Natural Hybrids between the Common Goldeneye, *Bucephala clangula*, and Barrow's Goldeneye, *B. islandica*

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Most records of hybrid Common x Barrow's goldeneyes are of male alternate-plumaged birds, probably reflecting bias with respect to identification and possibly a greater abundance of hybrids in this plumage. The male alternate plumage is the only hybrid plumage to be acceptably described. Hybrids in this plumage appear fairly uniform as a group, exhibiting intermediate characteristics between the two parent species. Hybrid records are geographically widespread, originating from all three distinct regions of overlap. An increase in the number of hybrid records in the past 40 years is obscured by an increase in the number of observers in the field, as well as improved optical equipment. Despite these biases, a recent increase in the incidences of hybridization in British Columbia may exist.

Key Words: Common Goldeneye, *Bucephala clangula*, Barrow's Goldeneye, *B. islandica*, Anseriformes, Anatidae, natural hybridization.

The occurrence of widespread hybridization between bird species is supported by evidence for almost 10% of all species hybridizing in the wild (Grant and Grant 1992). This may reflect the large degree of genetic compatibility between species; however, it provides no information on the importance of hybridization from the perspective of the individual species. Differentiating between occasional incidences of hybridization, and hybridization that may threaten the genetic identity of a species or population is therefore important, especially from the perspective of conservation (see Cade 1983). Species whose ranges are altered due to human influences are especially vulnerable to increased incidences of hybridization which may threaten the genetic integrity of a species (Cade 1983; Boag 1988). Thus, documentation of hybrid records and descriptions or patterns in these records provide important groundwork for the monitoring of hybridization and its subsequent assessment relative to conservation.

Natural hybrids between the Common Goldeneye, *Bucephala clangula*, and the Barrow's Goldeneye, *B. islandica*, have been reported at least since 1951 (Snyder 1953). A recent review of avian hybrids by Panov (1989) listed five references describing six possible records of natural hybrids occurring in the wild. The present paper provides information on at least ten other instances of reported natural hybrids (Table 1), as well as recent occurrences of cross-species pairing and suspected broods of hybrid goldeneyes.

Hybridization between the two goldeneye species has been described in the literature on the basis of specimens and sight records of individuals intermediate between the two species in morphological characteristics. Descriptions of such intermediate hybrids have been relatively consistent (see Martin and Di Labio 1994), with the exception of head iridescence of male alternate-plumaged hybrids, which may be variable in colour. Validity of presumed male alternate-plumaged hybrids from the wild is supported by similar morphology of known hybrid males from captivity (e.g. Gochfeld and Tudor 1976); however, much less is known about the morphology of hybrid females and first-year birds.

Of the seventeen records of hybrids, thirteen represent male alternate-plumaged goldeneyes. Hybrids with this plumage are more frequently reported due to their distinctive characteristics, especially in comparison with the very similar female, yearling, and basic male goldeneye plumages. Males may also represent a greater percentage of all hybrids due to a higher prehatching mortality suffered by hybrid females (the heterozygous sex) (Haldane 1922; Gray 1958).

The only two female hybrid specimens recorded to date, an adult and a juvenile reported by Fjeldså (1973), were specimens identified on the basis of various bill measurements. Although goldeneyes are distinguishable between species by bill measurements from nestling stages onwards (Gardarsson 1967; C. Nelson, personal communication 1991), the bill is still developing until skull ossification is complete when adult plumage is attained (Palmer 1976). Taking into account individual variation in bill measurements, it would seem very difficult to positively identify female hybrids based on bill measurements alone, especially in hatching-year birds. As all plumage characteristics of these described specimens fit the species most commonly found at the site of

TABLE 1. Records of hybrids between the Common Goldeneye, *Bucephala clangula,* and the Barrow's Goldeneye, *B. islandica,* in the wild.

Date	Location	Plumage	Record	Reference
27 June 1907	Lake Myvatn, Iceland 65°38′N, 17°00′W	female-alternate	specimen ZMUC 59275	Fjeldså 1973
30 October 1922	Merrymeeting Bay, Maine 44°00′N, 69°54′W	female-1st basic	specimen ZMUC 69022	Fjeldså 1973
14 April 1951	Petitcodiac, New Brunswick 45°56′N, 65°10′W	male-alternate	specimen ROM 78916	Snyder 1953
13 May 1954	Westwick Lake British Columbia 52°00′N, 122°10′W	male-alternate	specimen MZ UBC 4472	Jackson 1959
20 December 1956	Niagara River, Ontario 43°16′N, 79°03′W	male-alternate	specimen ROM 76662	Beardslee and Mitchell 1965
26 March 1957	Alki, Seattle, Washington 47°35′N, 122°25′W	male-alternate	sight record	Schultz 1958
3 March 1963	Perkins Cove, York Co., Maine 43°35′N, 70°36′W	male-alternate	sight record	Gochfeld and Tudor 1976
20 June 1970	Lake Myvatn Iceland 65°38′N, 17°00′W	male-alternate	sight record	Bengtson 1972
11 March 1976	Peterborough, Ontario 44°8′N, 78°19′W	male-alternate	sight record	Goodwin 1976
13 April 1978	Iles-des-Soeurs, Québec 45°28′N, 73°33′W	male-alternate	sight record	Bannon 1978
November-March 1984-1989 estimated 4 different indiv.duals	Vancouver, British Columbia 49°55′N, 123°07′W	all male-alternate alternate	sight records	J.-P. Savard, personal communication 1993
breeding season 1984-1992	100 Mile House, British Columbia 51°39′N, 121°17′W	females	examined in the hand	J. Eadie, personal communication 1992
May 1985[1]	Riske Creek, British Columbia 51°58′N, 122°31′W	male-alternate	sight record	J.-P. Savard, personal communication 1993
27 November 1988	Cornwall, Ontario/New York 45°00′N, 74°46′W	male-alternate	sight record	Martin and Di Labio 1991
17 March 1991	Aylmer, Québec 45°23′N, 75°48′W	male-alternate	sight record	Yank et al. 1991
31 March 1991	Baie Comeau, Québec 49°13′N, 68°09′W	male-alternate	sight record	personal observation PRM
11 January 1992	Larchmont, New York 40°56′N, 73°45′W	male-alternate	sight record	Boyle et al. 1992
26 January 1992	Cornwall Ontario/New York 45°00′N, 74°46′W	male-alternate	sight record	Boyle et al. 1992

[1]estimated year
ZMUC: Zoological Museum of the University of Copenhagen
ROM: Royal Ontario Museum
MZ UBC: Museum of Zoology, University of British Columbia

collection, it seems possible to us that these two specimens especially the first-year female, may be extreme variations of their respective species (based on plumage). The possibility that these specimens are backcrosses (F_2 hybrids) as opposed to first generation (F_1) hybrids, as suggested by Fjeldså (1973), also exists.

Other suspected female hybrid goldeneyes were examined in the hand near 100 Mile House, British Columbia, by John Eadie (personal communication 1992) during the breeding seasons of 1984 through to 1992. These individuals were suspected of being hybrids based on intermediate characteristics for several of the following traits: weight, culmen length, wing pattern, and head shape.

The majority of hybrid goldeneye records are from the latter half of this century. Difficulty in identifying such hybrids, especially in the field prior to improved modern optical equipment, as well as an increase in observers in the field, may be responsible for the prior scarcity of hybrid records. Increased work on breeding goldeneyes in British Columbia and Iceland in the latter half of this century may also account for the temporal pattern of hybrid records in these areas. In addition, some records may not represent new individuals, especially in cases where recurring wintering birds are involved. Winter site fidelity has been described in the genus *Bucephala* (Erskine 1961; Limpert 1980; Savard 1985), so wintering hybrids may return to the same locality in subsequent years. Goldeneyes are also suspected to move locally, dependent on conditions of open water (personal observations from eastern Ontario and adjacent Québec and New York state), and an individual hybrid moving around may result in more than one record.

The six records of cross-pairing in goldeneyes all come from British Columbia, and all involve female Common Goldeneyes pairing with male Barrow's (J. Eadie, personal communication 1992). Five records were from 1985, when populations of goldeneyes were abnormally high (J. Eadie, personal communication 1992), with the sixth from 1992 (D. Anstey, personal communication 1992). These records suggest an increase in the incidence of hybridization, however, evidence to support this hypothesis is inconclusive.

Hybridization between goldeneye species is not confined to one geographic region. In fact, records of hybrids span all three areas of co-occurrence of the two goldeneye species: Iceland (two records), northeastern North America (eleven records), and western North America (over eight records). The observations of mixed pairing, noted above, are restricted to western North America. Together, these records of hybrids and mixed pairing illustrate the geographically widespread nature of hybridization between the goldeneyes. Biases in the distribution of observers and factors confounding the precise number of individuals represented by the records (as noted above), however, obscure the relative importance of hybridization among geographic areas.

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