# A SUMMARY OF DOCUMENTED HARLEQUIN DUCK OBSERVATIONS IN GLACIER NATIONAL PARK, 1874-1992

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## INTRODUCTION

Harlequins ducks are small, sea-going birds that migrate inland to nest along pristine mountain streams. Two distinct populations of harlequins winter along the northern Atlantic and Pacific coasts, respectively, of North America. The eastern population, listed as endangered in Canada, had declined dramatically and is estimated at less than 1,000 ducks (Goudie, 1989). The larger western population is listed under Category 2 of the Endangered Species Act by the U.S. Fish and Wildlife Service (USFWS), indicating that additional research and field study are needed before listing harlequins as threatened or endangered. Harlequins are listed as a "Sensitive Species" by the U.S. Forest Service in Regions 1, 4 and 6 and as a "Species of Special Concern" by the state of Montana.

In 1989, the Montana Natural Heritage Program (MNHP) began a harlequin banding project to document recruitment and nest productivity on Montana streams. In 1992 (the first year of banding in GNP), 91 ducks were banded on three creeks and two rivers. Fifty-three of these (58%), including 40 juveniles, were banded on Upper McDonald Creek (UMC).

In May 1992, automated stream gauging devices were installed in two UMC locations as part of a four-year study by University of Montana personnel. Initial data will become available in 1993.

This report summarizes documented harlequin observations in GNP from 1874 through 1992. The four-year harlequin banding and stream gaging programs on UMC could contribute significantly to

our knowledge of harlequin ducks. However, no funding has been allocated to monitor harlequins at UMC.

**METHODS**

Documented harlequin duck observations in GNP were located in a card file at the park library and on GNP's Wildlife Observation Report Forms (WORF). Additional harlequin sightings may have been recorded in other places, such as GNP ranger logs and backcountry patrol reports; these were not searched. No harlequin reports were found in a 1991 search of GNP archives.

Several dated observations mentioned in the scientific literature were also presented in F.M. Bailey's The Birds (1918). During 1973-75, harlequins were studied intensively at UMC from Lake McDonald to Logan Creek, approximately 15.6 stream kilometers in length, by Craig Kuchel for his Master's Thesis, Some aspects of the behavior and ecology of harlequin ducks in Glacier National Park, Montana. Both of these texts are on file in the GNP library.

In 1989, surveys were initiated on the lower 15.6 km section of UMC in June and September to monitor harlequin breeding pairs and broods, respectively (Table 2). These surveys required 4-8 volunteers to cover the entire 15.6 km. In 1991-92, a weekly, one-person survey was run along a 2.6 km stretch between Lake McDonald and Moose Country (Table 3, Figures 1-2). Only harlequin locations were recorded from the 1991 weekly surveys; dates of unsuccessful surveys were not recorded.

In 1990, Craig Groves, Idaho Fish and Game Dept. staff biologist, collected benthic organisms from UMC for baseline data for an Idaho harlequin food study. Results have not been reported to GNP biologists.

In 1992, 53 harlequin ducks (13 adult females, 40 juveniles) were captured on UMC using mist nets. Ducks were marked with three colored leg bands and one aluminum USFWS band (two bands on each leg) that allow individual ducks to be identified from a distance (Appendix 1). MNHP biologists plan to capture and band UMC birds for four successive years.

## RESULTS

### Historical Observations

In GNP, a scattering of harlequin observations have been reported as early as 1874 in several park lakes and streams. Most observations occurred during May and June while the distinctive males are present. Areas of moderately consistent use include Kootenai, Waterton and Avalanche Lakes, and UMC. All harlequin observations that were located, other than recent sightings at UMC, are listed in Appendix 3.

### Wintering Areas

The western harlequin duck population winters along the Pacific coast from Alaska to Oregon. Specific wintering areas or migration corridors have not been identified for the harlequins

breeding at UMC. Banded ducks may potentially be observed on their wintering grounds and identified by their band color codes.

## Spring Arrival To Glacier National Park

Harlequins migrate inland from the coast to nest along fast-moving, pristine mountain streams. Unpaired males arrive at GNP in late March and early April, showing up at UMC by early to mid-April. Paired adults arrive at UMC in late April (Table 1).

Table 1. Early harlequin duck observation dates.

| Year | Lone males | Pairs | Location | Source |
|---|---|---|---|---|
| 1968 | - | 26 April | Lk. McDonald lodge | GNP library file |
| 1970 | 4 April | - | M. Fork Flathead R. | GNP library file |
| 1974 | 14 April | 27 April | U. McDonald Creek | Kuchel (1977) |
| 1975 | 12 April | 27 April | U. McDonald Creek | Kuchel (1977) |
| 1976 | 16 April | 30 April | U. McDonald Creek | Kuchel (1977) |
| 1979 | 30 March | - | N. Fork Flathead R. | GNP library file |
| 1992 | 3 March | 29 April | U. McDonald Creek | GNP WORF |

## Breeding Pairs

Harlequins reach sexual maturity in their second year. Most pairs are believed to have formed before spring migration; pairs arrive together on the breeding grounds (Bengston 1966). Mate fidelity from year to year is unknown at UMC. High counts of harlequin pairs on UMC (between Lk. McDonald and Logan Cr.) were 11 in 1974 and 14 in 1975 and 1991. Surveys run on 5 June in years 1974-75 and 1991-92 found 3, 9, 5, 4 and 4 pairs, respectively, on UMC (Figure 3).

Table 2. Harlequin duck surveys, Upper McDonald Creek, Lake McDonald to Logan Creek, 1974-75, 90-92.

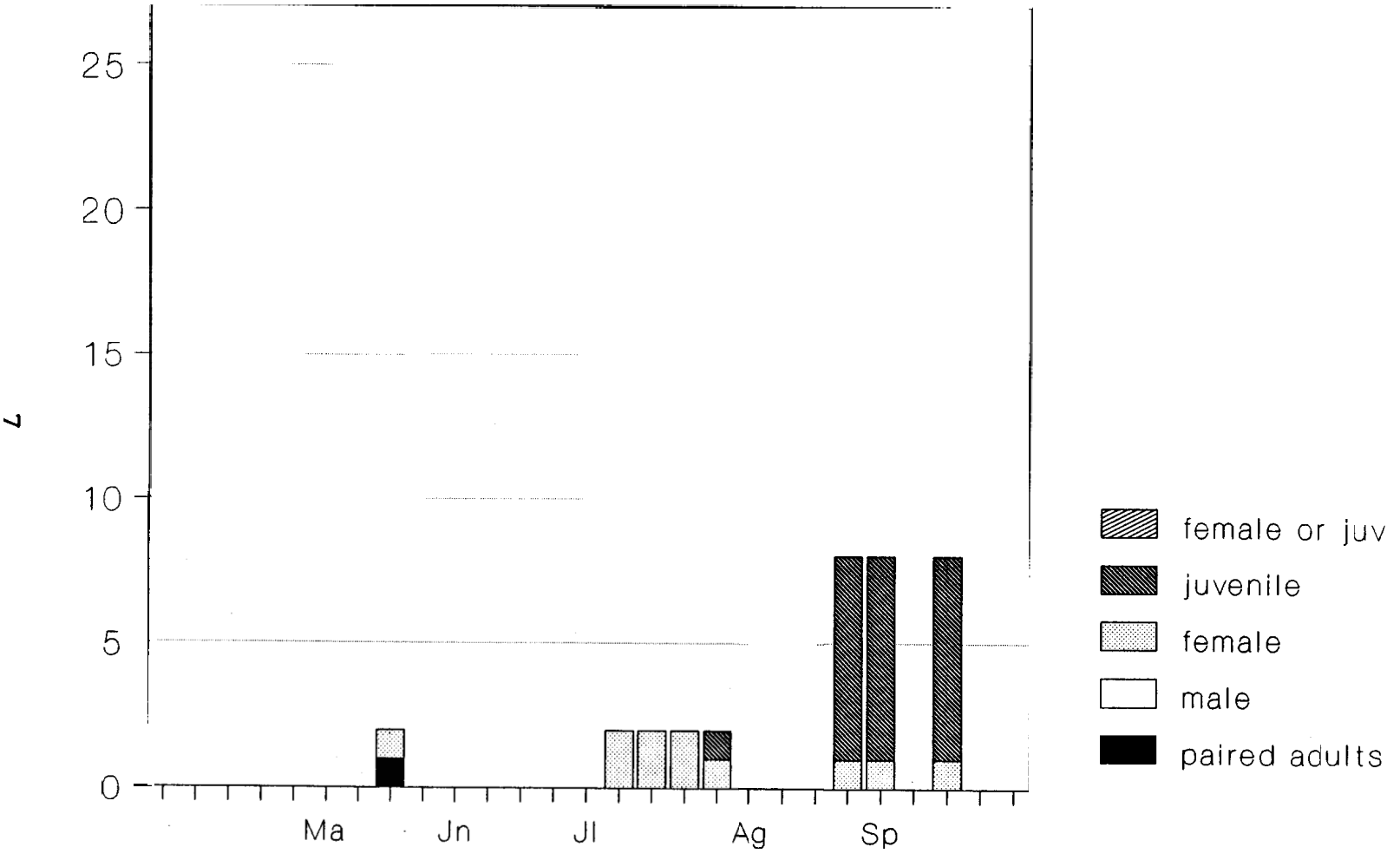
| Date | M | F | (Pairs) | Juv | Unk | (Broods) | TOTAL | Comments |
|---|---|---|---|---|---|---|---|---|
| 4/17/74 | 3 | 0 | (0) | 0 | 0 | (0) | 3 | adapted from Kuchel (1977) |
| 4/24/74 | 4 | 1 | (1) | 0 | 0 | (0) | 5 | adapted from Kuchel (1977) |
| 5/1/74 | 16 | 7 | (7) | 0 | 0 | (0) | 23 | adapted from Kuchel (1977) |
| 5/8/74 | 14 | 6 | (6) | 0 | 0 | (0) | 20 | adapted from Kuchel (1977) |
| 5/15/74 | 21 | 10 | (10) | 0 | 0 | (0) | 31 | adapted from Kuchel (1977) |
| 5/22/74 | 22 | 10 | (10) | 0 | 0 | (0) | 32 | adapted from Kuchel (1977) |
| 5/29/74 | 21 | 11 | (11) | 0 | 0 | (0) | 31 | adapted from Kuchel (1977) |
| 6/5/74 | 17 | 6 | (3) | 0 | 0 | (0) | 23 | adapted from Kuchel (1977) |
| 6/12/74 | 8 | 4 | (1) | 0 | 0 | (0) | 12 | adapted from Kuchel (1977) |
| 6/19/74 | 5 | 6 | (2) | 0 | 0 | (0) | 11 | adapted from Kuchel (1977) |
| 6/26/74 | 6 | 5 | (1) | 0 | 0 | (0) | 11 | adapted from Kuchel (1977) |
| 7/3/74 | 4 | 7 | (0) | ? | 0 | (?) | ? | adapted from Kuchel (1977) |
| 7/10/74 | 0 | 9 | (0) | ? | 0 | (?) | ? | adapted from Kuchel (1977) |
| 4/17/75 | 2 | 0 | (0) | 0 | 0 | (0) | 2 | adapted from Kuchel (1977) |
| 4/24/75 | 3 | 1 | (1) | 0 | 0 | (0) | 4 | adapted from Kuchel (1977) |
| 5/1/75 | 18 | 8 | (8) | 0 | 0 | (0) | 26 | adapted from Kuchel (1977) |
| 5/8/75 | 20 | 10 | (10) | 0 | 0 | (0) | 30 | adapted from Kuchel (1977) |
| 5/15/75 | 25 | 15 | (14) | 0 | 0 | (0) | 40 | adapted from Kuchel (1977) |
| 5/22/75 | 26 | 15 | (13) | 0 | 0 | (0) | 41 | adapted from Kuchel (1977) |
| 5/29/75 | 23 | 17 | (10) | 0 | 0 | (0) | 40 | adapted from Kuchel (1977) |
| 6/5/75 | 27 | 16 | (9) | 0 | 0 | (0) | 43 | adapted from Kuchel (1977) |
| 6/12/75 | 19 | 14 | (5) | 0 | 0 | (0) | 31 | adapted from Kuchel (1977) |
| 6/19/75 | 14 | 10 | (4) | 0 | 0 | (0) | 24 | adapted from Kuchel (1977) |
| 6/26/75 | 10 | 10 | (0) | 0 | 0 | (0) | 20 | adapted from Kuchel (1977) |
| 7/3/75 | 5 | 10 | (0) | ? | 0 | (?) | ? | adapted from Kuchel (1977) |
| 7/10/75 | 0 | 10 | (0) | ? | 0 | (?) | ? | adapted from Kuchel (1977) |
| 6/5/90 | 16 | 6 | (5) | 0 | 0 | (0) | 22 | |
| 5/3/91 | 19 | 14 | (14) | 0 | 0 | (0) | 33 | |
| 6/5/91 | 5 | 7 | (4) | 0 | 0 | (0) | 12 | surveyed from GTSR, Avalanche exhibit to Logan Cr. |
| 8/14/91 | 0 | 3 | (0) | 7 | 0 | (3) | 10 | |
| 6/5/92 | 12 | 6 | (4) | 0 | 0 | (0) | 18 | |
| 7/23/92 | 0 | 6 | (0) | 12 | 2 | (3-4) | 20 | |
| 8/11/92 | 0 | 8 | (0) | 30 | 0 | (7-8) | 38 | 3F & 6J more above Logan Cr. |
| 8/26/92 | 0 | 7 | (0) | 24 | 15 | (7-8) | 46 | 3 more Unk. above Logan Cr. |
| 9/2/92 | 0 | 5 | (0) | 20 | 2 | (4-5) | 27 | group of 14 ducks observed |

Table 3. Harlequin duck surveys, Upper McDonald Creek, sections between Lake McDonald and Logan Creek, 1988-92.

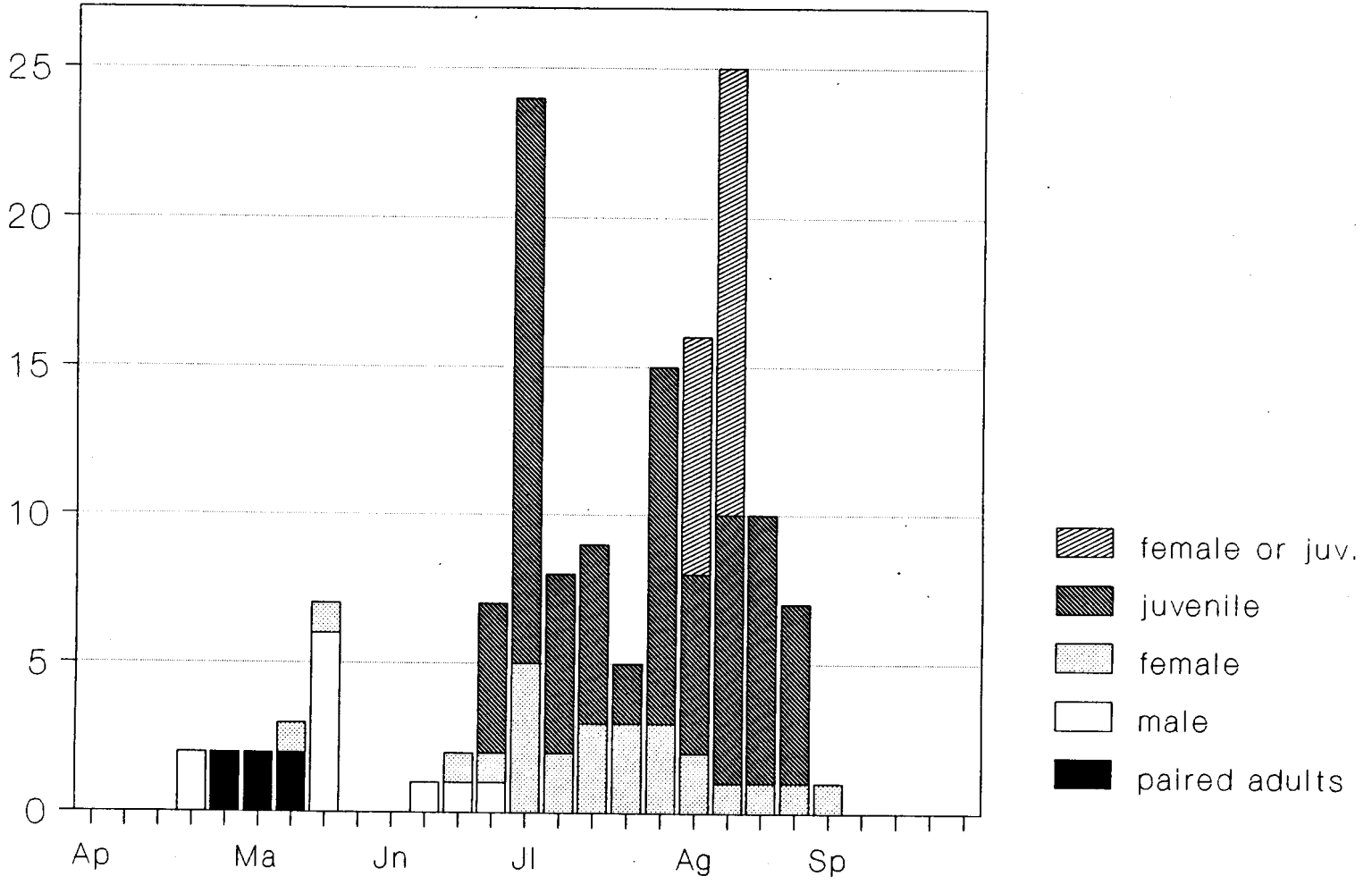
| Date | M | F | (Pairs) | Juv | Unk | (Broods) | TOTAL | Area surveyed | Water* |
|---|---|---|---|---|---|---|---|---|---|
| 7/21/88 | 0 | 0 | (0) | 0 | 0 | (0) | 0 | Lake McDonald - Red Rock Pt. | |
| 8/30/89 | 0 | 1 | (0) | 5 | 0 | (1) | 6 | LM - Logan Creek except 3km below Avalanche Cr. | |
| 8/17/90 | 0 | 1 | (0) | 4 | 0 | (1) | 5 | LM - Avalanche Creek | - |
| 5/22/91 | 1 | 2 | (1) | 0 | 0 | (0) | 3 | LM - Moose Country | - |
| 7/16/91 | 0 | 2 | (0) | 0 | 0 | (0) | 2 | LM - Moose Country | - |
| 7/23/91 | 0 | 2 | (0) | 0 | 0 | (0) | 2 | LM - Moose Country | - |
| 7/31/91 | 0 | 1 | (0) | 1 | 0 | (0) | 2 | LM - Moose Country | - |
| 8/22/91 | 0 | 1 | (0) | 7 | 0 | (1) | 8 | LM - Moose Country | - |
| 8/27/91 | 0 | 1 | (0) | 7 | 0 | (1) | 8 | LM - Moose Country | - |
| 9/4/91 | 0 | 0 | (0) | 0 | 2 | (0-1) | 2 | LM - Moose Country | - |
| 9/10/91 | 0 | 1 | (0) | 7 | 0 | (1) | 8 | LM - Moose Country | - |
| 4/2/92 | 0 | 0 | (0) | 0 | 0 | (0) | 0 | LM - Moose Country | - |
| 4/7/92 | 0 | 0 | (0) | 0 | 0 | (0) | 0 | LM - Moose Country | - |
| 4/14/92 | 0 | 0 | (0) | 0 | 0 | (0) | 0 | LM - Moose Country | - |
| 4/22/92 | 2 | 0 | (0) | 0 | 0 | (0) | 2 | LM - Moose Country | - |
| 4/29/92 | 2 | 2 | (2) | 0 | 0 | (0) | 4 | LM - Moose Country | - |
| 5/8/92 | 1 | 1 | (1) | 0 | 0 | (0) | 2 | LM - Moose Country | - |
| 5/14/92 | 2 | 3 | (2) | 0 | 0 | (0) | 5 | LM - Moose Country | - |
| 5/21/92 | 6 | 1 | (0) | 0 | 0 | (0) | 7 | LM - Moose Country | 315 |
| 5/29/92 | 0 | 0 | (0) | 0 | 0 | (0) | 0 | LM - Moose Country | 325 |
| 6/5/92 | 0 | 0 | (0) | 0 | 0 | (0) | 0 | LM - Moose Country | 285 |
| 6/11/92 | 1 | 0 | (0) | 0 | 0 | (0) | 1 | LM - Moose Country | 270 |
| 6/18/92 | 1 | 1 | (0) | 0 | 0 | (0) | 2 | LM - Moose Country | 275 |
| 6/23/92 | 1 | 1 | (0) | 5 | 0 | (1) | 7 | LM - Moose Country | 237 |
| 7/1/92 | 0 | 5 | (0) | 19 | 0 | (4) | 24 | LM - Moose Country | 192 |
| 7/8/92 | 0 | 2 | (0) | 6 | 0 | (2) | 8 | LM - Moose Country | 186 |
| 7/16/92 | 0 | 3 | (0) | 6 | 0 | (1) | 9 | LM - Moose Country | 172 |
| 7/23/92 | 0 | 3 | (0) | 2 | 0 | (1) | 5 | LM - Moose Country | 145 |
| 7/28/92 | 0 | 3 | (0) | 12 | 0 | (3) | 15 | LM - Moose Country | 145 |
| 8/4/92 | 0 | 3 | (0) | 13 | 0 | (3) | 16 | LM - Moose Country | 130 |
| 8/10/92 | 0 | 2 | (0) | 8 | 15 | (2-4) | 25 | LM - Moose Country | 115 |
| 8/19/92 | 0 | 1 | (0) | 8 | 0 | (1-2) | 9 | LM - Moose Country | 15 |
| 8/26/92 | 0 | 1 | (0) | 6 | 0 | (1) | 7 | LM - Moose Country | 85 |
| 9/2/92 | 0 | 1 | (0) | 0 | 0 | (0) | 1 | LM - Moose Country | 85 |
| 9/9/92 | 0 | 0 | (0) | 0 | 0 | (0) | 0 | LM - Moose Country | 90 |
| 9/16/92 | 0 | 0 | (0) | 0 | 0 | (0) | 0 | LM - Moose Country | 140 |
| 9/23/92 | 0 | 0 | (0) | 0 | 0 | (0) | 0 | LM - Moose Country | 170 |
| 9/30/92 | 0 | 0 | (0) | 0 | 0 | (0) | 0 | LM - Moose Country | 200 |

* water level (cm) from gauge on Upper McDonald Creek vehicle bridge

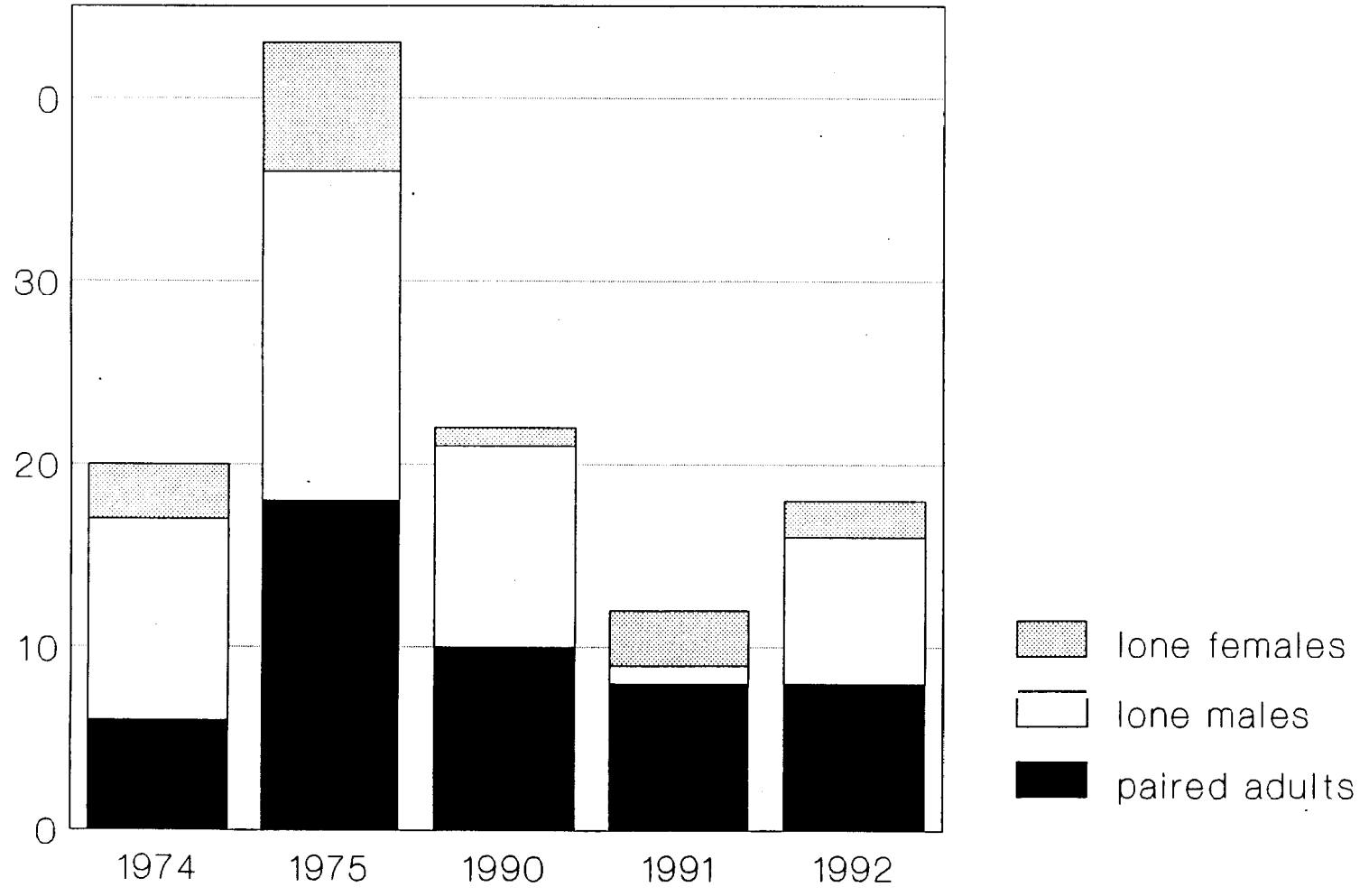
# F gure 1  1991 weekly harlequin surveys
## UMC, Lake McDonald to Moose Country



# Figure 2. 1992 weekly harlequin surveys
## UMC, Lake McDonald to Moose Country



# Figure 3. June 5 harlequin surveys
## UMC, Lake McDonald to Logan Creek



Kuchel (1977) found that paired males defended their mates from other males, but pairs were not territorial. Harlequin pair home ranges were 1-2 km in length with considerable overlapping.

**Nest Initiation and Egg Hatching**

Disintegration of the pair bond, initiation of incubation, and male departure from the breeding grounds tend to coincide with spring runoff. Nesting success was "closely correlated with the timing and intensity of spring runoff" (Kuchel, 1977).

No harlequin nests have been located in Montana. On 20 June, 1978, a GNP ranger reported a harlequin nest on Kishenehn Creek in British Columbia approximately 8 miles upstream from the park boundary. The nest contained five eggs and was situated 30 feet "above water at mouth of gorges, in rock crevice and sheltered by live and dead juniper branches." Kuchel (1977) suggested that nests may be located outside of the pair's home range, possibly near backwater ponds. In Iceland, Bengston (1966) reported that well-concealed nest sites were occupied in consecutive years and concluded that the same hens used the same nests each year.

Females incubate an average clutch of 5.5 eggs for 28 days, leaving the nest to feed only once every 48 hours (Bengston, 1966). On UMC, Kuchel (1977) estimated that egg laying began in mid-May and took 13 days to complete a clutch of six eggs. Estimated hatch dates for most broods at UMC were between 30 June and 4 July.

## Productivity and Brood Mixing

Bengston (1966) reported "amicable associations" of several broods that were occasionally joined by unsuccessfully breeding adult females. During 1973-76, Kuchel (1977) reported only two instances of brood mixing at UMC, both in 1974. In 1992, a year of high juvenile productivity and survival (Table 4), groups composed of multiple harlequin broods were observed at UMC before and after banding: 10, 23, 26 August and 2 September (Appendix 5). Leg band codes identified group members as one hen with similar-aged juveniles from 2-4 different broods. Group sizes ranged from 3-13 juveniles and lasted from less than 15 minutes to more than 1 week. Brood mixing in 1974 and 1992 may have been an artifact of high productivity.

Table 4. Harlequin brood and juvenile high counts at UMC.

| Year | 1973 | 1974 | 1975 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|---|
| Broods | 4 | 6 | 2 | 0 | 1 | 1 | 3 | *7-8 |
| Juveniles | 17 | 27 | 11 | 0 | 5 | 4 | 7 | 40 |

* estimation due to brood mixing

## Brood Habitat Selection

Kuchel (1977) found that harlequin chicks spent their first several weeks (3 July to 6 August) in backwater ponds, using streamside vegetation for shelter until becoming proficient divers by three or four weeks of age. As diving skills improved and water levels receded, hens and chicks moved out into UMC, but they still avoided "all areas frequented by humans" (Kuchel,

1977). In 1992, a hen with five chicks were observed on 20 June in the main UMC channel.

Kuchel (1977) found that, "after broods began using the creek, home ranges were continually expanded in a downstream direction." In 1992, 25 banded harlequins were relocated 46 times (Appendix 3). Relocations showed long-range movements upstream as well as downstream. Sixteen relocations (35%) of 11 ducks were more than 1 km upstream from the capture locations (range 1.1 - 13.05 km). Twenty relocations (43%) of 12 ducks were within 1 km of the capture location, and 10 relocations (22%) of eight ducks were more than 1 km downstream from the capture location (range 1.02 - 16.08 km). On 23 August, two ducks captured above and one captured below the Avalanche Creek inlet to UMC were observed at Avalanche Lake, 4.15 km from UMC.

**Departure From Glacier National Park**

The last male harlequin duck observation was on 3 July in 1974 and '75 (Kuchel, 1977). In 1992, the last male harlequin observation on the lower 2.6 km of UMC occurred on 23 June. The last adult female and/or juvenile harlequin observations at UMC were on 10 September and 2 September in 1991 and 1992, respectively.

Harlequin ducks have been seen on Lower McDonald Creek on 31 October, 16 and 24 November, 1979, and 24 November, 1985. These observations may have included harlequins that nested or were born at UMC.

**REFERENCES**


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Palmer, T. S. 1921. Harlequin Duck in Montana. The Condor. 23:133.

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Warren, E. R. 1914. Harlequin Duck in Glacier National Park, Montana. The Auk. 31:535.

Appendix 1. Harlequin duck leg band codes from Upper McDonald Creek, 1992.

y = yellow  r = red  w = white
g = green  o = orange  y = yellow
p = pink  s = silver (USFWS band)

NOTE: All 1992 juveniles banded with pink over silver on one leg.

| Age/sex | USFWS band # | Plastic leg bands left | right |
|---|---|---|---|
| Site (1), 10 August 1992, 0.92 km above Lake McDonald: | | | |
| Juvenile | 755-76021 | o/g | p/s |
| Juvenile | 755-76022 | o/b | p/s |
| Juvenile | 755-76023 | o/y | p/s |
| Juvenile | 755-76024 | o/w | p/s |
| Adult Female | 755-76025 | o/g | o/s |
| Juvenile | 755-76026 | o/o | p/s |
| Juvenile | 755-76027 | g/o | p/s |
| Juvenile | 755-76028 | b/o | p/s |
| (1-2 additional juveniles present but not captured) | | | |
| Site (2), 10 August 1992, 1.75 km above Lake McDonald: | | | |
| Juvenile | 755-76029 | p/s | o/g |
| Juvenile | 755-76030 | p/s | o/b |
| Adult Female | 755-76031 | o/b | o/s |
| Juvenile | 755-76032 | p/s | o/y |
| Site (3), 11 August 1992, 2.25 km above Lake McDonald: | | | |
| Adult Female | 755-76033 | o/y | o/s |
| Juvenile | 755-76034 | p/s | o/w |
| (1 additional juvenile present but not captured) | | | |
| Site (3A), 2 September 1992, 5.13 km above Lake McDonald: | | | |
| Juvenile | 755-76047 | p/s | b/o |
| Juvenile | 755-76048 | p/s | y/o |
| Juvenile | 755-76049 | p/s | w/o |
| Juvenile | 755-76050 | y/b | p/s |
| Adult Female | 755-76051 | o/s | o/b |
| Site (4), 10 August 1992, 5.30 km above Lake McDonald: | | | |
| Juvenile | 765-27568 | b/w | p/s |
| Juvenile | 765-27569 | g/w | p/s |
| Juvenile | 765-27570 | w/w | p/s |
| Adult Female | 765-27571 | w/b | w/s |
| (Female was rebanded on 2 September to correct original b/w-w/s marking that was put on two birds.) | | | |
| Site (4A), 2 September 1992, 5.90 km above Lake McDonald: | | | |
| Juvenile | 755-76053 | y/g | p/s |

Appendix 1 (cont.). Harlequin duck leg band codes from Upper McDonald Creek, 1992.

| Age/sex | USFWS band # | Plastic leg bands left | right |
|---|---|---|---|
| Site (5), 11 August 1992, 9.95 km above Lake McDonald: | | | |
| Juvenile | 765-27572 | w/b | p/s |
| Adult Female | 765-27573 | g/w | w/s |
| Juvenile | 765-27574 | p/s | b/w |
| Juvenile | 765-27575 | p/s | g/w |
| Juvenile | 765-27576 | p/s | w/w |
| Juvenile | 765-27577 | p/s | w/b |
| Juvenile | 765-27578 | p/s | w/g |
| (1 additional juvenile present but not captured) | | | |
| Site (6), 11 August 1992, 10.80 km above Lake McDonald (2 groups): | | | |
| Adult Female | 765-27579 | b/w | w/s |
| Juvenile | 765-27580 | w/g | p/s |
| Juvenile | 765-27581 | p/s | o/r |
| Juvenile | 765-27582 | p/s | w/r |
| Juvenile | 765-27583 | p/s | y/r |
| Juvenile | 765-27584 | s | p |
| Adult Female | 765-27585 | w/s | g/w |
| Site (7), 11 August 1992, 13.57 km above Lake McDonald: | | | |
| Adult Female | 765-27586 | w/s | w/w |
| Juvenile | 765-27587 | p/s | g/r |
| Juvenile | 765-27588 | o/r | p/s |
| Site (7A), 2 September 1992, 14.91 km above Lake McDonald: | | | |
| Adult Female | 755-76054 | o/s | o/y |
| Juvenile | 755-76055 | y/y | p/s |
| Juvenile | 755-76056 | y/w | p/s |
| Juvenile | 755-76057 | p/s | y/g |
| Juvenile | 755-76058 | p/s | y/b |
| Site (8), 11 August 1992, 18.35 km abova Lake McDonald: | | | |
| Juvenile | 755-76035 | p/s | o/o |
| Adult Female | 755-76036 | o/w | o/s |
| Site (9), 11 August 1992, 18.85 km abova Lake McDonald: | | | |
| Juvenile | 755-76037 | y/o | p/s |
| Adult Female | 755-76038 | o/o | o/s |
| Site (10), 11 Aug. 1992, 23.48 km above Lk. McDonald (Mineral Cr.): | | | |
| Adult Female | 755-76039 | o/s | o/g |
| Juvenile | 755-76040 | w/o | p/s |
| Juvenile | 755-76041 | p/s | g/o |

## Appendix 2. Documented harlequin duck observations at Glacier Nat. Park locations other than Upper McDonald Cr., 1874-1992.*

| Location | Date | Observation | Observer (Source) |
|---|---|---|---|
| GOAT HAUNT SUBDISTRICT---------- | | | |
| "Olson Valley" | Aug. 21, 1917 | 7 unspecified | Robert S. Yard (F.M. Bailey, 1918) |
| Thunderbird Pond (Olson Cr.) | 8/10/60 | 1F with 3Y | (illegible) (GNP library file card) |
| Thunderbird Pond (Olson Cr.) | 7/3/71 | 1F | Dave Shea (GNP library file card) |
| Lake Francis (inlet) | 7/9/73 | 1M, 1F | Dave Shea (GNP library file card) |
| Lake Francis (inlet) | 6/19/74 | 1 pair | Dave Shea (GNP library file card) |
| Lake Francis | 6/12/89 | 1 pair | K. Murphy (GNP wildlife obs. form) |
| Kootenai Lakes (at Camp Cr.) | 6/1/70 | 2 pairs | Dave Shea (GNP library file card) |
| Kootenai Lakes | 5/20/73 | 4 pairs | Jerry Desanto (GNP library file card) |
| Kootenai Lakes | 6/19/73 | 1 pair | Dave Shea (GNP library file card) |
| Kootenai Lakes | 6/1/74 | 8M, 5F | Jerry Desanto (GNP library file card) |
| Kootenai Lakes | 7/17/74 | 2F | Dave Shea (GNP library file card) |
| "Waterton Valley Trail" | 6/24/78 | 2 unspecified | Mark Oltman (GNP library file card) |
| Kootenai Lakes | 6/11/79 | 1M | Dave Shea (GNP library file card) |
| Kootenai Lakes | 6/21/79 | 1M | Dick Mattson (GNP wildlife obs. form) |
| Kootenai Lakes | 5/31/80 | 7M, 1F | Dick Mattson (GNP wildlife obs. form) |
| Kootenai Lakes | 6/24/82 | 1M, 1F | Chin, Emerich (GNP wildlife obs. form) |
| Kootenai Lakes | 6/6/85 | 1M, 1F | "B.K." (GNP wildlife obs. form) |
| Kootenai Lakes | 6/9/85 | 1M, 1F | "B.K." (GNP wildlife obs. form) |
| Kootenai River ("above falls") | 8/28/86 | 1F with 5Y | "W.A., J.D." (GNP wildlife obs. form) |
| Waterton River (at bridge) | 5/13/86 | 1M, 1F | "M.L." (GNP wildlife obs. form) |
| Waterton River ("mouth") | 6/1/89 | 1 adult | "U.M." (GNP wildlife obs. form) |
| Waterton R. (above Rainbow Falls) | 9/21/89 | 2F | "M.J." (GNP wildlife obs. form) |
| Boundry Creek | 6/13/84 | 1M, 1F | "M.L." (GNP wildlife obs. form) |
| Boundry Creek | 6/24/86 | 2M, 2F | "M.L." (GNP wildlife obs. form) |
| Boundry Creek (2 miles up trail) | 6/22/88 | 1M, 1F | Rick Yates (GNP wildlife obs. form) |
| Waterton Lake | Aug. 20-22, 1874 | 1F with 3Y | Dr. Elliot Coues (The Auk. 32:225, 1915) |
| Waterton Lake | 5/5/68 | 1 pair (?) | Jerry Desanto (GNP wildlife obs. form) |
| Waterton Lake (inlet) | 9/30/70 | 1F | Dave Shea (GNP library file card) |
| Waterton Lake (inlet) | 6/21/73 | 1F | Dave Shea (GNP library file card) |
| Waterton Lake ("head") | 5/26/85 | 1M, 1F | "S.B." (GNP wildlife obs. form) |
| Waterton Lake (inlet) | 6/10/85 | 1M, 1F | "M.L." (GNP wildlife obs. form) |
| Waterton Lake (inlet) | 5/23/86 | 2M, 2F | "M.L." (GNP wildlife obs. form) |
| Waterton Lake (at Boundry Bay) | 6/15/87 | 3 adults | "K.C." (GNP library file card) |
| Waterton Lake ("head") | 5/21/89 | 1M, 1F | "U.M." (GNP wildlife obs. form) |
| Waterton Lake ("head") | 5/24/89 | 3 adults | "M.J." (GNP wildlife obs. form) |
| Waterton Lake | 8/12/90 | 3F | Mike Johnston (GNP wildlife obs. form) |
| Waterton Lake (at boat dock) | 5/19/91 | 1M, 1F | Dick Mattson (GNP wildlife obs. form) |
| Waterton Lake (inlet) | 5/22/91 | 1M, 1F | Al Hoffs (GNP wildlife obs. form) |
| Waterton Lake (inlet) | 6/25/91 | 1M | Rick Yates (GNP wildlife obs. form) |
| Margaret Lake | 8/18/85 | 3F | Dave Shea (GNP wildlife obs. form) |
| Margaret Lake | 7/12/90 | 2F | Dick Mattson (GNP case incident 900024) |
| Kaina Cr. ("at trail crossing") | 5/29/78 | 1M, 1F | Dave Shea (GNP library file card) |
| Elizabeth Lake | 6/13/73 | 1M, 1F | Dave Shea (GNP library file card) |
| Elizabeth Lake (foot) | 5/11/88 | 1M, 1F | Dave Shea (GNP wildlife obs. form) |
| Belly River (1 mile N of RS) | 5/13/65 | 1M, 2F | Robt. Wasem (GNP library file card) |
| Belly River | 5/17/84 | 1M, 1F | Dave Shea (GNP wildlife obs. form) |
| Slide Lake | 7/6/65 | 2F | Robt. Wasem (GNP library file card) |
| Slide Lake | 8/31/66 | 7F (1F & 7Y?) | R. Wood (GNP wildlife obs. form) |
| Slide Lake | 7/19/67 | 2F | Dave Shea (GNP wildlife obs. form) |
| Slide Lake | 7/25/91 | 1F | Rick Yates (GNP wildlife obs. form) |

* Observations not necessarily verified

Appendix 2 (cont.). Documented harlequin duck observations at Glacier Nat. Park locations other than Upper McDonald Creek, 1874-1992.*

| Location | Date | Observation | Observer (Source) |
|---|---|---|---|
| **GOAT HAUNT SUBDISTRICT** | | | |
| Grinnell Lake | August 1895 | 1F with 6Y | "Dr. Grinnell" (F.M. Bailey, 1918) |
| Iceburg Lake | June 27, 1913 | 1 pair | E.R. Warren (F.M. Bailey, 1918) |
| "McDermott [Swiftcurrent] Falls" | winter 1917 | 1 unspecified | "Mr. Gibb" (F.M. Bailey, 1918) |
| Swiftcurrent Cr. (below dam) | 5/23/70 | 1 pair | F. Elmose (GNP library file card) |
| **SAINT MARY SUBDISTRICT** | | | |
| Saint Mary River & Gunsite Lk. | July 1917 | "several" | F.M. Bailey (F.M. Bailey, 1918) |
| Saint Mary River (Deadwood Falls) | 7/7/92 | 1F | G. West (GNP library file card) |
| Roes Creek (near Otokomi Lake) | July 1950 | 1F with 6Y | anonymous (GNP library file card) |
| Roes Creek (near Otokomi Lake) | 1951 | 1F with 3Y | anonymous (GNP library file card) |
| Roes Creek (near Otokomi Lake) | 1952 | 1 adult | anonymous (GNP library file card) |
| Saint Mary Lake (near Baring Cr.) | 5/23/91 | 1 pair | John Ashley (GNP wildlife obs. form) |
| lower Saint Mary River | spring 1895 | "8 or 10" | V. Bailey (F.M. Bailey, 1918) |
| (lower?) Saint Mary River | 5/16/90 | 1M, 1F | Pat Hagan (GNP wildlife obs. form) |
| Cut Bank Cr. (1.5 m N Katoysa Lk.) | 7/25/67 | 1F | Robt. Wasem (GNP library file card) |
| Cut Bank Cr. (2.5 m W R. Station) | 7/25/67 | 1M, 1F | R. Seibert (GNP library file card) |
| **TWO MEDICINE SUBDISTRICT** | | | |
| Upper Two Medicine Lake | Aug. 4-5, 1914 | 5 unspecified | Aretas A. Saunders (F.M. Bailey, 1918) |
| Aster Creek (near Aster Falls) | July 1988 | 1 pair | Charlie Scribner (GNP biologist's files) |
| Two Medicine Lake | 6/8/90 | 1M | Reggie Altop (GNP wildlife obs. form) |
| Two Medicine Lake (Paradise Cr.) | 6/4/92 | 1M | Patty Killian (GNP biologist's files) |
| Pray Lake | 5/31/79 | 1M, 1F | "Baker" (GNP wildlife obs. form) |
| Pray Lake | 5/16/88 | 1 pair | Steve Gniadek (GNP library file card) |
| Pray Lake | 5/19/90 | 1 adult | Reggie Altop (GNP wildlife obs. form) |
| Pray Lake | 6/13/90 | 1 unspecified | "visitor" (GNP wildlife obs. form) |
| **WALTON SUBDISTRICT** | | | |
| Ole Creek | 5/26/65 | 1 pair | R. Wasem (GNP library file card) |
| Ole Creek | 5/31/78 | 2M, 1F | Ursula Mattson (GNP library file card) |
| Ole Creek | 5/19/90 | 1 adult | "visitor" (GNP library file card) |
| Nyack Creek | 7/17/87 | 2F | Jim Bellamy(Nyack Cr. patrol cabin log) |
| Middle Fork Flathead River | 7/29/89 | 1F & 2Y | Steven Petrashek (GNp library file card) |
| MFFR (2.5 miles above Essex) | 8/5/89 | 1F & 1Y | Steven Petrashek (GNp library file card) |
| **LAKE McDONALD SUBDISTRICT** | | | |
| Continental Cr. (Upper McD. Creek) | 7/15/71 | 1F with 1Y | Dave Shea (GNP library file card) |
| Mineral Creek | August 1895 | "family of 7" | F.M. Bailey (F.M. Bailey, 1918) |
| Upper McDonald Creek | August 1895 | "family of 5" | F.M. Bailey (F.M. Bailey, 1918) |
| Lake McDonald (near lodge) | 4/26/68 | 1 pair | Mrs. John Fabian (GNP library file card) |
| Lake McDonald (outlet) | 6/1/70 | 2 pairs | "The Wasems" (GNP library file card) |
| Lower McDonald Creek | 5/29/70 | 4M, 1F | Dave Shea (GNP library file Card) |
| Lower McDonald Creek | 10/31/79 | 1F | Dave Shea (GNP library file Card) |
| Lower McDonald Cr. (Apgar bridge) | 11/16/79 | 1F | (illegible) (GNP wildlife obs. form) |
| Lower McDonald Cr. (Apgar bridge) | 11/26/79 | 1F | "J.B." (GNP wildlife obs. form) |
| Lower McDonald Creek | 11/24/85 | 1F | Ellen Horowitz (GNP library file Card) |
| Lower McDonald Creek | 7/30/91 | 1F with 7Y | "visitors" (GNP biologist's files) |

* Observations not necessarily verified

Appendix 2 (cont.). Documented harlequin duck observations at Glacier Nat. Park locations other than Upper McDonald Creek, 1874-1992.*

| Location | Date | Observation | Observer (Source) |
|---|---|---|---|
| LAKE McDONALD SUBDISTRICT (continued)---------- | | | |
| Avalanche Lake | 6/3/70 | 2 pairs | Dave Shea (GNP library file card) |
| Avalanche Lake | 6/12/89 | 1M | Greg Notess (GNP biologist's files) |
| Avalanche Lake (inlet) | 6/22/89 | 2M | "visitors" (GNP library file card) |
| Avalanche Lake | 5/21/90 | 1M, 1F | Laurie Kurth (GNP wildlife obs. form) |
| Avalanche Lake (outlet) | 5/22/90 | 1M | Steve Gniadek (GNP wildlife obs. form) |
| Avalanche Lake | 6/9/90 | 2 pairs, 2M | Steve Gniadek (GNP wildlife obs. form) |
| Avalanche Lake (outlet) | 5/28/92 | 1 adult | Lynne Dickson (GNP biologist's files) |
| Avalanche Lake (outlet) | 6/15/92 | 4M | "volunteer" (GNP biologist's files) |
| Avalanche Lake (inlet) | 8/18/92 | 1F with 4Y | Dave Shea (GNP library file card) |
| Avalanche Lake (inlet) | 8/23/92 | 1F with 4Y | John Ashley (GNP library file card) |
| Avalanche Lake (inlet) | 8/23/92 | 1F with 2Y | John Ashley (GNP library file card) |
| M. Fork Flathead R. (2 m E of WG) | 4/4/70 | 1M | Dave Shea (GNP library file card) |
| M. Fork Flathead R. (W. Glacier) | 4/27/70 | 2M | Robt. Wasem (GNP library file card) |
| M. Fork Flathead R. (W. Glacier) | 3/16/91 | 1M | Diana Milove (GNP wildlife obs. form) |
| M. Fork Flathead R. (W. Glacier) | 5/3/91 | 1M, 1F | B.R. McClelland (GNP wildlife obs. form) |
| NORTH FORK SUBDISTRICT---------- | | | |
| Kishenehn Creek (at NFFR) | 5/17/78 | 2M, 1F | Jerry Desanto (GNP library file card) |
| Kishenehn Cr. (8 m into Canada) | 6/20/78 | nest & 5 eggs | Jerry Desanto (GNP library file card) |
| Kishenehn Creek (at NFFR) | 6/20/78 | "5 ducks" | Jerry Desanto (GNP library file card) |
| Kishenehn Cr. (3 miles E of NFFR) | 7/4/80 | 1F | Jerry Desanto (GNP library file card) |
| Kishenehn Creek | 9/3/81 | 1F with 3Y | Jerry Desanto (GNP library file card) |
| Kishenehn Creek (at NFFR) | May 1988 | 1M (?) | Roger Semler (GNP biologist's files) |
| Starvation Creek (at NFFR) | 5/26/76 | 1 pair | Jerry Desanto (GNP library file card) |
| Starvation Creek (at NFFR) | 6/2/85 | 1 pair | Jerry Desanto (GNP library file card) |
| Starvation Creek (at NFFR) | 5/29/86 | 1 pair | Jerry Desanto (GNP library file card) |
| N.F. Flathead R. (Fool Hen Hill) | 3/30/79 | 1M | Jerry Desanto (GNP library file card) |
| N.F. Flathead R. (Ford Creek) | 5/29/80 | 1 pair | Jerry Desanto (GNP library file card) |
| N.F. Flathead R. (5 m N P-bridge) | 6/1/80 | 2 pairs | Jerry Desanto (GNP library file card) |
| N.F. Flathead R. (near Trail Cr.) | 5/21/83 | 1M, 1F (apart) | Jerry Desanto (GNP library file card) |
| N.F. Flathead R. (at Logging Cr.) | 5/12/85 | 1 pair | Jerry Desanto (GNP library file card) |
| N.F. Flathead R. (at Trail Cr.) | 5/19/90 | 1M | Susan Kemper (GNP wildlife obs. form) |
| North Fork Flathead River | 9/6/91 | 1F | James Bellamy (GNP wildlife obs. form) |
| North Fork Flathead River | 9/27/91 | 1F | Allyson Davis (GNP wildlife obs. form) |

* Observations not necessarily verified

## Appendix 3. Banded harlequin duck relocations, 1992, Upper McDonald Creek and Avalanche Lake.

| Date | *Location | Comments |
|---|---|---|
| FROM CAPTURE SITE 1 (0.92 km) | | |
| 8/10/92 | 0.92 | Hen banded o/g-o/s, USF&W 755-76025, captured with 7 juvs., 1 juv. not captured |
| 8/19/92 | 1.25 | Seen with original 7 juvs. |
| 8/26/92 | 1.20 | Seen with 5 of 7 original juvs. |
| 8/10/92 | 0.92 | Juv. banded g/o-p/s, USF&W 755-76027, captured with hen and 6 juvs., 1 juv. not captured |
| 8/19/92 | 1.25 | Seen with original hen and 6 of 7 juvs. |
| 8/26/92 | 1.20 | Seen with original hen and 5 of 7 juvs. |
| 8/10/92 | 0.92 | Juv. banded o/o-p/s, USF&W 755-76026, captured with hen and 6 juvs., 1 juv. not captured |
| 8/19/92 | 1.25 | Seen with original hen and 6 of 7 juvs. |
| 8/25/92 | 7.40 | Seen in creche of eight with ducks from capture sites 2, 5 (3), 7, 10, and one unidentified |
| 8/26/92 | 1.20 | Seen with original hen and 5 of 7 juvs. |
| 8/10/92 | 0.92 | Juv. banded o/y-p/s, USF&W 755-76023, captured with hen and 6 juvs., 1 juv. not captured |
| 8/19/92 | 1.25 | Seen with original hen and 6 of 7 juvs. |
| 8/26/92 | 1.20 | Seen with original hen and 5 of 7 juvs. |
| 8/10/92 | 0.92 | Juv. banded o/w-p/s, USF&W 755-76024, captured with hen and 6 juvs., 1 juv. not captured |
| 8/19/92 | 1.25 | Seen with original hen and 6 of 7 juvs. |
| 8/26/92 | 1.20 | Seen with original hen and 5 of 7 juvs. |
| 8/10/92 | 0.92 | Juv. banded o/b-p/s, USF&W 755-76022, captured with hen and 6 juvs., 1 juv. not captured |
| 8/19/92 | 1.25 | Seen with original hen and 6 of 7 juvs. |
| 8/26/92 | 1.20 | Seen with original hen and 5 of 7 juvs. |
| 8/10/92 | 0.92 | Juv. banded o/g-p/s, USF&W 755-76021, captured with hen and 6 juvs., 1 juv. not captured |
| 8/19/92 | 1.25 | Seen with original hen and 6 of 7 juvs. |
| 8/26/92 | 1.20 | Seen with original hen and 5 of 7 juvs. |
| 8/10/92 | 0.92 | Juv. banded b/o-p/s, USF&W 755-76028, captured with hen and 6 juvs., 1 juv. not captured |
| 8/19/92 | 1.25 | Seen with original hen and 6 of 7 juvs. |
| FROM CAPTURE SITE 2 (1.75 km) | | |
| 8/10/92 | 1.75 | Juv. banded p/s-o/g, USF&W 755-76029, captured with hen and 2 other juvs. |
| 8/25/92 | 7.40 | Seen in creche of eight ducks from capture sites 2, 5 (3), 7, 10, and one unbanded |
| 8/26/92 | 8.72 | May have been in nearby creche earlier this date |
| 9/2/92 | 14.80 | Seen in creche of eleven with ducks from capture sites 2, 5 (5), 7, 10, and two unbanded |
| 8/11/92 | 1.75 | Juv. banded p/s-o/y, USF&W 755-76032, captured with hen and two other juvs. |
| 8/23/92 | AvLk | Seen at Avalanche Lk. with hen 036 and juv. 035 (both from capture site two) |
| FROM CAPTURE SITE 3 (2.25 km) | | |
| 8/11/92 | 2.25 | Hen banded o/y-o/s, USF&W 655-76033, captured with 1 juv., 1 other juv. not captured |
| 8/26/9 | 5.53 | Seen alone |
| 9/2/92 | 2.10 | Seen alone |
| 8/11/92 | 2.25 | Juv. banded p/s-o/w, USF&W 755-76034, captured with hen, 1 other juv. not captured |
| 8/26/92 | 6.00 | Seen with 1 other duck - unsure if other duck was banded |
| FROM CAPTURE SITE 4 (5.30 km) | | |
| 8/10/92 | 5.30 | Hen banded w/b-w/s, USF&W 765-27571, captured with 3 juvs. |
| 9/2/92 | 5.42 | Seen with one of three original juvs. |
| 8/11/92 | 5.30 | Juv. banded b/w-p/s, USF&W 765-27568, captured with hen and 2 other juvs. |
| 8/26/92 | 8.62 | Seen with 2 other banded ducks (band colors unidentified) |
| 8/10/92 | 5.30 | Juv. banded w/w-p/s, USF&W 765-27570, captured with hen and 2 other juvs. |
| 9/2/92 | 5.42 | Seen with original hen only |

* Locations given in kilometers upstream from Lake McDonald inlet