

AGEING HARLEQUIN DUCK *HISTRIONICUS HISTRIONICUS* DRAKES USING PLUMAGE CHARACTERISTICS

CYNDI SMITH^{1,2}, FRED COOKE², and R IAN GOUDIE³

¹ Parks Canada, Banff National Park, Banff, AB T0L 0C0, CANADA

tel: 604-291-5618 fax: 604-291-3496 e-mail: cms@sfu.ca

² CWS/NSERC Research Chair in Wildlife Ecology, Dept. of Biological Sciences, Simon Fraser University, Burnaby, BC V5A 1S6, Canada e-mail: fcooke@sfu.ca

³ Harlequin Duck Conservation Society, Eastern Office, 17 Waterford Bridge Rd., St. John's, Nfld. A1E 1C5, Canada e-mail: igoudie@thezone.net

Most ducks (Subfamily Anatinae) progress through a sequence of moults from natal downy plumage to definitive alternate plumage. The accurate identification of age classes by plumage allows the proportion of immature males to adult males in the autumn and winter populations to be used as an index of recruitment and to determine age-specific mortality. By observing Harlequin Ducks (tribe Mergini) that were banded as ducklings on streams in North America we show that males are distinguishable in the autumn of the hatch year. The Alternate I plumage is variable and could result from differences of up to 10 weeks in hatch date, or could reflect the physical condition of individual birds. We also show that males attain definitive alternate plumage after the pre-alternate moult in the second calendar year. These plumage characteristics are useful both in the field and in working with specimens.

Keywords: Harlequin Duck, Age Class, Plumage

Waterfowl exhibit a sequence of plumages (Weller 1980). Natal downy feathers are quickly replaced by juvenile plumage. During the first autumn the juvenile plumage is replaced by the first alternate plumage. Drakes of some species may exhibit a second alternate plumage before the definitive alternate plumage is attained (Hohman *et al.* 1992). A plumage is considered definitive when it is unchanged in subsequent annual cycles (Hohman *et al.* 1992). Most ducks (Subfamily Anatinae) thereafter show two adult plumages each year, a relatively inconspicuous basic plumage, and a usually brightly coloured definitive alternate plumage (Palmer 1976). In coastal British Columbia most male Harlequin Ducks complete the entire moult, including the pre-basic and pre-alternate body moult, and the wing and tail moult, by the end of September (Robertson *et al.* 1997).

This sequence of plumages allows the proportion of immature males to adult males in the autumn and winter populations of waterfowl to be used as an index of recruitment (Bellrose 1980). Obtaining this ratio can be particularly important for species that are difficult to study during the breeding season. Age ratios may also be used to determine age-specific mortality rates (Ricklefs 1973, Owen 1980). Age counts are subject to several sources of error, including variable flock structure, timing of migration, behavioural differences between age groups, habitat use and geographic location (Owen 1980, Lambeck 1990). Age counts are only useful, however, if age classes can be accurately identified.

The literature is equivocal as to when male Harlequin Ducks (tribe Mergini) attain definitive alternate plumage. Cassirer and

Groves (1994) and Robertson *et al.* (1997) suggested that males attain definitive alternate plumage at the end of the pre-alternate moult in the second calendar year. Other authors (Dement'ev & Gladkov 1967, Canadian Wildlife Service 1987, Chadwick 1992, Rosenberg 1995) state that this plumage is attained after the pre-alternate moult in the third calendar year. Palmer (1976) and Weller (1980) both state that alternate plumage is attained in the second calendar year, but that it is not as distinct as the definitive drake (latter), or there might be changes in the following year (former).

In this study, we used known-aged Harlequin Ducks to show that: (1) males are distinguishable in the autumn of the hatch year, and (2) that males attain definitive alternate plumage in the second calendar year.

Definitions

In this paper we refer to the following age classes (Gustafson *et al.* 1991):

Hatch year (HY). Age class from flight until end of December of hatching year. Also known as first year, or 1Y.

Second year (SY). Age class from first of January to end of December of following year.

Third year (TY). Age class from first of January to end of December of third year of life.

Methods

Harlequin drakes were banded as ducklings on their natal streams in Alberta in 1996 (Smith 1996a, 1996b, MacCallum 1997), 1997 (Smith 1998a) and 1998 (Smith 1998b), in Montana in 1997 (P. Hendricks, pers. comm.) and in Oregon in 1997 (R. Jarvis, pers. comm.). On the breeding stream, a mist net was set across the river and birds were actively chased towards it (Smith 1996a). Captured birds were marked on one tarsus with a standard aluminium band, and on the other tarsus with a coloured plastic band with a unique two-digit code. Juvenile males were identified by the presence of a penis.

Banded Harlequin Duck males were observed at coastal wintering areas in the Strait of Georgia, British Columbia, between September 1996 and November 1998, and in Juan de Fuca

Strait near Port Townsend, Washington, in September and December 1997. Auxiliary band codes were read using a 20-45x or 20-60x telescope. In 1998, a plumage score sheet was used to standardise recording.

Results

Description of juvenile and Alternate I plumages

The juvenile plumage of both sexes are alike and superficially similar to female definitive basic (see Witherby *et al.* 1943 and Palmer 1976 for a complete description of the female's definitive basic plumage). The juvenile breast feathers are more or less brownish, with the feathers subterminally barred darker and margined paler (Palmer 1976), producing a vermiculated pattern (F. Cooke, unpubl. data). This character can be used to still distinguish females for a short time once males have begun to acquire Alternate I plumage. Legs are yellowish (Cassirer & Groves 1994).

The overall appearance of a male in Alternate I plumage was that of a dull-plumaged definitive alternate male, with considerable variation among individuals. The white loreal patch begins to extend into the crown, and the rust colour in the crown is absent or ill-defined. The white neck collar may be absent, when present it is often narrower, broken in front and seldom edged in black. The white nape stripe is often ill-defined. The white chest stripe may also be absent, and when present is often poorly defined and not usually edged in black. Belly feathers are light in colour or mottled. The amount of rust colouring on the side and flank is variable. White colour may be absent or asymmetrical on scapulars and tertials. Legs are yellowish.

Timing of alternate plumage acquisition

There were 23 observations of known-aged male Harlequin Ducks in coastal wintering areas that allowed us to determine age at which plumage changes occur. Seven hatch year males were observed at wintering areas in the autumn. One male was observed on 6 September 1996 and again on 24 September, and no alternate plumage characteristics were

noted (G. Robertson, *pers. comm.*). A male observed on 22 September 1997 (J. Hardin, *pers. comm.*), and three males (two were siblings) observed on 9-11 October 1998, were distinguishable by faint white loreal patches and crown stripes. A third sibling showed obvious Alternate I plumage on 22 October. Another male was observed on 3 December 1997 and showed Alternate I plumage (J. Hardin, *pers. comm.*).

Eight SY males (approx. eight months of age) were observed in late March in both 1997 and 1998, and all were in Alternate I plumage.

Eight TY males were observed in March and April in both years and were in definitive alternate plumage, indistinguishable from older banded birds in the study (see Witherby *et al.* 1943 and Palmer 1976 for a complete description of the drake's definitive alternate plumage). Three of these males had been observed the previous March in Alternate I plumage.

Discussion

Observations of known-aged individuals allowed us to clarify age-related changes in the plumage of male Harlequin Ducks. A partial body moult in autumn (Witherby *et al.* 1943, Palmer 1976, Cramp & Simmons 1977) allows identification of hatch year Harlequin drakes as early as 22 September in coastal British Columbia and Washington. By December, HY males are easily distinguished from females.

Variation in Alternate I plumage that we observed could result from differences in hatch date. Some individuals hatch on coastal streams in the first week in May in Oregon (Bruner 1997), others not until the end of July on the east side of the Canadian Rockies (MacCallum 1997). Variation in plumage could also reflect variation in physical condition of individual birds. Of three known-aged siblings from one brood (observed in October), one showed considerably more advanced plumage. His white tertials were conspicuous and he showed faint nape and chest stripes and neck collar, while these characteristics were absent in his two siblings. Two known-aged siblings in Alternate I plumage that were observed only

days apart in March had different plumages. One had a single oblong white tertial on each wing and very faint white scapulars; the other had no white tertials or scapulars.

Known-aged SY males were not followed through to their pre-alternate moult in September, but we believe they attained their full definitive alternate plumage by October. Robertson *et al.* (1997) captured three moulting SY males (aged by bursa depth) and later observed that they were in definitive plumage after the moult.

We suggest that male Harlequin Ducks observed in Alternate I plumage should be classified as hatch year (HY or IY) until the end of December, and second year (SY) from January to August. From September until December of any year, males observed in definitive alternate plumage should be classified as after hatch year (AHY) as they could be SY or ASY; from January through August of any year they should be classified as after second year (ASY).

For most of the winter, there are two male plumages in Harlequin Ducks, one the Alternate I and one the definitive alternate, and frequency of these plumages can be used as an index of recruitment and age-specific mortality. We recommend that age counts be conducted after the beginning of December.

We thank P. Hendricks and R. Jarvis for providing us with unpublished data on banded ducklings in Montana and Oregon, respectively. We are grateful to P. Clarkson, D. Genter, J. Hardin, H. Regehr, M. Rodway, D. Rosenberg, R. Swanston and K. Wright for field observations and discussions. G. Robertson and two anonymous reviewers kindly commented on an earlier draft. Funding was received from Alberta Environmental Protection, the Biodiversity Grants Program (Department of Biological Sciences, University of Alberta, through joint efforts of the sportsmen of Alberta and the Alberta Department of Environmental Protection, Fish and Wildlife Trust Fund), British Columbia Waterfowl Society, Canadian Wildlife Service, CWS/INSERC Wildlife Ecology Research Chair, Parks Canada Highway Services and Aquatic Service, and Simon Fraser University.

References

- Bellrose, F.C. 1980. *Ducks, geese and swans of North America*. Stackpole Books, PA.
- Bruner, H. 1997. Habitat use and productivity of Harlequin Ducks in the Central Cascade Range of Oregon. Unpubl. MSc. thesis. Oregon State Univ., Corvallis, OR.
- Canadian Wildlife Service. 1987. *How to identify Harlequin Ducks*. Dept. of Environment, Ottawa, ON.
- Cassirer, E.F. & Groves, C.R. 1994. Ecology of Harlequin Ducks (*Histrionicus histrionicus*) in northern Idaho. Unpubl. Tech. Report, Study No. 4202-1-7-2. Idaho Dept. Fish & Game, Boise, ID.
- Chadwick, D.H. 1992. Some observations of a concentration of Harlequin Ducks in the Strait of Georgia, British Columbia. *Proc. Harlequin Duck Symp.*
- Cramp, S. & Simmons K.E.L. 1977. *Handbook of Europe, the Middle East and North Africa: the birds of the western Palearctic*. Vol. I. Oxford University Press, Oxford.
- Dement'ev, G.P. & Gladkov, N.A. 1967. *Birds of the Soviet Union*. Vol. IV. Israel Prog. for Scientific Trans., Jerusalem.
- Gustafson, M.E., Hildenbrand, J. & Metras, L. 1997. *The North American Bird Banding Manual* (Electronic Version). Version 1.0.
- Hohman, W.L., Ankney, C.D. & Gordon, D.H. 1992. Ecology and management of postbreeding waterfowl. In: Batt, B.D.J., Afton, A.D., Anderson, M.G., Ankney, C.D., Johnson, D.H., Kadlec, J.A. & Krapu, G.L. (Eds.), *Ecology and management of breeding waterfowl*. Univ. Minnesota Press, Minneapolis, MN. Pp. 128-189.
- Lambeck, R.H.D. 1990. The applicability of age ratio and brood size counts in population dynamic studies of the Brent goose *Branta b. bernicla*. *Ardea* 78:414-425.
- MacCallum, B. 1997. The abundance, distribution, and life history of the Harlequin Duck *Histrionicus histrionicus* in the McLeod River and adjacent streams of the Alberta foothills. Unpubl. Tech. Report, Bighorn Env. Design Ltd., Hinton, AB.
- Owen, M. 1980. *Wild geese of the world*. B.T. Batsford, London.
- Palmer, R.S. 1976. *Handbook of North American birds*. Yale Univ. Press, New Haven, CT.
- Ricklefs, R.E. 1973. Fecundity, mortality, and avian demography. In: Farner, D.S. (Ed.). *Breeding biology of birds*. Nat. Academy of Sciences, Washington, DC. Pp. 366-448.
- Robertson, G.J., Cooke, F., Goudie, R.I. & Boyd, W.S. 1997. The timing of arrival and moult chronology of Harlequin Ducks *Histrionicus histrionicus*. *Wildfowl* 48:147-155.
- Rosenberg, D.H. 1995. Experimental Harlequin Duck breeding survey in Prince William Sound, Alaska. Exxon Valdez oil spill restoration project annual report (restoration project 94427). Alaska Dept. Fish and Game, Div. of Wildlife Cons., Anchorage, AK.
- Smith, C. 1996a. Harlequin Duck research project Banff National Park: progress report 1996. Unpubl. Tech. Report, Parks Canada, Banff, AB.
- Smith, C. 1996b. Kananaskis Country Harlequin Duck research project (Elbow, Sheep, Highwood and Kananaskis rivers): progress report 1996 field season. Unpubl. Tech. Report, Parks Canada, Banff, AB.
- Smith, C. 1998a. Harlequin Ducks *Histrionicus histrionicus* in Kananaskis Country, Alberta. Unpubl. Tech. Report, Alberta Env. Protection, Canmore, AB.
- Smith, C. 1998b. Harlequin Duck research in Kananaskis Country, Alberta, in 1998: Kananaskis River and Elbow River. Unpubl. Tech. Report, Alberta Env. Protection, Canmore, AB.
- Weller, M.W. 1980. Moults and plumages of waterfowl. In: Bellrose, F.C. (Ed.). *Ducks, geese and swans of North America*. Stackpole Books, Pennsylvania. Pp. 34-38.
- Witherby, H.F., Jourdain, F.C.R., Ticehurst, N.F. & Tucker, B.W. 1943. *The handbook of British Birds*. Vol. III. H.F. & G. Witherby, London.