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dangers of nesting
studies to raptors
and other sensitive
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**by Richard W. Fyfe
and Richard R. Olendorff**

**Occasional Paper
Number 23**

**Canadian
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Environment Canada
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We are indebted to the many individuals who worked with us in the field. Without their dedication and interest in the raptor resource, this paper would not have been possible.

Abstract

This paper discusses the problems resulting from human interference with the nests of sensitive bird species. It notes the toll of eggs and nestlings caused by an undiscerning general public, which makes it especially necessary for amateur bird-watchers and professional biologists to act responsibly when they visit active nests. One set of problems centres on the desertion of nests by frightened adult birds, the injury to eggs and young that they may cause in doing so, the adverse environment for eggs and nestlings brought about by this desertion, and the consequent threats to the feeding and safety of the young. A further set of problems arises from mishandling — the unnecessary handling, awkward handling, admiring, and photographing of young birds in the nest. The discussion includes possible solutions to the problems, and also calls for knowledgeable trespass on a bird's territory — or no trespass at all.

Résumé

La présente communication porte sur les problèmes que cause l'intrusion humaine dans les nids d'oiseaux d'espèces fragiles ou faciles à effaroucher. On y fait état des pertes d'oeufs et d'oisillons causées par un grand public sans discernement, ce qui fait, tout particulièrement aux amateurs d'observation ornithologique et aux biologistes professionnels, une nécessité de se comporter raisonnablement lorsqu'ils visitent des nids habités. Une des séries de problèmes en cause découle de l'abandon des nids par des oiseaux adultes effrayés et va du dommage qu'ils

peuvent ainsi causer aux oeufs et aux petits, à l'environnement défavorable à l'ensemble de leur progéniture qui résulte de cet abandon, et aux dangers qui s'ensuivent pour la nutrition et la sécurité des oisillons. Un autre ensemble de problèmes relève de la manipulation nuisible, que cette conséquence résulte de l'absence de nécessité de cette intervention, de la maladresse à l'effectuer, d'une approche trop poussée (fût-elle causée par le sentiment d'admiration) ou de l'action de photographier des petits au nid. On indique des solutions possibles et demande qu'il n'y ait d'intrusion dans le territoire d'un oiseau qu'à bon escient.

Introduction

Eggs and nestling birds are observed, counted, collected, weighed, measured, and photographed — both casually and professionally — sometimes at the expense of the birds. Because an undiscerning general public continues to take its toll, amateur bird-watchers and professional biologists especially need to act responsibly, and to encourage others to do so, in visiting active bird nests. There must be both compassion and common sense, including the realization that the eggs and young birds that may be jeopardized are the future breeding stock.

It must also be recognized that our current knowledge of nesting birds has come from competent field study. Except for a very few historical instances, this bird research has not had long-term detrimental effects on the population dynamics of any species. This paper is presented in an effort to perpetuate the good record of professional ornithologists and to alert casual bird watchers to potential problems.

Although much of the following may seem superfluous to active ornithologists and naturalists, we sincerely hope that professionals will benefit from the introspection stimulated by the ideas presented, that inexperienced field biologists will profit from the discussions, and that all other bird enthusiasts and casual observers will be encouraged to recognize the problems and develop the empathy necessary to deal considerably with birds in the field.

Our call is for knowledgeable trespass on a bird's territory, or none at all.

1. Scope of the discussion

The authors have used their experiences with raptorial birds (birds of prey) to illustrate problems that may arise during ornithological field studies with bird species that are sensitive to human interference. In addition, we have included the observations and recommendations

of other raptor researchers. Of necessity, much of the discussion and general conclusions follow from specific, often one-time or unusual occurrences in the field. The generalizations that we have made are in the interest of conservational field research.

Any of the following problems could be encountered when a nest is visited: 1) the parent birds may become so disturbed that they desert their eggs or young completely; 2) the incidence of egg breakage or trampling of young by parent birds may be increased, as may the chances of cooling, overheating, loss of humidity, and avian predation of eggs; 3) newly hatched birds may be chilled or overheated, and may die in the absence of brooding; 4) older nestlings may leave the nest prematurely, damaging still-growing feathers and breaking bones at the end of futile first flights, or may be forced to spend one night or several on the ground where they may be highly vulnerable to predation; 5) mammalian predators may follow human scent trails directly to the eggs or young; 6) the attention of other people may be attracted by the visitor's activities; 7) mishandling a nestling may damage feathers, bones, and claws; and 8) on cliffs, the visitor may inadvertently knock rocks and other debris onto eggs or young birds.

In the following discussion we assess each of the above problems in terms of its seriousness to birds of prey and recommend some solutions.

Problems and solutions

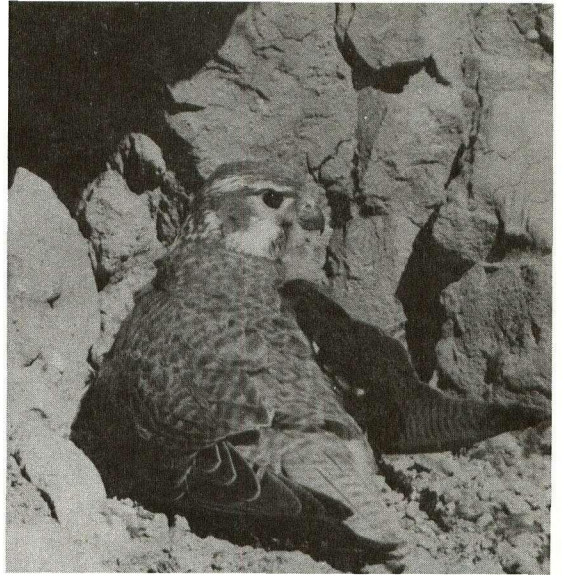
A male Prairie Falcon incubates the eggs. The males of this species tend to be shyer at the nest site than the females.

1. Desertion

The failure of parent birds to return to eggs or young after human interference is both serious and unpredictable. The potential effects of interference vary greatly depending upon the species, the idiosyncrasies of individuals, and the previous experience of the birds with man (Smith and Murphy, 1973). The possibility of desertion also varies according to the *level of acceptability* to the birds of their nest sites (Ratcliffe, 1962; Hickey, 1942; and many others).

Many observers suggest that the most critical time from the standpoint of nest desertion is just prior to egg-laying, when the female spends many hours sitting on or near her empty nest (Nethersole-Thompson and Nethersole-Thompson, 1944). Our field observations also suggest that the site tenacity of many species of raptors is weakest when they first establish their territories. At that time, human disturbance of even limited duration may cause desertion, not only of nest sites, but also of long-established territories. Desertion of nest ledges has been observed (both before and during egg-laying) following single short visits to the eyries of both Peregrine and Prairie falcons. Desertion of established nesting cliffs and territories of Peregrines, Prairie Falcons, and California Condors (Sibley, 1969), Ferruginous Hawks, and even Ospreys (Dunstan, 1973) have also been documented early in incubation.

Some species of buteos, such as Ferruginous Hawks, seem to be more prone to nest desertion than others during the early stages of nesting. However, the factors causing disturbance are little understood and may vary within a species and between areas. For example, the experience in north-eastern Colorado has been that Swainson's Hawks do not desert if disturbed late in incubation. In Alberta and Saskatchewan, however, researchers maintain a hands-off policy



with Swainson's Hawks during incubation because they are desertion prone. In both areas, Prairie Falcons, which readily desert a nest site prior to egg-laying, rarely desert once incubation has begun.

Desertion is less likely to occur the longer incubation is allowed to progress. As hatching approaches most species are especially tenacious to their clutches of eggs. Peregrine Falcons, Prairie Falcons, Golden Eagles, and even some Swainson's and Ferruginous hawks will usually sit tight during the several days just before and just after hatching, and will allow people to approach closely, occasionally to within a few feet. At such close quarters, however, the eventual hasty departure of the parent bird can crack eggs or injure eyases (see below).

Generally it is uncommon for raptors to desert a nest after the young hatch. Coincidental with the decreased likelihood of desertion, the

These three chicks are Ferruginous Hawks. Care must be taken not to scare or keep the parents away from the nest as the young are subject to exposure.



This Ferruginous Hawk nest is built on a hillside.



intensity of nest defence by most adult raptors increases. To our knowledge our routine population surveys, prey collections, banding studies, and growth research, involving nearly 2,000 nesting attempts by 12 species of raptors, have not been the direct cause of the desertion of any nestlings. This indicates, as others have noted (e.g., Bloom, 1974; Grier, 1969), that nest visits should be delayed until late in the nesting sequence, preferably until the latter half of the nestling period, but certainly until the eggs have hatched. It is not difficult, given a spotting scope and time, to determine *from a distance* whether or not hatching has occurred.

Field experience also pays great dividends in helping to avoid nest desertion. Performance records of particular pairs of birds over the years and the tolerances of the species involved come into play. If a pair (or nest) has been consistently unsuccessful in the past, desertion may occur

more readily. One should stay away from such birds and nest sites, even though Enderson (1964) points out that Prairie Falcons often nest in an eyrie the year after total failure. Studies of Ferruginous Hawks (Olendorff, 1973) suggest that only a few visits to a nesting site may cause these birds at least to move their nests to alternative sites in subsequent seasons.

Many species are not that sensitive. Ospreys, for example, seem to be the most tolerant of all raptors during the early stages of nesting. They can be trapped, banded, and colour marked at their nests, and will tolerate their eggs being moved from nest to nest without deserting them. In our experience, Great Horned Owls have a similar tolerance. What a boon to ornithologists it would be if all species were as co-operative.

The hazards of one special technique of the modern era merits mention. Recent extensive population surveys from fixed-wing aircraft and

helicopters have led to speculation about the effects of these machines on nesting birds (Boeker, 1970; White and Sherrod, 1974). Our data suggest that helicopters, particularly turbo-jets, have little effect on incubating falcons, eagles or Ospreys, other than to provoke an occasional attack. Ospreys, Gyrfalcons, and Peregrine Falcon, in particular, can actually pose a hazard to helicopters in this manner. Similarly, fixed-wing aircraft flying at heights *in excess of 1,500 feet (450 m)* above the nest sites, do not seem to present a disturbance, although the birds are aware of their presence. In contrast, data relative to nest occupancy following fixed-wing aircraft flying near nest sites at lower altitudes early in the nesting cycle suggest that such activities may cause nest desertions of Gyrfalcons, before egg-laying. Although the results are not conclusive and further investigation is required, it is advisable to be conservative and to avoid close approaches to nest sites with either type of aircraft early in the cycle. Also, from the standpoint of pilot safety, Gyrfalcons (and occasionally Peregrines) must be watched closely because they will attack slow-flying, fixed-wing aircraft.

During the breeding season, make any approach to a nest cliff by aircraft as direct as possible. This will ensure that an incubating or brooding adult is fully aware of your presence and can leave at its discretion. An approach from behind the nesting cliff may result in the sudden appearance and sound of an aircraft directly above the nest site, which may make the attending adult fly in panic and fatally damage the eggs or young as it goes.

2. Damage to eggs and young by frightened adults

Frightened parent birds may crush or puncture eggs, trample newly hatched young, or eject the young or eggs from nests in their excite-

ment. The fact that raptors try to sit tight late in incubation and during the first days following hatching increases the risk considerably. At that time, some birds will stay in a nest until a climber is halfway up a tree or down a cliff and will then have to leave in a hurry (Brown, 1953; Cade, 1960).

It is second nature for a person interested in birds to want to sneak up on an incubating or brooding bird in order to get a closer look or a photograph, but such intrusions invite disaster. It is much safer to make your presence known to the birds long before climbing. You can do this by whistling, talking, clapping, imitating calls of the species, or making an approach within sight of the nest. The last of these is generally a good practice, since some raptors respond poorly, if at all, to the sounds of a person's approach. In any case, make only a slight disturbance at first and increase it progressively until the parent leaves the nest. Eliminate the element of surprise whenever possible. If a parent bird is extremely reluctant to fly away, you should retreat and then visit the nest a week or more later, perhaps after hatching has been completed.

If you walk to a nest tangentially rather than directly, you slow the approach and allow the parent to respond unhurriedly, especially in giving it time to stand and hobble carefully to the nest edge before fleeing. This is much less dangerous than flushing a bird quickly while you are climbing. Our experience in open grassland, where a visual warning is almost unavoidable, does not include a single incident of eggs or young being damaged by the disturbed parents.

The reason why parent birds eject eggs or small chicks from their nest during the disorderly departure is often because the adults place their feet under or between their offspring when incubating or brooding them, and may catapult them out of the scrape or nest when startled.

Our field observations and photographs show that this method of incubating and brooding is used by both Peregrine and Prairie falcons. It has been well documented that several other species usually move eggs or young in leaving, which implies that this characteristic may be a critical factor in most, if not all, raptor species. Nevertheless, you can avoid damage by using the proper technique as explained above. Test your technique by looking for eggs or young lying outside the scrape or nest cup well separated from others.

3. Cooling, overheating, and loss of moisture from eggs

As with the psychological limits of the birds, their physiological limits, particularly those of their eggs and nestlings, must weigh heavily in all field decisions. In addition, research methods must fit the area under study. In the Arctic, study would surely be hampered by absolute rules concerning temperature and other climatic factors. The xeric conditions of many grasslands are quite different from temperature-humidity relationships in deciduous forests and similar biomes. Likewise, the physiological characteristics of the birds that inhabit such areas vary widely.

The cooling of eggs does not pose a serious problem during normal field procedures. However, if a visit exceeds 10 minutes, you should take protective measures when the temperature is low (see below). Overheating is a serious problem with eggs and direct exposure to sunlight should be strictly avoided. Also, unattended eggs do not receive the normal transfer of moisture from the brood patch of the parent bird. Dehydration in dry air and sunlight may be extremely detrimental at hatching, a time when a high humidity has been shown to be important in the artificial incubation of raptor eggs.

In northern areas, where temperatures seldom exceed 10°C (50°F), except in mid-

summer, more thought must be given to the potential danger of cooling. This is particularly true when dealing with Gyrfalcons, Golden Eagles, Snowy Owls, and other timid species. With these birds the length of exposure to adverse temperatures can be greatly increased by the adults remaining off their eggs as they wait until intruders have disappeared from the nesting area.

In general, keep visits short, relatively unobtrusive, and as timely as possible with regard to weather, sun position, and time of day. When a nest is not shaded, restrict all visits to the cooler part of the day before noon. If you plan an extended visit, put the eggs into a fur-lined glove or cover them with a cloth to slow down the loss of heat and moisture. Most important of all, be sure you are justified in making the nest visit in the first place, and avoid, if possible, visiting nests at the time of hatching.

4. Chill and heat prostration of nestlings

Like eggs, young raptors can withstand far more cooling than heating. Except when the ambient temperature is below about 7°C (45°F), you need not attempt to warm even newly hatched (but dried) eyases during brief visits to nests of 10 to 15 minutes.

Overheating is a different matter. Young birds have mechanisms, such as panting or crawling to shade, to deal with normal high temperatures in nests. However, many nests of Swainson's Hawks, Ferruginous Hawks, Golden Eagles, and Prairie Falcons are fully exposed to direct sunlight, which can be fatal to young raptors if both parents (who normally shade their young with outstretched wings when necessary) are drawn away from their nests during the heat of the day. Nelson (1969) recorded several instances of heat-induced death among young Golden

A female Peregrine Falcon feeds her newly-hatched chicks. The young at this age are extremely vulnerable to exposure.



Eagles. Kochert (1972) found that 8 of 25 deaths of nestling Golden Eagles along the Snake River in Idaho were possibly caused by heat prostration but definitely not related to the conduct of his study. Such natural incidences of heat prostration, the outward distress of young raptors to overheating that we have noted both during field observations from blinds and in the laboratory, and the shading of young by adults during the heat of the day are all warnings to professional biologists and casual observers alike to stay away from nests on hot mornings and afternoons.

Overheating may not be as critical for older nestlings as it is for younger ones, and species differences are apparent. In Alberta in 1972, behavioural observations on Peregrine Falcon chicks at several different stages of development indicated considerable intolerance to even relatively short exposure to direct sunlight. Observations on large nestling Prairie Falcons have not

shown similar evidence of severe distress. Adults of both species were observed brooding or providing shade until the young were about 2½ weeks old.

5. Missed feedings

The failure of a young raptor to get one or even several feedings in a row is not likely to kill it except, perhaps, within a few days of hatching. Nevertheless, the shyer species — Golden Eagles and California Condors (Sibley, 1969) and Ferruginous Hawks, for example — have been recorded as absent from their nestlings for extended periods of up to several days as a consequence of continual harassment. Eagles especially are reported to be able to survive extended periods of fasting, yet one incident is known where a young Golden Eagle (an estimated 3 to 4 weeks old) starved to death because the parents were disturbed by a photographer's blind or the activity associated with it. Similarly, a male Gyrfalcon apparently deserted its female and young when a blind was established too close to the nest ledge. Had the female not assumed the role of provider, the young may have perished.

Such incidents are difficult to forecast and apparently do not occur frequently. Nevertheless, they clearly indicate the potential danger of incorrect procedures and a lack of understanding of the behaviour of parent birds. A naturalist must appreciate the burdens he places on the animals he studies and be willing to compensate for them.

A case in point arose in Colorado. Early one morning we carried a preconstructed blind to a spot overlooking a Golden Eagle eyrie containing a three-week-old eaglet. The parent birds deserted. Within minutes we left the blind unattended, but we checked the nest every several hours to see if the adults had become accustomed to the structure. After 24 hours neither parent had re-

These immature Golden Eagles are very shy birds. If disturbed at this age, they may try to fledge prematurely.

These young Prairie Falcons are about to fledge from their nest ledge. Care must be taken to prevent premature fledging.

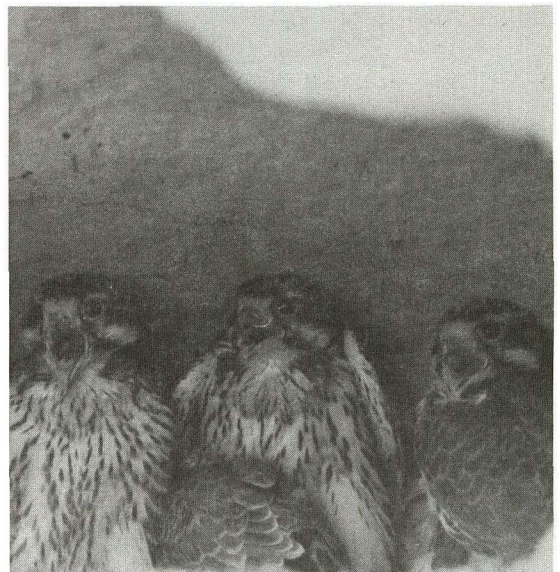
turned, so we removed the blind. That afternoon things were back to normal; the eaglet fledged normally several weeks later. Thus eyases can miss feedings, and the effects of even lengthy disturbance can be reversed.

6. Premature fledging

Premature fledging is a serious problem encountered late in the nestling period. As one's head or feet first appear at the edge of a nest, feathered young will usually spread their wings, move quickly to the opposite edge, and lean backward (often precariously) in a defensive posture. In such situations, just one quick motion by the climber can cause birds to jump before their wings are developed sufficiently to break the fall. The result can be death, or fracture of legs, wings, feathers, or the keel. Even if there is no injury, an unnatural hastening of the birds' high vulnerability to attack by ground predators during the post-fledging period occurs — and should be avoided.

We have not had injuries or deaths from premature fledging in our studies of grassland raptors. This has probably involved a certain amount of luck and the fact that nests on the prairies generally are not high above the ground, but technique is also important.

Young falcons and eagles especially seem predisposed to leave the nest or ledge as fledging approaches (Grier, 1969). It is best to study each situation closely prior to climbing. For example, if an eyrie is near or over water, you should not visit the nest unless you can station an assistant below the eyrie in a boat to retrieve errant eyases. If it is absolutely necessary to visit such a nest, you can often plan your visit so as not to startle the birds. Whistling, talking, clapping, and otherwise letting your presence be known (as mentioned earlier) are equally important with older nestlings.



When confronting older eyases, try to move them into a corner, under an overhang, or against part of the tree in order to block their escape. All movements must be slow and deliberate. If a bird is about to jump, slowly move a hand toward its feet. Leave the hand and arm flat on the nest rather than reaching for the bird as if to grab its body. Move the hand in an arc rather than straight at the bird. If the bird grabs the hand, so much the better; at least reliable contact is established. If three or four birds are all threatening to jump from a tree nest, they can often be retrieved one at a time by reaching up and letting them grab a hand without putting your head or shoulders above the nest edge. A hand is much less obtrusive than a torso. A makeshift *poultry hook* is useful in some situations (Grier, 1969), but it should be lightweight, and release it if a bird resists vigorously.

In all cases, evaluate thoroughly the justification for being at a nest when the eyases are near fledging; and do not hesitate to retreat for the sake of the birds. The only completely safe thing to do is *not* to force birds to fledge prematurely.

If a bird does jump during a nest visit, stop what you are doing and note where it comes down. Some birds will glide a considerable distance even on the first flight. Keep in mind that the longer a bird is left on the ground, the harder it will be to find, even in shortgrass prairie. When you retrieve a bird, check for injury and return it to its nest. Usually a firm downward push with the open hand to force a bird into a prone position in the nest cup, followed by a slow retreat, will be sufficient to prevent the bird from jumping a second time.

An observer can be less anxious when wing development is far enough along to allow a bird to glide to the ground. In general, if nestlings are fully feathered except for down on their heads and flanks, most can fly well enough to avoid

injury. However, the age at which this can be done varies, and the nests of some species often contain birds that can glide down safely and others that cannot. Also, the possibility exists that a bird can fly a long distance and then come to grief because it is unable to regain the nest tree or cliff.

7. Mammalian and avian predation

Scent trails laid down by observers on foot pose a serious threat to both eggs and young birds. If raccoons or other nest predators are common, you should take special precautions to guard the nests under study. This is a perplexing problem with regard to amateur bird-watchers, who are rarely equipped to take the necessary protective measures.

Hamerstrom (1970) described the proper way to approach a raptor nest, that is to walk straight past it *at a distance*, retrace a portion of the path, and then walk along a single right-angled side trail to the nest or nest tree. If you sprinkle the side trail with naphthalene crystals (moth balls) during the exit to destroy the human scent, you greatly decrease the chances of predation at the nest. The use of naphthalene crystals as protection for nesting raptors has been discussed further by Ray (1968).

The chance encounter between an avian predator and an undefended raptor nest containing eggs or young is impossible to interdict, particularly since an observer's presence may attract the predator. Although most avian predation of eggs probably occurs after nest desertion from other causes, it is wrong to conclude that raptors can or do defend viable eggs and young against other avian predators at all times. Some species, for example jaegers in the Arctic, are quick to visit vacated nests. Thus a potential problem exists depending on the species of raptor, the behaviour of a particular pair of raptors, and the

This is a Marsh Hawk nest. These hawks build their nests on the ground; as a result, the eggs and young are very vulnerable to predation.



These Marsh Hawk eggs were destroyed in the nest by a predator.



density of such species as crows, magpies, jaegers, etc.

Avian predation can be serious in areas where raptors and corvids coexist in a common stand of cover. This is particularly true when dealing with the relatively shy species of raptors which nest in open-topped or otherwise exposed nests. Such birds may remain away from a nest site until humans have left the area, thus allowing the more brazen predators ample time to strike. Nest predation is also possible upon aggressive species, such as Richardson's Merlins, which may direct their undivided attention to human intruders at some distance and leave their nests unattended. It is always a good policy to move well out of a bird's territory after a nest visit. Do not move off two hundred yards and stop to take notes.

8. Mishandling of young birds

Unnecessary handling, awkward handling, admiring, or photographing of birds at a nest may lead to harm. If there is no reason to handle a young bird, do not do it; simply collect the required data (e.g. brood size, prey items, etc.) and leave promptly. If nestlings must be picked up and examined, allow for their ages, weights, and stages of plumage development.

Whenever possible, pick birds up with both hands. This is not always possible when one hand is holding a rope or a tree limb. Methods of handling birds satisfactorily using only one hand include the following:

- 1) Very young birds, for example buteos during the first two weeks, can be cradled in one hand and held firmly with the thumb.

- 2) During the next week or so buteos and other medium-sized raptors should be held firmly by both *drumsticks*. Immediately cradle the bird

against your body to stabilize it on top of your hand. If the bird falls over in your hand, *do not* try to right it by putting counter-pressure on the legs, as this may sprain joints, pull tendons, or break bones. Instead, let the bird go completely upside down, lay it on its back in the nest or your lap and begin again.

3) During the final weeks of nest life, it is best to pin a bird to the nest with your free hand and then slip the same hand slowly underneath in search of the feet. A bird that is firmly pinned to the nest will usually remain in that position when the pressure is released; at least long enough for you to grasp the legs. This technique also prevents premature fledging and effectively immobilizes large birds such as eagles, allowing you to secure the legs with the other hand, if it is free. Well developed Golden Eagle nestlings can sometimes be banded while they lie prone of their own accord. Simply pull a leg out behind the bird and attach the band.

4) An older bird also can be picked up at the bases of both wings, if this is done properly. Approach the bird from behind and slip the spread fingers of one hand up the back and under the wings. The index finger should pass between the two proximal wing bones (humeri), which are then gripped by the thumb and middle finger about equal distances from their ends. Be sure the hand is underneath all of the major flight feathers and do not grip too close to the ends of the humeri: the latter avoids setting up potentially injurious leverages near the joints. Done properly, the forces will be translated through normal muscular and skeletal pathways. The advantage of this technique is that the bird is immobilized in a position which has not, in our experience, led to injuries. Wings cannot flail and flight feathers are not likely to be damaged. Also, less of the surface of the bird is touched, and there is no hasty grabbing of *portions* of the

bird that somehow escape even from the normal two-handed method. *However, the humeral method of handling is not satisfactory for young birds with weak bones (during the first half or two-thirds of the nestling period) or large birds with superior strength (such as eagles).* Eagles must be handled by the feet and legs to prevent injury both to the bird and to the observer. The most serious drawback of handling birds one-handed by the wing bases is that their feet are free to grip the nest. Severe damage to claws, with detachment of the horny sheaths, can result if you pull a clinging bird from the nest or perch. Clear each claw individually, if necessary, before you lift a bird.

9. Miscellaneous considerations

There are several other precautions and techniques which can reduce the adverse effects of interference during raptor nesting studies.

9.1. Use of two observers and note-taking

The use of two observers, besides being safer when climbing is involved, saves a significant amount of time. Furthermore, some field assignments cannot be accomplished by one person within a reasonable time, if at all.

A second person becomes a great time-saver if capable of taking good field notes dictated by the observer at the nest. To save additional time, the recorder might use preprinted data cards or sheets, each listing the parameters to be noted and providing adequate space to write the data.

If you know the itinerary in advance, you can partially fill out data forms (with nest locations, species, dates, etc.) before going to a nest. Additional data such as parental behaviour, prey items, behaviour of young birds, weather, and time of day can be recorded after leaving the nest's vicinity. Do this well out of sight of, and some distance from, the nest and take only the minimum amount of data necessary while at the site.

9.2. Banding

On rare occasions, banding can be hazardous to young birds. If they are banded too early, not only may the band slip off the leg, but, as happened to one of our Swainson's Hawks, it may slip only partway off and encircle the foot at the base of the toes. In that instance, as the young bird moved about the nest, it broke its leg above the band. During a subsequent visit we removed the band and left the bird in the nest. It fledged normally, with only a slight *knot* where the break had healed. This suggests the need to avoid applying bands to birds that are too young, but it also indicates that young raptors have a certain resiliency to injury. They should be left in their nests if there is any chance of survival.

In another isolated mishap a piece of barbed wire slipped between the band and the tarsus of a Ferruginous Hawk. (Short pieces of wire are sometimes used as nest material by Golden Eagles and Ferruginous Hawks.) A visit several days after banding revealed that about seven inches of a three-foot piece of wire (including one barb) had forced its way through the band. Although the bird's tarsus was slightly scratched, no bones were broken and, after release from the wire, the bird fledged normally.

As a general rule, banding should be done when the birds are about one-half to two-thirds of the way through the nestling period. For the prairie buteos this would be at an age of 20 to 30 days. The tarsus reaches 90% of its size at 20 to 25 days of age in Swainson's, Red-tailed, and Ferruginous hawks (Olendorff, 1971). At this time the young birds are still not very mobile in the nest and are unlikely to fledge prematurely. Banding at this stage saves time at the nests in two ways: it eases handling and there is less chance of having to retrieve a bird. Banding Prairie Falcons later in the nestling period may be difficult because by then the birds can move well back

in the nest hole into smaller holes and crevices, out of reach of the climber, or they may fledge prematurely and require a second visit to place them back in the eyrie.

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