ADVANTAGES AND DISADVANTAGES OF THE USE OF ROTOR-WINGED AIRCRAFT IN RAPTOR SURVEYS*

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ABSTRACT. We believe that the advantages of aerial survey with helicopters far outweigh the disadvantages. Disturbance may be less than that caused by entering on foot. Statistical validity is greatly increased as is understanding of the *gestalt* of the population.

Although other raptors may react in a different manner to helicopter observations, our impressions are that little damage is done by aerial vehicles used in the manner we have described for collecting data from the raptor species we have mentioned.

Additionally one should be aware that although the cost, on a per hour basis, for helicopters may be considered expensive, it may prove no more expensive than the cost of outfitting and supporting a field party when the differential of time and efficiency are compared.

Introduction

Fixed-winged aircraft and rotary-winged aircraft (helicopters) are available today for use in censusing raptor populations. Indeed the latter type has been used rather extensively with the opening up of northern regions in the course of mineral and oil explorations. Along with their use, however, has come considerable criticism sometimes justified, but more often than not from people who have never used one for such work. Due to our limited experience with fixed-wing aircraft, the following remarks are primarily confined to both advantages and disadvantages of using rotary-winged aircraft for observations of raptor populations. We have tried to be unbiased in our observations and to present the data as we see it. Our impressions are based upon a total of 888 hours of helicopter usage in Interior Alaska, on the North Slope, and in the Aleutian Islands from 1969 to the present, and an additional 50 hours in 1964 on the North Slope. Species that have been observed are the Bald Eagle (*Haliaeetus leucocephalus*), Golden Eagle (*Aquila chrysaëtos*), Peregrine Falcon (*Falco peregrinus*), Gyrfalcon (*Falco rusticolus*), and Rough-legged Hawk (*Buteo lagopus*).

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Our experience is also limited to work with raptors nesting off cliffs or hillsides in open terrain and not with tree nesting species. We hope that such people as D. Roseneau, T. Ray, E. Boeker, L. Crowley, J. McGowan and J. Gerrard will also record their observations for they have worked with either fixed-wing aircraft or tree-nesting species. Once this is done, we might then come up with a more realistic evaluation of the impact the use of aircraft seemingly has on raptors. We recognize that different groups of birds react in different manners. For example, Snow Geese (*Chen caerulescens*) are particularly sensitive to aircraft, especially fixed-winged, and we must stress that our remarks should not be taken as applying to birds in general.

Types of Aircraft

Helicopters are preferable over fixed-wing craft in many cases. They allow more time for observing habitat therefore spotting birds. Many times it is necessary to hover in mid-air while making an accurate census count or while searching a cliff for a nest ledge.

Helicopters are primarily divided into two kinds: jet engine powered, and piston engine powered. The high frequency whine made by some of the jet engine helicopters seems to be much less disturbing to nesting raptors than the low frequency noise of the piston-powered craft.

We have experience with the following aircraft: Sikorsky S-56, Hiller 12-E4, and two Bell helicopters of unknown models, all piston driven; Aloutte II, Aloutte III, Hiller FH 1100 and Bell Ranger, all jet engine-powered. Of these we prefer Hiller FH 1100 since noise levels seem least disturbing to raptors and there is sufficient power to maneuver in and out of wind drafts around cliffs.

Flight Patterns

We have noted that certain patterns of approach are much less disturbing to raptors than others. Allowing the birds to see the vehicle approaching is of primary importance. We have found that by flying parallel to a cliff at an initial distance of about a half mile out with gradual approach toward the nest, the birds are least disturbed and, indeed often continue to feed the young or loaf on a cliff when approached in this manner. To have the helicopter on the same level as the birds or slightly below while making the observations seems to be important.

Birds which are surprised suddenly by the presence of a helicopter appearing from over the top of a cliff usually panic and exhibit frantic escape behavior. This may even result in the dumping of eggs or young from the nest by the adult (Richard Fyfe, pers. comm. and pers. observ.).

Approach from above is not nearly as alarming to the bird especially when they can see the approach from a considerable distance as in the case of tree nests or those on sea stacks.

Timing of Flights

The time that nesting census data are gathered from aerial observations are

important. We believe the most deleterious times are just before egg laying, during egg laying, and during incubation depending on the species. Disturbance during these periods may cause desertion or even breakage or dumping of eggs as we have previously mentioned.

If it is imperative that counts be made during these periods, interference may be reduced to a minimum by following the flight pattern suggested above.

Once the young have hatched, if the suggested flight pattern is followed, we believe that minimal damage will result.

Weather conditions are of prime consideration. Forcing birds from the nest during inclement weather may result in chilled eggs or young. Fair-weather days are both desirable for this reason and for the fact that they allow clearer observation.

Aerial observations too late in the season can be just as harmful as observations at earlier critical periods. The presence of helicopters too close to a nest may force young birds into premature fledging. However, young birds almost ready to fledge which have been surveyed several times previously at younger stages show little fear of the helicopter. In the same fashion Mr. James Brooks, Commissioner of the Alaska Department of Fish and Game, has mentioned to us that young mountain goats and Dall sheep are forced off cliffs, especially by photographers in helicopters anxious to obtain the ideal picture.

Other Suggestions

Experienced pilots are indispensable. After they have flown surveys for a while, they obtain an intuitive feeling as to "how" to fly for raptor work. Experienced pilots are most essential where weather is particularly turbulent. He must be able to maneuver away from the adult birds and should be familiar with wind drafts. He should be somewhat familiar with the behavior of the species of concern. Hopefully, he would be exposed to the material presented in this paper before attempting a raptor census of any kind.

In addition to the pilot, there should be two observers: one that is observing to the front and side and one that is observing to the side and back. Some falcons, particularly, leave their perch after the aircraft has passed.

From our previous experience, we realize that certain unexpected reactions may occur. We have had Peregrines, and Bald Eagles, and even on one occasion a Gyrfalcon, try to attack a helicopter. Once birds obtain position directly above the aircraft, it is possible for them to be sucked into the rotor, killing both the bird and the observer. Attacks, however, appear to be more frequent against fixed-winged aircraft especially by Gyrfalcons (D. Roseneau, pers. comm.).

Birds that are inadvertently flushed into the wind may wing back into the helicopter. Approach from upwind is advisable.

Advantages

The advantages afforded by aerial observation from helicopters are numerous and of significant importance. This is especially true in the management aspects

of raptors.

The ability to cover large areas of habitat is particularly of interest. Whether conducting population census or obtaining nesting data, one is able to increase the sample size and therefore, the statistical validity, of such information. Surveillance on foot or by boat in such instances may prove next to impossible and certainly much less thorough. During the non-breeding season when birds are not "attached to nests," it is extremely difficult to make density observations. The over-all *gestalt* of some populations such as eagles on Amchitka, becomes much clearer through aerial surveillance. We now have an excellent idea of the age class structure of that population. One may easily observe old as well as new nests.

Of primary importance is the opportunity to obtain large blocks of data within a short period. For population census data, this may allow counting of an entire population at one time and therefore, much more accurate results; and we can better evaluate, for example, the effects of weather on nestlings. Collection of such data by other means is impossible. For production data obtained from nest counts, aerial observations are essential. They allow synchronous counts during one part of the nesting period and repetition of such counts throughout the season. A series of complete counts for Amchitka Bald Eagle nesting data in 1972 exemplifies the differences in data that can be collected according to how far along the nesting season is when such data are collected. The observer who collects data by one observation at each nest in a population which takes an entire summer to check is in fact collecting data from a continuously changing set of facts. By this we mean, for example, that the number of young per nest is quite different at the completion of hatching than at the period of fledging. Aerial observations over a great area in a short period of time eliminate such error.

Disadvantages

There are many disadvantages to be weighed against the advantages.

First of all is the fact that the birds are obviously disturbed during nesting season. However, in order to obtain many kinds of nesting data first hand, it is necessary to disturb the birds whether on foot or via helicopter (excepting by spotting scope in which case erroneous data may often be concluded). The time spent at a nest observing from a helicopter is usually much shorter (10 sec.-2 min.) than on foot.

Aerial observation can result in biased information in several ways. On many occasions, birds (especially Peregrine Falcons) will not flush from a cliff when approached in a jet helicopter. Such pairs of birds may be missed on initial survey. At other times birds conditioned to the approach of a helicopter may not flush even though they have flushed previously. Such pairs may be counted as having abandoned a previously occupied nest. Alternatively, Peregrines often flush from the cliff after the helicopter has passed and the falcons go in the opposite direction the helicopter is traveling.

Although the Hiller FH 1100 is an excellent aircraft because it appears not

to frighten birds, the possibility of missing birds, simply because they are not flushed, is a real problem.

Young which crawl off behind grass mounds or rocks may also be missed in an aerial count. Even young eagles nesting on hillsides on Amchitka have "disappeared" only to reappear again on the next survey.

The presence of high winds greatly limits use of helicopter as updrafts and downdrafts can be extremely hazardous especially around cliffs. Lack of wind can have less severe but similar deleterious effects.

Small helicopters are limited as to loading capacity and the number of people (and size or weight of people). The distance that can be traveled is directly proportional to the number of people (and size) as well as wind speed. The weight loading capacity is determined by these values plus the quantity of gasoline that can be carried for any given helicopter.

Conclusions

At present we do not feel that the data support the allegation that helicopters are a source of reduced productivity in certain raptors at the population level. Some data are as follows.

On Amchitka Island helicopters have been used for five years to census raptors. On average, 66% of nesting attempts by Peregrines are successful in fledging young. A sample of 63 nesting attempts in 1939-1940 in New York and on the British Coast had 60% of the attempts to produce young (Hickey and Anderson, 1969). Other information is also available. Data for Bald Eagles are as enlightening. Egg production for Amchitka is 1.91 egg per nest and in Southeast Alaska and parts of British Columbia, Canada, where helicopters were not used in the studies, production was 1.97 per nest (F. Robards and J. King, mimeo. report U.S.F.W.S. for 1966; D. Hancock, pers. comm.). Percent of territories with young were about 55% in Ontario (J. Grier, pers. comm., 1971), about 64% in Saskatchewan (D. Whitfield, J. Gerrard and W. Davis, Mimeo. report, 1969), about 58% on Kodiak Alaska (Hensel and Troyer, 1964), and for Amchitka in 1972, about 60%. Helicopters were not used in the first three studies. Fledging success for active nest shows a similar conformity when comparing yearly variation. For Ontario between 0.73 and 0.89 young fledged per active nest (Grier, pers. comm.), between 0.62-0.93 for Kodiak (Hensel and Troyer, 1964), and for Amchitka 0.85 for 1972. These values are all in the same ball park for both those studies in which helicopters were not used and used.

Perhaps the best over-all helicopter, at least the one that appears to be least frightening to raptors, is the Hiller FH 1100. As we have shown (Figs. 1, 2, 3, 4), pictures have been taken from the Hiller of adult Peregrines, Golden Eagles, Gyrfalcons and Rough-legged Hawks while feeding large downy young, and the adults have not flushed even though approached to within 60 feet (18 m) at the same level as the nest.

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Figure 1. Adult Bald Eagle in the Aleutian Islands returning from a perch to alight in a sea stack nest containing small young. Helicopter is hovering about 80 feet (24 m) away and was in that same position when the bird left the perch to return to the nest. Helicopter bubble struts can be seen in bottom of picture. Photo taken with a standard 50 mm lens.

Figure 2. Adult female Peregrine Falcon feeding week old young in an eyrie on the North Slope of Alaska. Photo taken from a helicopter that hovered about 45 feet (14 m) away throughout the entire feeding sequence. Note shadow of the helicopter's main rotor blade (marked by arrow) on cliff. Photo with standard 50 mm lens.

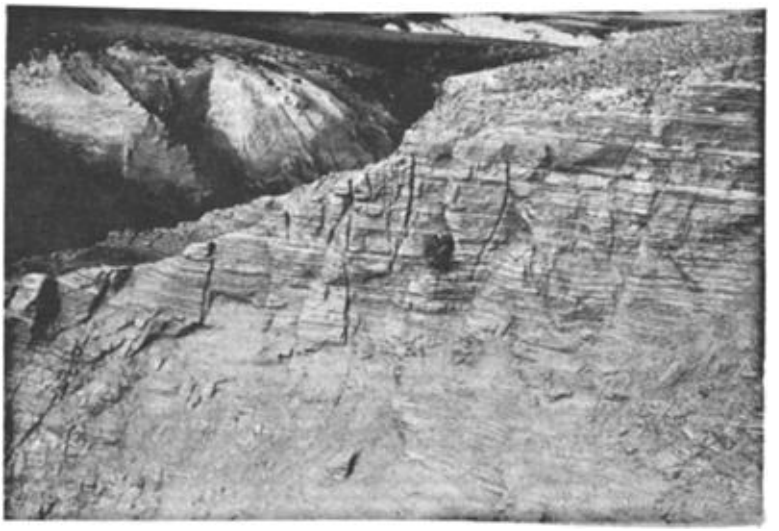

Figure 3. Adult female Rough-legged Hawk brooding young on the North Slope of Alaska. Photo taken at about 85 feet (26 m) with standard 50 mm lens from a hovering helicopter.

Figure 4. Adult female Peregrine Falcon brooding two week old young in nest on the North Slope of Alaska. In order to flush the adult to obtain an accurate count of the young the helicopter had to be landed and the nest had to be approached on foot. Photo taken from hovering helicopter at about 45 feet (14 m) with a standard 50 mm lens.

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