

CANVASBACK AND REDHEAD PRODUCTIVITY AT RUBY LAKE NATIONAL WILDLIFE REFUGE

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ABSTRACT

Canvasback (*Aythya valisineria*) and redhead (*A. americana*) productivity was studied at Ruby Lake National Wildlife Refuge in 1970, 71, and 77-82. Nest and egg success were high for both species. Canvasback clutch and brood sizes were lower than those reported from other areas, but because of high nest success and egg hatch rates the number of young produced per pair was high. Redhead clutch and brood sizes and productivity were within the range reported from other areas. Sixty-eight percent of all canvasback nests were parasitized by redheads. Productivity was affected by parasitism, spring weather and human disturbance. The effects of the weather and disturbance were not quantifiable.

INTRODUCTION

Effects of egg parasitism, weather and human disturbance on canvasback and redhead productivity were studied at Ruby Lake National Wildlife Refuge (NWR) in 1970, 71, and 77-82. Egg parasitism occurs, when a female bird lays its eggs (intruded eggs) in the nest of another bird. This behavior is common in redheads (Weller 1959). Egg parasitism can affect productivity of the host species (Weller 1959, Bouffard 1983). Effects of cold, wet weather on breeding waterfowl include arrested courtship (Dane and Pearson 1971), delayed nesting (Dane 1966, Krapu and Doty 1979), increased nest attendance (Breckenridge 1956, Dane 1966), decreased clutch size (Milne 1976, Krapu and Doty 1979), reduced nesting drive (Yocum 1950, Milne 1976), death of embryos (Batt and Cornwell 1972), increased energy drain on the female (Harvey 1971) and death of adults (Dane and Pearson 1971). Little has been published on effects of disturbance by humans on nest success. Erickson (1948) stated that golden eagles and humans were the 2 most powerful stimuli of fright response in canvasbacks.

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STUDY AREA AND METHODS

Ruby Lake NWR lies in a high (1820 m) valley in northeastern Nevada. All nest surveys were conducted on the South Sump, a 2830 ha marsh. The marsh unit is well interspersed with open water, uplands and emergent vegetation. The emergent vegetation is nearly all hard-stem bulrush (*Scirpus acutus*).

Breeding populations were estimated using standard refuge procedures (U.S. Fish and Wildlife Service 1983). Breeding population surveys were conducted in April and May. Brood counts were conducted from late May to mid-August. Production was estimated by multiplying estimated breeding pairs, estimated percentage of females that nested successfully, and brood size just prior to fledging. Productivity was production divided by breeding pairs. The statistical accuracy and precision of breeding pair estimates, production and productivity in this study were not known, nor have they been published from other studies (Low 1940, Low 1945), Erickson 1948, Weller 1959, Rienecker and Anderson 1960, Olson 1964, Lokemoen 1966, Stoudt 1971, Johnson 1978, Alliston 1979).

Nests were located by slowly cruising the bulrush/open water edge with a small motorboat. When a canvasback or redhead female flushed from the bulrush, the adjacent area was searched for a nest. The number of eggs of each species was recorded and the stage of nest development was determined by candling the eggs (Weller 1956). In 1970, 71, 77, and 78 several eggs from each nest were candled; in 1979-82 all eggs were candled. Nests were rechecked just after their projected hatch dates to determine if they were successful. A nest where 1 or more eggs hatched was classed as successful. Egg success was the percent of all eggs laid that hatched. From 1980-82 all nest were also checked just before hatching and while hatching. Stage of development was rechecked at each nest visit. Embryos from known-aged clutches which died before hatching were aged again and the date of their death was determined. Nest success was calculated by the Mayfield - 40% method (Johnson 1979). Weather data were recorded at Ruby Lake NWR.

RESULTS AND DISCUSSION

Canvasback breeding pairs averaged 524 (range 265-1050) and redhead breeding pairs averaged 451 (range 298-621) during 1971 and 77-82 (Table 1). During the study 537 canvasback and 401 redhead nests were found. Of the 537 canvasback nests 367 were parasitized by redheads

Table 1. Breeding pair, production and productivity estimates at Ruby Lake National Wildlife Refuge.

YEAR	PAIRS	PRODUCTION	YOUNG/PAIR
Canvasback			
71	585	1778	3.0
77	265	1400	5.3
78	305	1230	4.0
79	458	2200	4.8
80	531	1680	3.2
81	1050	3500	3.3
82	475	1550	3.3
\bar{x}	524.1	1905.4	3.6
Redhead			
71	570	1687	3.0
77	375	1900	5.1
78	298	1600	5.4
79	420	2115	5.0
80	621	2010	3.2
81	521	1600	3.1
82	350	985	2.8
\bar{x}	450.7	1699.6	3.8

or other ducks. Nest success for all years combined was 69, 60 and 70% for parasitized canvasback, unparasitized canvasback and redhead nests respectively (Table 2). Low parasitism rates coupled with low nest success in 1980 lowered the combined nest success for all years of unparasitized canvasback nests below that of parasitized canvasback nests. Canvasback nest success reported in the literature ranged from 43% (Erickson 1948, Sugden 1978) to 65% (Stroudt 1971). Redhead nest success varied from 15.2% (Lokemoen 1966) to 93% (Alliston 1979) with most reports in the 50% range. Only Alliston used a Mayfield technique to estimate nest success. The other authors did not and their estimates are probably biased upward (Miller and Johnson 1978). Alliston's (1979) estimates are high because the redheads he studied nested on predator-free islands.

Table 2. Nest success calculated by the Mayfield - 40% method (Johnson 1979) at Ruby Lake NWR for 1970, 71, 77-82.

YEAR	PARASITIZED CANVASBACK	UNPARASITIZED CANVASBACK	REDHEAD
1970	0.85	0.71	0.93
1971	0.61	0.62	0.88
1977	0.84	1.00	0.81
1978	0.78	1.00	0.63
1979	0.88	0.67	0.85
1980	0.15	0.33	0.33
1981	0.83	0.67	0.53
1982	0.61	0.61	0.55
Combined ^a	0.69	0.60	0.70

a. Nest success for all years together.

Clutch size was 6.6, 7.1 and 8.9 for parasitized canvasback, unparasitized canvasback and redheads, respectively (Table 3). Most intruded eggs were redhead eggs, but intruded canvasback and ruddy duck (*Oxyura jamaicensis*) eggs also were found. Unparasitized canvasback clutch size at Ruby Lake NWR was smaller than reported in other studies (Table 3). Parasitized canvasback clutch sizes are not indicative of true clutch sizes since eggs are frequently dislodged from the nest during parasitic egg laying. Redhead clutch size at Ruby Lake NWR was within the range reported from other studies (Table 3).

Brood sizes at Ruby Lake NWR were lower for both species than reported for most other studies. Canvasback brood size of class III ducklings (fully feathered, but flightless) was 4.2 at Ruby Lake NWR. Canvasback brood sizes from other studies were 5.4 (Erickson 1948, Stoudt 1971), 3.8 (Sugden 1978) and 5.3 (Stoudt 1982). Redhead brood size of class II ducklings (partially feathered) was 4.5 at Ruby Lake NWR. Redhead females with broods avoided boats by hiding in the bulrush or by moving to areas of the marsh inaccessible to boats. Canvasback and redhead broods frequently broke up during class II and III stages. For these reasons insufficient class III redhead broods were seen to use for estimating brood size. Low (1945) reported 6.3 young fledged per successful female.

Table 3. Comparison of clutch sizes and egg hatch rates (in parentheses) from Ruby Lake NWR (1970, 71, 77-82) and other studies.

Source	CANVASBACK		Unparasitized	REDHEAD
	Parasitized			
	Host Eggs	Intruded Eggs		
Present Study	6.6 (67)	3.1 (50)	7.1 (71)	8.9 (63)
Low 1940				9.9 (38)
Low 1945				9.8 (45)
Erickson 1948			8.6, 9.9	
Weller 1959				7.3, 7.4
Stoudt 1971				8.9
Sugden 1978			8.5	
Alliston 1979				11.3 (82)
Stoudt 1982	7.3	3.1, 3.5	8.2	

Productivity at Ruby Lake NWR was 3.6 canvasback ducklings/pair and 3.8 redhead ducklings/pair (Table 1). Canvasback productivity reported in the literature ranged from 1.04 (Sugden 1978) to 2.7 (Olson 1964) ducklings/pair in pothole habitat with similar parasitism rates as at Ruby Lake NWR. In areas of heavy nest parasitism canvasback productivity ranged from 0.99 (Olson 1964) to 2.3 (Erickson 1948) ducklings/pair. Redhead productivity in the literature ranged from 2.9 and 3.2 (Johnson 1978) to 6.3 (Rienecker and Anderson 1960) ducklings/pair.

Effects of Parasitism

Sixty-eight percent of the canvasback nests found during this study were parasitized. Parasitism rates from other studies were 80% (Erickson 1948), 26-65% in pothole habitat and 83-97% in large marshes (Olson 1964), 65% (Sugden 1978) and 57% (Stoudt 1982). Egg parasitism by redheads reduced canvasback productivity by reducing canvasback clutch size (Bouffard 1983).

Effects of Weather

Weather during May 1980 was somewhat colder and much wetter than normal (Table 4). Temperatures of 0°C or less occurred on 8 days. Measurable precipitation occurred on 21 days; on 8 of them snow or sleet fell. Snow accumulated on May 11 and 24.

Nest success in 1980 was lower than normal for both species (Table 2). Canvasback nest success was negatively correlated with total precipitation in May ($r=-0.743$; $P=0.035$) and with the interaction of total precipitation and number of days of precipitation (total precipitation x days of precipitation) in May ($r=-0.82$; $P=0.013$). Canvasback nest success was not correlated with May mean high or low temperatures, the number of days of precipitation, the number of days of snow, or the interaction of the mean low temperature and total precipitation (1/mean low temperature x total precipitation). Redhead nest success was not correlated with any of these variables.

Table 4. Summary of May weather data at Ruby Lake NWR.

	1951-73 ^a	1980
Mean High Temperature	19.7°C	15.8°C
Mean Low Temperature	3.2°C	3.8°C
Precipitation	3.3 cm	12.8 cm
Number of Days with ≥ 0.25 cm Precipitation	4	14

a. National Oceanic and Atmospheric Administration. 1978.

In 1980, 5 canvasbacks and 1 redhead were found incubating dead eggs. A canvasback nest located on 7 May was checked on 26 May, its projected hatch date and the day following a 3 day snowstorm. The female was present on 26 May; some eggs had pipped, but each contained a dead duckling. The date of death of other clutches could not be determined. Batt and Cornwell (1972) reported death of mallard (*Anas platyrhynchos*) embryos on exposure to cold in laboratory experiments, but it had not been reported in wild populations.

Four canvasback nests were deserted on or near the 11 May 1980 snowstorm and 1 canvasback nest was deserted during the 23-25 May 1980 snowstorm. These nests were found several days to several weeks prior to their desertion. Eggs in these nests had continued to develop between the time found and their desertion.

Effect of Human Disturbance

Nest desertion caused by recreational boating was documented. In 1980, 2 redhead and 1 canvasback deserted their nests because of boaters. In 1981, 1 redhead deserted its nest because of boaters. In 3 of these cases, boats were observed moored near the nest site. The fourth case was a redhead nest within 0.5 m of a narrow channel (2 m wide) that was heavily used by boaters; the nest was deserted by the second day of boating season. Since 1979 Ruby Lake NWR has been opened to motorless boating on 15 June. Weather was not likely a contributing cause of failure of these nests since the weather after 15 June was warm and dry. Boat traffic was suspected of causing many other nest desertions, but only in these 4 cases could nest desertion, resulting from boat activity, be substantiated. The major disturbing factors to nesting canvasbacks and redheads appeared to be noise and the presence of people near the nest site. Erickson (1948) found human presence disturbing to canvasbacks. Human voices and other noise from boats caused females to flush from their nest. Noise from outboard motors was used to flush nesting females to locate nests in this study and by Erickson (1948).

CONCLUSIONS

Canvasback and redhead productivity was high at Ruby Lake NWR. High nest and egg success offset the low clutch sizes to attain this high productivity. Productivity was affected by egg parasitism, weather and human disturbance. Egg parasitism by redheads improved productivity of redheads and reduced productivity of canvasbacks. A decline in canvasback and redhead nest success was associated with cold, wet weather in May 1980, when some nesting females deserted their nests and some developing embryos dried during snowstorms. Human disturbance during the nesting season adversely affected nest success, but these effects were difficult to document and quantify.

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