause leg and foot injuries, as well as trampling in larger broods.

It is also wise if a single duckling is brought in (particularly at the end of the season when this is most likely to occur), to purchase or obtain a domestic duckling of the same age for companionship. The comfort level this will afford a wild duckling will be well worth the effort it may take to locate a domestic companion late in the season. Any duckling can be placed into an existing group provided the duckling is reasonably close in age. That is, within a couple of days of the average age of the brood. A duckling that is too young has neither the size nor maturity to deal with older brood mates and is likely to become trampled or picked on. A duckling that is too old will be avoided by its conspecifics. A certain amount of pecking and pushing will occur when the new member is placed in the brooder and, although normal, should be monitored. The author recommends leaving them alone for a few minutes or observing from a location out of sight of the ducklings. In most cases the ducklings will work out the pecking order situation and the new duckling will be accepted without difficulty. There are, however, rare instances when an existing brood will simply refuse to admit a newcomer for one reason or another. If this should occur, the new duckling and one of similar age/size should be removed and placed in a separate brooder as remaining with the brood may prove hazardous and uncomfortable. Additionally, it is not recommended that injured ducklings be placed in a brooder with healthy ducklings.

The author recommends placing different breeds of ducklings in separate brooders as opposed to mixing them together (e.g. wood ducks and mallards). The author feels that behavior patterns, habitat needs, and sizes are sufficiently different to increase the potential for social problems.

Although fostering may seem a viable solution, it is a rare hen that will accept young other than her own. In most cases, the hen will violently drive the intruder away and, occasionally, drown or kill an individual (Armstrong, 1965). The ducklings are then forced to spend time outside the influence of the hen's warmth and protection, thereby becoming hypothermic as well as easy prey. It is the author's opinion that subjecting a duckling to the stress of rejection followed by a second capture by humans is unnecessary and should be avoided.

The author does not recommend the use of brood chicken hens as foster mothers. Chickens have different behaviors, needs and habits that can cause some difficulties for young ducklings. Additionally, chickens often are infested with lice and mites and must be treated prior to the introduction of a foster duckling.

The first two to three weeks, the author

provides water in a chick fount-style watering device (available at all feed stores) using either a pint or quart jar, depending upon the size of the brood (Rodgers, 1994). It is extremely important that fresh water be available to ducklings at all times (White, 1990). The author will often place small marbles or pebbles in the dish portion of the fount base, to prevent the more adventurous ducklings from splashing too vigorously (White, 1990). Because ducklings grow extremely rapidly, the author's first choice of feed is a high-protein feed, Trip-L-Duty, produced by Albers Pacific Northwest Milling. However, there are several non-medicated, high protein/calcium supplemented, nutritionally balanced poultry feeds available that will work as well. Ideally, feed should consist of the following: 20-22% protein level for the first two weeks, followed by 16% to 18% protein for the remaining eight to 10 weeks (Holderread, 1978).

Feed should be provided to the ducklings in an open, untippable food dish so several birds can feed at one time (Rodgers, 1994). It is also important to watch any left-over feed for signs of mold which can be deadly to young ducklings. Due to its propensity for molding quickly, the author suggests that, if using Triple Duty or a similar poultry feed, the dish should be cleaned each time fresh feed is offered.

Because mallards are grain eaters, fine grit (parakeet grit available at feed and pet stores is a good size for young birds) should be available to the ducklings at all times if not present in the commerical feed being fed (Holderread, 1978). This can be offered in a dish or sprinkled on the surface of the feeding area. As the ducklings age and have greater access to soil, they will begin to pick up their own gravel and appropriate-sized pebbles as they filter dirt through their bills. Additionally, if the weather permits, the brood should be taken outside for at least 30 minutes of natural sunlight per day (White, 1990; Rodgers, 1994). If it's difficult or impossible to provide natural sunlight, a low-hanging Vitalite ™ bulb is recommended as an efficient substitute. These bulbs may be purchased at any pet store.

Oyster shell gravel available at any feed store can also be beneficial to older ducklings as it contains calcium. If this is offered, it should be on a free-feed basis as the ducklings will take it if so desired when they reach an appropriate age.

Beginning at the end of the second week, the author introduces shallow, clean water troughs (White, 1990; Rodgers, 1994) allowing the ducklings to swim and bathe. These can be placed outdoors in a protected area offering partial shade to allow the babies to begin acclimating to life outside. This also gives the young birds an opportunity to sample the various seeds and grasses that will become a normal part of their diet. They will begin to dig and strain water and mud through their bills at this stage. It's important, however, that they not become chilled, so they should be observed frequently for signs of discomfort or wetness in the breast area. It is easy to assume ducklings are dry because their fluffy backs and upper bodies tend to disguise any wetness on the underside.

As the brood becomes older, the size and depth of the pool can be enlarged until, at five or six weeks of age they can be provided a children's-size wading pool with easy access in and out of the water. This allows the ducklings to enhance their waterproofing, as well as perfect their swimming and diving skills. The author offers the ducklings an outdoor pen at this point. Completely enclosed and constructed of 2" x 4" hog wire on a wooden frame, the pen contains a plywood "house" with a 100 watt light bulb for added warmth. There is an access hole cut on one side of the "house" with the back side designed as a removable panel for cleaning. Within the pen is a 60" plastic children's wading pool with a ramp provided for exterior access and cement stepping stones stacked on the inside for preening/exiting ease. Until they are fully feathered, it's not a good idea to allow constant access to this swimming area. Therefore, the author has a fence panel that can be placed across one side of the swimming area to keep the ducklings out at night or when frequent observation is not possible. However, when leaving ducks outside at night, the presence of local predators such as weasels or skunks that dig, must be considered.

At the point of full feathering (eight weeks) but prior to release (10 to 11 weeks) the author then places the ducklings in an adjoining preflight pen. This pen is larger, approx. 1/8 acre, allowing longer distances for short flights and running exercise, enabling the ducklings to build up their flight and leg muscles before release. This is a good opportunity for them to learn take offs and landings in a protected area.

Common Health Problems

Generally hearty and healthy, mallards occasionally fall ill from a variety of causes. Like any bird, they can contract Aspergillosis but this is rare in ducks and can be very difficult to diagnose. Aspergillosis, however, is the only disease carried by mallards that is common to man.

The majority of problems suffered by mallards are injuries, nutritional imbalances, or food-related diseases like Botulism. The author will

attempt to briefly cover the types of problems a rehabilitator may encounter with wild ducks.

Feed and Nutrition-related Problems

Botulism is the most serious form of food-poisoning that is found in mallards. The disease is caused by a toxin found in decaying plant and animal material. As lake beds and wetlands dry in the warm season, rotting vegetation is readily available to foraging ducks. Extremely deadly, botulism can kill in three to 24 hours. The exception being a mild case in which event the duck may recover, provided it doesn't perish from a related problem such as paralysis while swimming. Signs can include loss of muscle control in the neck, wings and legs, easily extractable feathers, and the bird may be comatose (Holderread, 1978). Emergency treatment is performed by administering balanced electrolyte solutions orally as soon as possible. If the duck is unable to drink itself, assistance should be provided.

Hardware Disease is another problem related to feeding. It is caused by the ingestion of various small, non-lead, metal or easily consumable objects by foraging ducks. These can include nails, staples, pieces of wire or string (Holderread, 1978). Causing perforation of tissues or impaction of crops, the result is often death. Signs include slow weight loss, refusal to eat, sitting with half closed eyes as if in extreme pain, emaciation. If the object is causing a crop impaction (normally caused by swallowing string), the crop may be opened by a veterinarian and the object removed giving the bird a good prognosis. Perforated esophagus or portions of the intestinal tract, may, however, result in death or the need for euthanasia.

Angel wing (or slipped wing) is a condition found in many species of waterfowl. Easily identified, the tip of the wing is turned outward at the wrist joint when the wings are folded. Some success has been observed when diagnosed early by positioning the wing correctly and taping it to the body of the bird. While not generally seen in the wild, it is a common nutrition-related problem suffered by waterfowl raised captively. Angel wing is caused by a high level of protein in the feed of young birds (Kreeger, 1984). Although 22% protein is acceptable for the very young, it is a borderline number and protein levels should be kept below 22% as the birds grow (Holderread, 1978).

Vitamin D deficiency or Rickets is caused by a lack of Vitamin D and/or lack of calcium, in the diet. Signs include weak , bowed or broken legs and stunted growth. Normally, birds are able to manufacture enough Vitamin D to meet the their requirements. However, if the birds are in a rehab situation where natural sun is unavailable for at least 30 minutes a day (White, 1990; Rodgers, 1994), a good substitute is a Vitalite ™, which will provide a sufficient amount of correct light for the body to fulfill its need for Vitamin D. Calcium levels are generally adequate in commerical duck or turkey chows.

Leg and Foot Problems

Bumblefoot is a bacterial infection of the foot characterized by sore callouses on the underside of the foot (Holderread, 1978). Bumblefoot in ducks is usually caused by poor foot surfaces concurrent to some insult (e.g., bruise) to the foot. Because mallards in the wild spend a percentage of their time in water or soft mud, their feet may become lame if forced to spend all or much of their time on solid surfaces, especially hard-packed dirt, asphalt or concrete. Bumblefoot can be prevented by providing uneven foot surfaces (6" of pea gravel) with good drainage and constant acess to a pool deep enough for the bird to float with its legs extended (as for swimming). Bumblefoot is difficult to treat and is more effectively prevented. As with other bacterial infections, appropriate antibiotic therapy can be attempted.

Spraddled legs are a common problem seen in captive ducks being raised in a smooth-floored brooder. Symptoms of spraddled legs include the legs doing just that, spraddling and slipping out from under the bird. Birds should be provided with non-slip surfaces to prevent this problem.

Injuries

Garbage cuts are common among young ducklings. Often times, a duckling will have been chased when captured and may suffer cut feet from broken glass or similar materials. In minor cases, cleansing with a diluted solution of Nolvasan™ (chlorhexidine) or other anti-bacterial cleanser will be sufficient.

Cat bites are occasionally seen in live ducklings. Unfortunately, the birds are so fragile that a cat will often crush the young bones and internal organs without outward sign of injury. However, if the wound is a puncture wound, it should be cleaned and the duckling placed on antibiotics. The author recommends consulting a veterinarian for correct dosage and type of antibiotic. If several injured orphans are brooded together, a water-soluble antibiotic can be used.

Leg injuries, often in the tarsi, are probably the most common injury occurring in young ducklings. The break should be immobi-

lized and the bird transported for veterinary care as soon as possible. If the break is part of a compound fracture, care must be taken to make sure the bone is covered, bleeding stopped, and the duckling is stable prior to transport.

Release

Ducklings can be released into the wild at a suitable location at around 10 weeks. By this time they are able to fly sufficiently well to avoid predation and are sufficiently skilled to seek out natural food without human-offered supplementation.

Although all ducklings are born precocial, the hen will teach them where to look for food. Normally, while feeding, hen Mallards will maintain a continuing verbalization with their brood using special "contentment" calls (Nelson, 1993). When a good feeding location has been discovered, the ducklings will rush to her side and emulate the mud straining behavior she demonstrates. This behavior is instinctual and the orphaned ducklings will begin to strain mud at around two weeks of age when their bills have hardened sufficiently. At three to four weeks they will begin displaying foraging behavior. Because Mallards are dabling ducks, ducklings will attempt to eat nearly everything, therefore it is not necessary to "teach" them what to eat. However, they should be given access to wild-type foods.

When a release site is sought, care should be given to ascertain the presence of other waterfowl (preferably other Mallards) as this will indicate the availability of food and water at the site. The ideal release site will offer a quiet, secluded environment with a variety of waterbird life. Favorite cover for mallards has been shown to include whitetop, sedge and bulrush (Bellrose, 1976) and this can be found along the edges of most ponds and lakes or as part of wetland flora.

Ducks are diurnal and so should be released as early in the day as possible. Releasing ducks in the evening may not give the bird sufficient time to acclimate itself to new surroundings, find food and a safe place to spend the night (White, 1990).

Mallards should be checked for waterproofing prior to being released. If they have had access to swimming water prior to release, this should not be a problem.

Birds should have a normal hemogram. The packed cell volumes for young adult mallards are between 40-44% (White, unpublished data). Normal total proteins for young mallards are between 3.5-5.0 g/dl (White, unpublished data).

It should be noted that new USDA regulations require wildlife veterinarians to obey withdrawal times on medications for all game species. This means that any time a rehabilitator is using medication (commonly antibiotics) for adult or young ducklings, the birds may not be released until the medication's withdrawal time has passed. Basically, this means the bird will need to be kept for an allotted number of days *after* the last dose of medication has been administered. If you are medicating any game animal, consult your wildlife veterinarian prior to release for the correct withdrawal time.

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Products Mentioned in the Text

Trip-L-Duty™ feed: Albers Pacific Northwest Milling, Portland, OR 97203.

Vitalight™: Pet Pals, Discount Food and Supplies, 3660 Soquel Dr., Santa Cruz, CA (408) 464-8775.

Nolvasan™ disinfectant: Nasco Farm & Ranch, 4825 Stoddard Rd. Modesto, CA (800) 558-9595.

Continued from pg 6

results to date have been very encouraging. In the 1996 breeding season, 6 eggs were laid, 3 chicks fledged, and up to 29 birds attended Devil's Slide Rock at any one time (Parker et al. 1997). This project has been the first in the world to restore breeding to an extirpated colony of Common Murres. Restoration efforts will continue for many years to build the colony up to hundreds or thousands of breeding birds.

Final Comment

Wildlife rehabilitators and other biologists must work together to document the impact of oil spills and chronic oiling on seabirds, as well as improve rehabilitation and restoration efforts. As part of this overall process, accurate records of all oiled birds found throughout the year must be maintained at rehabilitation centers which, at minimum, indicate the species of bird involved and the date and exact location where oiled birds are found on beaches and shorelines. People collecting oiled and injured wildlife from beaches must record this information and transfer it to the rehabilitation center with the bird(s). Efforts should be made to collate all available rehabilitation center data over the past few decades into computer databases to better summarize known impacts of small or undocumented oil spills during this period. Efforts should be made to track down information from previous rehabilitation centers, such as the Native Animal Rescue Center in Santa Cruz which closed recently. If an effort is not made to collate past data, there is a strong likelihood that substantial portions of data will be lost forever. Collations of present and future data will be facilitated by keeping current databases up to date. One day, we can hope that wildlife rehabilitators will collate oiled and injured seabird data from throughout the year for the entire central California coast over a 25-year period to better describe and assess the impacts of oil pollution. I hope that this article will help wildlife rehabilitators, as well as Reserve rangers, to identify this role and develop future plans to more fully participate in this important process.

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Director of Operations, Laguna Beach, CA

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Social and Behavioral Well-being of Captive Bats

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Abstract

Although some physical needs of bats are chronicled in the literature, little information exists on the importance of the psychological aspects of bats in captivity. An increase in the psychological well-being of bats in captivity should increase their chances of survival when introduced back into the wild. Environmental enrichment and social needs of bats is discussed, and a table provides information on the social behavior, colonial clustering, relative success in captivity, and suggested flight cage sizes for the indigenous bats of the United States and Canada.

Key words: captive bats, psychological well-being, bat rehabilitation

Introduction

Over the past 10 to 15 years bats have become more commonly studied by researchers, more popular as display animals in zoos, and more often brought into a wildlife rehabilitation center, mainly from an increase in public awareness though groups such as Bats Conservation International.

There are over 900 species of bats, and our knowledge about them is limited compared to most other vertebrate species. Most information regarding bat rehabilitation and husbandry is directed towards providing a proper diet, containing them hygienically, and providing proper caging with temperature controls. To my knowledge, there exists little if any information in the literature regarding the psychological well-being of captive bats.

Blood and Studdert (1988) define animal welfare as "maintaining appropriate standards of accommodation, feeding and general care for the prevention and treatment of disease..." The American Veterinary Medical Association (Anon. 1990) defines it as "all aspects of animal well-being, including proper housing, management, nutrition, disease prevention and treatment, responsible care, humane handling, and, when necessary, humane euthanasia." Some authors recognize the specific importance of psychological factors as part of the health and well-being of captive animals. Fraser (1989) defines an animal's well-being with both physical and psychological components, and states that these normally coexist. The author also suggests that psychological well-being, is evident in the presence of normal behavior and the absence of substantial abnormal behavior. Hurnik (1988) defines animal well-being as "a state or condition of physical and psychological harmony between the organism and its surroundings." Most common species of bats have been studied enough to allow researchers access to literature on "normal" behavior in the wild, although a state of well-being may be difficult to assess in lesser-known species. Nonetheless, it is evident that the psychological well-being of an animal may affect its physical well-being and vice versa (Olfert et al. 1993). Therefore, captive bats should be maintained in a state of physical and behavioral well-being in order to successfully reintroduce them into the wild with the best possible chances of long-term survival.

Environmental enrichment

Environmental enrichment is defined by Beaver (1989) as, "additions to an animal's environment with which it can interact." Beaver (1989) suggests five different ways in which non-human primates' social and behavioral well-being may be promoted through improving the animals' environment: Behavioral enrichment created by an environment similar to the wild habitat, social peers, artificial appliances, food gathering activi-

ties and control of non-food items.

The amount of space should be appropriate to the species, but simply increasing the amount of space in a given cage does not necessarily promote better space utilization (Line 1987, Fajzi et al. 1989), nor does it necessarily improve the well-being of an animal in captivity (Novak and Suomi 1988). Some bats have narrow wings or high wing ratios creating a need for a larger area for flying, such as Big Brown Bats (*Eptesicus fuscus*) (Kunz 1988). I suggest that the size of any cage or flight room take this into consideration. Certainly Big Brown Bats need wider areas to fly than a bat with a low wing ratio such as Little Brown Bats (*Myotis lucifugus*). Table 1. lists suggested flight cage sizes based on the morphology of each species. I do not recommend flight cages for the larger molossids since they often fly into walls in captivity (Barbour and Davis 1969).

Crockett (1990) suggested that innovative ways of providing food to monkeys are effective in enhancing well-being, especially of animals individually caged with no opportunities for social interactions. Foraging tasks provide the animal with challenges to help prevent boredom, and also provide exercise (Kaman et al. 1987). Mac Donald (pers. comm.) suggests that gorillas given foraging tasks, are less bored and exhibit behavior closer to that found in the wild.

In a flight room 10 feet by 12 feet by 8 feet high, I gave Pallid Bats (*Antrozous pallidus*) simple foraging tasks designed to mimic situations in the wild. By providing these tasks, captive bats got regular exercise in addition to solving tasks similar to a wild situation (i.e., the detection, capture, and handling of each prey item). In 1993, I released 6 pallid bats that were in captivity for about 8 weeks. The following year, I recaptured two of these and in 1995, I recaptured a third bat making a 50% recapture rate. Fenton (pers. comm.) suggests that it's unusual to observe wild bats that were once acclimated to captivity. Barnard (1991) suggests that flying exercise is not important to the good health of bats. I suggest that if captive bats are to be released back into the wild, they should get regular flying exercise to improve survivorship. Not only does this provide exercise to improve the physical condition of the animal, it may also help prevent boredom.

Social needs

The social needs of rehabilitating, research, or educational animals should be given equal consideration with environmental factors such as lighting, heating, ventilation and caging (Olfert et al. 1993). Many bats are solitary during most of an annual cycle (e.g., Hoary Bat, *Lasiurus cinereus*, Red Bat *L. boreas*, while other species are colonial and form groups (e.g., Pallid Bat, MexicanFree-tail Bat *Tadarida braziliensis*, and theLittle Brown Bat (Table 1). Although need for social behavior is not addressed in the literature for bats in captivity, much work has been done to establish the need for other social mammals to continue social contact to remain healthy and behaviorally normal.

Olfert et al. (1993) suggested there are four ways in which social animals' well-being may be threatened while a group of animals is being established: first "space is insufficient for maintaining behavioral adequate distance; feeding or resting space for all individuals is insufficient; or when feeding and resting cannot be accomplished concurrently; regrouping is performed so frequently that animals must repeatedly undergo the stabilization process; and, group sizes are inappropriate for the species".

Wilson (1988) states that individual bats are often ostracized when introduced into an already established colony. I found this to be true for captive pallid bats. Social bats should not be housed singly unless required by a medical condition or aggression. Without specific controls, I have observed that pallid bats changed their behavior when housed separately after being housed with individuals from the some colony. A pallid bat housed in the Bat Lab at York University appeared more irritable (more likely to bite during handling after it had been separated for a few days). Another Pallid Bat housed in the lab usually appeared more lethargic and inactive after it was housed singly. Although these observations were not part of a formal study, they are consistent with observations made in many studies on dogs (review by Beaver 1981) and on non-human primates (Reinhardt 1990).

Crockett (1990) states that the best psychological enrichment is social enrichment for non-human primates. Thus, by providing opportunities for social interactions, these animals can better cope with the two main problems associated with captivity: boredom and fear. The author suggests that social interactions appear to provide the best source of stimulation and the best source of emotional security. Segal (1989) concludes in a review that several authors independently reached the conclusion that "the single most important thing one can do to enrich the life of a captive primate is to provide it with a companion animal". I have found that some bats of different species choose to roost together, both in the wild and in the laboratory situation. Pallid Bats often roost with Mexican Free-tailed Bats and sometimes with Big Brown Bats. Caution must be taken not to mix sizes of bats; HoaryBats and even Pallid Bats often eat smaller bats in captivity. Since bats of

the same species often have different personalities, one might expect that some individuals will have slightly different needs to interact with other individuals.

Summary

Although no studies have been made regarding the well-being of bats in captivity and their requirements for psychological balance, one might predict that the behavior of bats will be altered if individuals are under "emotional" stress. Social bats will need companions in captivity to help provide stimulation and emotional security, and solitary bats should have a minimum of contact with the animal caretaker or other bats. Many environmental factors may contribute to captive bats' psychological well-being. It seems clear that we need more information on the social and behavioral needs of bats in captivity, especially to provide them with the best possible chance of being reintroduced into the wild after any captive situation, through rehabilitation, research, or education.

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Author Profile

Dave Johnston received his Ph.D. in Biology working on the diet and learning abilities of pallid bats under Prof. M. Brock Fenton at York University in Toronto, Canada. Dave formerly administered the Youth Science Institute in California for 16 years and has worked with captive bats for over 5 years. He currently works for H.T. Harvey and Associates, a biological consulting firm.

Key to Abbreviations in Table 1 (page 18).

Type of social behavior (adapted from Bradbury 1975)

0 - Sexes are separate except for mating and mother-offspring association
1 - Sexes segregate at parturition, sexes together during other times
2 - sexes together all times of the year

Relative success in captivity (adapted from Wilson 1988, Barbour and Davis 1969, Constantine 1978, and Rasweiler 1977)
Scale of successful maintenance (0 - 3). 0 indicates no success.

Table 1. Considerations for the Well-being of Bats in Captivity

Bat species in the United States and Canada	Social behavior	Colonial	Relative success in captivity	Suggested Flight cage size
Phyllostomatidae				
Mormoops megalohylla	0	yes, not in clusters	?	10' x 10' x 8'
Macrotus waterhousii	1	yes	3	10' x 10' x 8'
Choeonycteris mexicana	1	yes	2	10' x 10' x 8'
Leptonycteris nivalis	1	yes	2	10' x 10' x 8'
Leptonycteris sanborni	1	yes	2	10' x 10' x 8'
Vespertilionidae				
Myotis lucifugus	1	yes, large	3	10' x 10' x 8'
Myotis yumanensis	1	yes, size varies	2	10' x 10' x 8'
Myotis austroriparius	1	yes	1	10' x 10' x 8'
Myotis grisescens	1	yes	?	10' x 10' x 8'
Myotis velifer	1	yes	2	10' x 10' x 8'
Myotis occultus	1	yes	?	10' x 10' x 8'
Myotis septentrionalis	1	yes, not in clusters	1	10' x 10' x 8'
Myotis keenii	1	yes, not in clusters	2	10' x 10' x 8'
Myotis auriculus	1	yes, not in clusters	?	10' x 10' x 8'
Myotis evotis	1	yes, small clusters	2	10' x 10' x 8'
Myotis thysanodes	1	yes, large colonies	2	10' x 10' x 8'
Myotis sodalis	1	yes, large colonies	2	10' x 10' x 8'
Myotis volans	1	yes	?	10' x 10' x 8'
Myotis californicus	1	yes, small colonies	2	10' x 10' x 8'
Myotis leibii	1	yes, small colonies	2	10' x 10' x 8'
Lasionycteris noctivagans	1	yes, size varies	2	10' x 10' x 8'
Pipistrellus hesperus	1	solitary, small clusters	?	10' x 10' x 8'
Pipistrellus subflavus	1	solitary, small clusters	1	10' x 10' x 8'
Eptesicus fuscus	1	yes, size varies	3	20' x 20' x 8'
Lasiurus borealis	0	no	1	20' x 20' x 8'
Lasiurus blossevillii	0	no	?	20' x 20' x 8'
Lasiurus seminolus	0	no	2	20' x 20' x 8'
Lasiurus cinereus	0	no	2	20' x 20' x 8'
Lasiurus intermedius	1	yes	?	20' x 20' x 8'
Lasiurus ega	?	solitary, small clusters	?	20' x 20' x 8'
Nycticeius humeralis	1	large colonies	2	10' x 10' x 8'
Euderma maculatum	?	?	0	10' x 10' x 8'
Plecotus townsendii	1	yes, size varies	0	10' x 10' x 8'
Plecotus rafinesquii	1	yes, size varies	?	10' x 10' x 8'
Idionycteris phyllotis	1	yes	?	10' x 10' x 8'
Antrozous pallidus	1	yes, size varies	2	10' x 10' x 8'
Molossidae				
Tadarida brasiliensis	1	yes, up to very large	1	20' x 40' x 10
Tadarida femorosacca	1	yes, small	?	not recommended
Tadarida macrotis	1	yes	?	not recommended
Eumops perotis	2 and 1	yes	?	not recommended
Eumops underwoodi	1	yes	2	not recommended
Eumops glaucinus	?	?	0	not recommended

See page 17 for key to abbreviations used in the table.

In Memoriam

Judi Jones—Her Memory Continues to Shine



The marine Mammal rehabilitation field has suffered a great loss since Judi Jones passed away on January 13, 1997. Judi was the Director of Operations at the Friends of the Sea Lion Marine Mammal Center in Laguna Beach, California for the past eight years. Judi, a former pediatric nurse and business office manager, began volunteering at the center 13 years ago eventually taking the lead position. Her dedication to the animals was evident from day one. Her vision, which would shape the development of the center, was to create a cohesive team that worked well within as well as with other stranding network facilities.

Judi always strived to attain the best quality in animal care and professionalism for our facility. Her compassion, knowledge and untiring dedication to these animals were instrumental in the Center's achievements. Although we are a small organization, Judi stood tall among environmental leaders.

Judi was more than a director to the people with whom she worked. She was an incredible inspiration, teacher and friend. She always taught us with guidance and patience. She instilled confidence and gave the volunteers recognition for their efforts. One of Judi's greatest legacies was that she left behind a group of well-trained staff and volunteers to carry on the operation of "Friends of the Sea Lion Marine Mammal Center". We hope she is proud of us, we will always miss her.

Michele Hunter and Colleen Haley
Animal Care Supervisors
Friends of the Sea Lion Marine Mammal Center

Editorial continued from Page 2

had to be how to work within the structure of the agency, providing assistance where we could, to help them help us. We hope our efforts can serve the international wildlife rehabilitation community as well.

We discussed creating a packet that would be mailed to each state currently without regulations governing wildlife rehabilitation, or in some cases, recognizing wildlife rehabilitation as a viable classification. The packet would include a letter written jointly by Elaine Thrune, NWRA President, and myself, Marge Gibson, IWRC President. This letter could introduce wildlife rehabilitation, acknowledge issues the agencies told us they faced, discuss aspects of wildlife rehabilitation the agencies were most frequently unclear about, and, finally, offer solutions.

One of the clearest signals to the agencies that wildlife rehabilitators have a valid position in the wildlife community, is the citizen's increased request for care for injured wildlife. As our population grows, so does it's interaction with wildlife. Some states admitted the issue of "need", but got lost in the shuffle of day to day work with governmental agencies. From the government's perspective, recognizing the profession of wildlife rehabilitation and setting standards, rules, and perhaps administering a test, is time consuming, and, frankly, our profession is not well understood. There were those functioning as overseers for wildlife rehabilitation that

Financial Report

IWRC
Revenue & Expense Statement
January 1, 1996 to December 31, 1996

REVENUES	
Skills Seminars	82,633.58
Conference	28,513.50
Literature	18,867.73
Membership	58,056.96
Standards & Accreditation	969.45
Research Contributions*	840.00
Interest Income	1,634.88
Donations & Miscellaneous Income	2,385.74
	$193,901.84
EXPENSES	
Acct. Fees/Bank Charges	$ 4,510.20
Skills Seminars Expenses (partial)	18,030.10
Conference related costs (partial)	9,286.04
Equipment Rental	2,743.67
Health Insurance	1,539.90
Liability/Board Insurance	4,256.39
Office Expenses	13,522.90
Postage/Shipping	15,483.83
Printing/Xerox machine costs	25,163.28
Journal of Wildlife Rehabilitation	11,992.62
Refunds/Return Items	1,545.00
Office Rent/Utilities	7,956.35
General Supplies	4,430.29
Sales Taxes	1,547.18
Communications	1,410.97
Travel (Skills Seminars, Conference, BOD)	11,855.02
Wages & Payroll taxes (2 Part-time & 1 FT Positions)	33,947.88
	$169,243.96
*1996 Net Income**	*$24,657.88*

**IWRC matches the research funds on a 1:1 basis out of the net income.*

Editorial (cont'd)

were unsure of what "it" was exactly, or how to get solid information on the subject. Many did not know who to trust when seeking information; we realized we held the key. A statement of needs and justification would also be part of the packet.

While we realize there is much more work ahead, we have found our involvement, on your behalf, to be not only encouraging, but energizing as well. The possibilities and potential to make a difference for you, your wild patients and wildlife rehabilitation as a profession, is tremendous!

-Marge Gibson, IWRC President-
-Elaine Thrune, NWRA President-

Announcements

"The Effects of Oil on Wildlife Conference" November 3-6, 1997, Monterey, California, hosted by the Oiled Wildlife Care Network, a joint program of the Ca Dept. of F&G, Ofc. of Oil Spill Prevention & Response, and Univ. of Ca., Davis Wildlife Health Center. Contact Nancy Ottum at 916-752-3809, fax 752-3318, or e-mail ndottum@ucdavis.edu

The Monterey Bay Aquarium is looking for small non-releasable sandpipers for programs aimed at educating the public to the importance of wetlands & preserving the sandpipers natural habitat. Birds will lead high quality lives in natural static exhibits. Contact Bonnie Grey at 408-648-7929/ bgrey@mbataq.com or Sally Wuttken at 408-648-7924/swuttken@mbayaq.com.

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Conference Corner:

From Science to Reality—A Bridge to the 21st Century!
October 2-5, 1997
Concord, California

Your Invited

Plan on joining your fellow wildlife rehabilitators at IWRC's 20th Annual Conference in Concord, California, October 2-5, 1997, hosted by the Lindsay Museum. This is a special anniversary for the International Wildlife Rehabilitation Council, 25 Years of Service to our members, and we want to make it the biggest and best meeting ever!

You will want add some extra time onto your travel plans to enjoy the multitude of things that the California San Francisco Bay Area has to offer! You'll be able to enjoy everything from the Pacific Ocean to the mountains.

Twenty-Five Years of Memories

Since IWRC will be celebrating its 25th Anniversary, we will also be honoring those of you that have been longtime "survivors" in the field of wildlife rehabilitation. If you know someone or you yourself have been actively involved in wildlife rehabilitation for 15 years or more, we want to thank you and recognize your efforts at our annual banquet and awards ceremony which will be held Saturday evening. Call with your nominations for this special recognition!

We invite you to bring pictures or photos, newsletters, newspaper clippings, mementos, or anything that might evoke memories to chronicle the past 25 years of growth for wildlife rehabilitation and rehabilitators worldwide. We will have a large area available for displaying this memorabilia.

SEE YOU THERE!