

WILDLIFE DATA CENTRE

FEATURED SPECIES - CLARK'S GREBE

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Although still not the most familiar of the seven species of grebes in North America, the Clark's Grebe (*Aechmophorus clarkii*; Figure 1) only came into its own about two decades ago. For many decades it was considered a colour morph of the Western Grebe (*Aechmophorus occidentalis*; Figure 1) until 1985 when a series of field and laboratory studies recognized them each as distinct species (Storer 1965, Ratti 1979, Nuechterlein 1981b, Storer and Nuechterlein 1985, Ahlquist et al. 1987). Consequently, early information was recorded for the nominate Western Grebe with little mention of colour phases. So, what is known about the Clark's Grebe is recent and much remains to be learned.

For at least 22 years, since its discovery in the province in 1981, the Clark's Grebe has been an annual summer visitor in Salmon Arm bay at the southern end of Shuswap Lake, British Columbia. It can regularly be seen from west of the municipal wharf in Salmon Arm to the mouth of the Salmon River, and east of the wharf to the vicinity of Christmas Island. It is most active within the Western Grebe nesting colony or among staging and feeding flocks of Western Grebes offshore.

The species also occurs with some regularity on Duck Lake, in the northern Creston valley in summer, but cannot be assured to be found every year.

At Shuswap Lake, male Clark's Grebes have participated in courtship behaviour with female Western Grebes, including nest-building and chick-rearing. The results have been families of one to three hybrid chicks that intermingle with much larger Western Grebe flocks that scatter over Salmon Arm bay after hatching. Unless birds are close to shore



Figure 1. Clark's Grebe (facing left) and Western Grebe (facing right) can be distinguished throughout the year, in all plumages, by the colour of the bill which is yellow-orange in Clark's Grebe and dull green in Western Grebe. Also, the facial feathers surrounding the eyes of Clark's Grebe are pure white while those of Western Grebe are black. Richmond, BC. 2 February 2009 (David Tang).

it is very difficult to differentiate between the two species. Only three pure pairs of Clark's Grebes have nested in British Columbia, all at Shuswap Lake.

After the interior breeding season, Clark's Grebes migrate to the Pacific coast for the winter and are often found among flocks of Western Grebes in the vicinity of the Juan de Fuca Strait and Strait of Georgia. Not only do they have to change their diet but they also must be able to adapt to living in a marine environment that includes ingesting salt water. And a different set of threats will be encountered. Every year, small numbers of Clark's

Grebe are found somewhere on the south coast, in protected nearshore waters.

The continued breeding success of the Clark's Grebe in the Salmon Arm bay area is dependent upon the health of Shuswap Lake and its foreshore. Indirect and direct human disturbance as well as threats from other activities such as fireworks in early July at critical times during the hatching process pose new challenges for the future of the grebes. Development of shopping complexes and "box" stores along the waterfront are also of concern. Local naturalists and provincial biologists are closely monitoring the Salmon Arm bay nesting grounds so any adverse affects may be announced.

Much of the ecology and breeding biology in the following account is based on studies of Western Grebe, which most ornithologists agree is very similar to the natural history of Clark's Grebe. Future research may, however, delineate subtle differences for Clark's Grebe that may be important in conservation efforts.

Wildlife Data Centre Provincial Status – 2009

Like Forster's Tern, Clark's Grebe is a fairly recent arrival and a peripheral species in the province (see Campbell et al. 2008) with one regular breeding site at Shuswap Lake and another that is used infrequently at Duck Lake in the northern Creston valley. At the northern part of its range in south-central Canada breeding sites are widely scattered and isolated. The nearest colony to British Columbia is at Moses Lake in eastern Washington (Wahl et al. 2005).

The Clark's Grebe was added to the provincial "Yellow List" of 493 species and subspecies of vertebrates considered "not at risk" in British Columbia (British Columbia Ministry of Environment, Lands and Parks 1995). The comment for listing was that the species was "casual" although Clark's Grebe was being reported annually since 1988.

Following criteria for other "Red" and "Blue"-listed species, including low viability, erratic occurrence, small population size, and restricted range, the species should be elevated to the "Red" List. Although we consider the Clark's Grebe as *A Species of Special Concern* in British Columbia

it should be noted that 59 of the 86 species and subspecies of birds on the "Red" and "Blue" lists are peripheral in nature (see Bunnell et al. 2004). Although these species merit recognition there is growing concern that conservation efforts for endemic birds, world populations, and significant portions of a species' range that occurs in British Columbia are being undermined by attention given to peripheral species. However, the elevated status would provide some complementary attention and protection for *Aechmophorus* grebes (Figure 2) generally in the province.



Figure 2. Following some of the criteria for "Red-listing" species of conservation concern in British Columbia, such as low viability, erratic occurrence, small population size, and restricted range, Clark's Grebe should be elevated to the "Red" List with its close relative the Western Grebe. Shuswap Lake, BC. 16 June 2008 (Ian James).

The Clark's Grebe has never been listed under the federal Endangered Species Act in the United States, and in Canada the Committee on the Status of Endangered Wildlife designates the species in the category "Data Deficient" as there is insufficient scientific information on recent population numbers on which to base a status designation.

The Clark's Grebe is ranked globally as "demonstrably secure (G5)" by the Nature Conservancy although individual states have their own rankings. For example, in Idaho, the Department of Fish and Game lists the Clark's Grebe

as “Imperilled breeding (S2B)” state wide due to its low breeding population and restricted distribution.

In British Columbia, the Clark’s Grebe is protected under the federal Migratory Birds Convention Act and to a lesser degree by the provincial Wildlife Act. The federal act prevents “the hunting, collecting, and keeping in captivity of migratory birds and their eggs and nests. However, it only protects habitat while it is occupied, for example during the breeding season. (Jones and van Drimmelen 2007, van Drimmelen and Jones 2007).

At a Glance

Other names: “White-faced” Grebe

Similar species: Western Grebe and Red-necked Grebe (winter).

The Clark’s Grebe closely resembles the Western Grebe in size (slightly smaller), colour (paler overall), shape, behaviour, and breeding and non-breeding habitats and shares much of the same range. Sexes are nearly 100% separable on bill size and shape (Storer and Nuechterlein 1992).

In a study of Clark’s and Western grebes in southern Saskatchewan and Manitoba, Konter (2009) determined that three percent of all grebes encountered had intermediate plumages between the two species. Hybrid grebes are not uncommon in British Columbia and such pairs have successfully raised young further complicating identification. During transition plumages in autumn, as well as on the winter grounds, it is especially difficult to identify hybrid Western/Clark’s Grebe (Figure 3).

Breeding Adult (see cover image)

- Large, slender body with long neck
- Long, thin, sharply-pointed bill with distinct black culmen
- Body contrasting dark gray above and white below
- Black crown and nape; red eye
- Narrow black stripe on hind neck
- White chin, throat, face, and belly
- Black does not extend below eye on face
- Bill bright yellow to orange-yellow



Figure 3. Hybrid plumages between Clark’s and Western grebe are not uncommon in British Columbia, and elsewhere in North America, making these similar-looking birds hard to identify at any time of the year. This *Aechmophorus* grebe, photographed at Penticton, BC on 2 November 2006 is a typical example of a bird in confusing plumage. (Laure W. Neish).

Breeding Male (Figure 4)

- Larger in size
- Bill longer, thicker

Breeding Female (Figure 4)

- Smaller in size
- Bill shorter, much thinner with nearly straight culmen
- Bill slightly upturned appearance

Non-breeding

- Dusky on face surrounding top of eye
- Bill all yellowish

In Flight

- Elongated shape with head and neck extended and feet trailing
- Flight feathers with extensive white

Length (Both sexes)

55-75 cm (21.7-29.5 in)

Wingspan (Both sexes)

58-61 cm (23-24 in)

Mass (Both sexes)

718-1,685 g (25.3-39.4 oz)

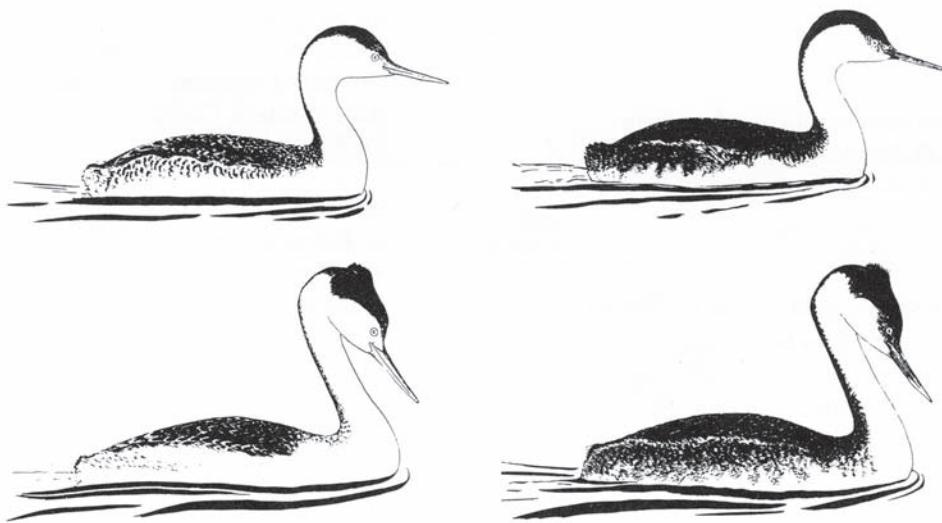


Figure 4. Plumage and sex differences in Clark's Grebe (left) and Western Grebe (right). Females are above, males below. Reprinted with permission from Storer (1965).

Where and When

World Range

Two populations have been identified which are comprised of a northern race (*Aechmophorus clarkii transitionalis*) and a Mexican race (*Aechmophorus clarkii clarkii*) (Storer and Nuechterlein 1992). The northern subspecies breeds in western North America from south-central British Columbia, extreme southern Alberta, southern Saskatchewan, and southwest Manitoba south to Wyoming, North Dakota, South Dakota, southwest Minnesota, western Nebraska, western Kansas, Colorado, Utah, Nevada, western Arizona, and New Mexico and in the west from eastern Washington, Oregon, and California to northern Baja California.

The race winters along the Pacific coast where it is scarce in the north in southern British Columbia and Washington becoming more common from central California south to southern Baja California. It is resident on some of the larger lakes in the

southwest United States that do not freeze.

The Mexican subspecies breeds on the Mexican Plateau.

British Columbia

Historical Status and Range Expansion: In British Columbia, summary technical literature (e.g., Brooks and Swarth 1925, Munro and McTaggart-Cowan 1947) and field notes of collectors and amateur ornithologists did not separate the colour phases although Fannin (1891) mentions that a Clark's Grebe, listed in his checklist as *Aechmophorus clarkii*, was "Taken at Fort Simpson by W.B. Anderson. Probably rare." Fort Simpson, near Prince Rupert, British Columbia, became a Hudson Bay Company trading post in 1834 and later its name was changed to Port Simpson. We have been unable to locate and examine the specimen.

The distribution of the Clark's Grebe is sympatric with the Western Grebe, generally breeding locally from eastern Washington south through western

North America to the Mexican Plateau (Storer and Nuechterlein 1992).

Since separation as a species in 1985, the Clark's Grebe has been increasing its breeding range both northward and southward primarily due to the establishment of large reservoirs (Storer and Nuechterlein 1985, Eichorst and Parkin 1991). In Washington State, the species was first recorded on Lake Washington on 18 April 1981 (Wahl et al. 2005) and first reported breeding at Moses Lake in eastern Washington in 1984 (Smith et al. 1997). Since then Clark's Grebe has been reported regularly.

Coincidentally, Clark's Grebe was first reported in British Columbia in 1981. An adult was photographed swimming with a Western Grebe (Figure 5) in Shuswap Lake off the Salmon Arm waterfront (Munro and Munro 1987, Campbell et al. 1990a). Since discovery of the photograph in 1987, and the announcement that "The light form of the Western Grebe has recently been declared a separate species, *A. clarkii* (Lawrence); it is rare among northern populations in North America." (Cannings et al. 1987).

Since its documented arrival in the province, Clark's Grebe has been observed regularly most breeding seasons on Shuswap Lake in the vicinity of Salmon Arm and irregularly on Duck Lake in the Creston valley (L.M. Van Damme pers. obs.). Vagrant occurrences are also being reported more

frequently from scattered locations in the south-central interior often where Western Grebes breed or stage.

Current Status: In the interior, an uncommon local breeder in extreme southern Shuswap Lake in the vicinity of Salmon Arm, rare and infrequent breeder in the northern Creston valley, and very rare elsewhere in the southern interior north to the Cariboo-Chilcotin region (Figure 6).

On the coast, very rare migrant and winter visitant to littoral marine waters of the Strait of Georgia, especially in the vicinity of the Fraser River delta, and Juan de Fuca Strait off southern Vancouver Island; casual in summer. There are two inland records for the upper Fraser River valley (Figure 6).

Occurrence: Due to its peripheral breeding distribution in the province the centre of abundance for Clark's Grebe occurs along the Salmon Arm waterfront at the south end of Shuswap Lake in south-central British Columbia. The only other location where the species occurs with some regularity is at Duck Lake near Creston. There is an increasing number of migration, dispersal, and vagrant records for other parts of the province including south coastal areas (see Figures 7 to 18).

Breeding: At the present time, Clark's Grebe is restricted to marshes and open water at the south end of Shuswap Lake from Sandy Point and Mallard Point south to the mouth of the Salmon River and east along the Salmon Arm waterfront to Christmas Island. The species also occurs fairly regularly at Duck Lake in the northern Creston valley (Figure 7). The increasing frequency of sightings during the breeding season in other lakes with emergent vegetation for nesting in the south-central interior suggests pioneering birds may be exploring new nesting sites.

Habitat

Migration and winter: In the interior, large and small open-water lakes (*i.e.*, not covered with aquatic plants), creek mouths at lakes, and open-water lakes with shore emergent vegetation.



Figure 5. This photograph appeared in a Salmon Arm newspaper in 1981 and was overlooked as an adult Clark's Grebe until 1987. It proved to be the first record for British Columbia. Shuswap Lake near Salmon Arm, BC. 6 June 1981 (Deane Munro). BC Photo 1162.

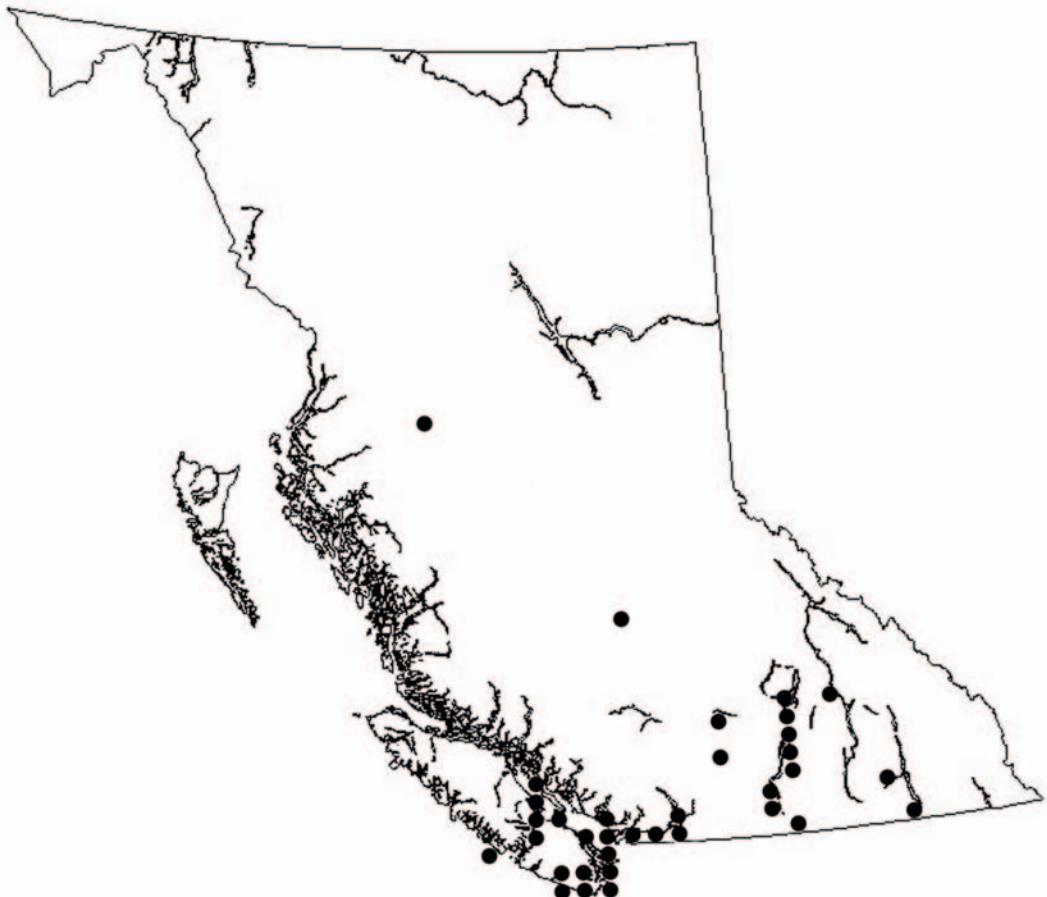


Figure 6. The locations (dots) of confirmed Clark's Grebe occurrences in British Columbia, 1981-2009.

On the south coast, nearshore marine waters with minimal tidal-current flow of protected and open bays (Figure 8), inlets, slow-moving rivers, and brackish estuaries. Farther inland wide canals and large lakes are frequented. There is a single record from a large sewage pond. Frequently Clark's Grebe is found associating with flocks of Western Grebes.

Breeding - North America: On freshwater lakes and marshes with extensive areas of open water bordered by emergent vegetation (Storer and Nuechterlein 1992).

Breeding - British Columbia: Clark's Grebe is known to breed regularly at Shuswap Lake and infrequently at Duck Lake in the northern Creston valley. Brief descriptions for each area follow.

Shuswap Lake: Shuswap Lake is 352 m in elevation. The following biophysical information for Shuswap Lake has been extracted from Stockner and Shortreed (1983).

A large lake with a surface area of 310 km² and a shoreline of 1,430 km in length. The maximum depth is 161m and mean depth is 62 m. The lake is relatively clear and oligotrophic and receives few



Figure 7. The breeding distribution (dots) of the Clark's Grebe in British Columbia.



Figure 8. On the south coast, many winter records of Clark's Grebes are from bays in nearshore marine waters surrounding the Greater Vancouver region. English Bay, BC. 5 March 1994 (R. Wayne Campbell).

nutrients from its mountainous surroundings due to their granitic nature.

The lake is composed of four arms. The two south arms are developed for high recreational use while the two northern arms remain undisturbed. Rivers flow into the arms but there is only one outlet, Little River, in the southwest. Shuswap Lake is a nursery for young Sockeye Salmon (*Oncorhynchus nerka*) which spawn in some adjacent rivers.

Water quality varies around the lake with the Salmon Arm waterfront being the most productive

area (Figure 9). This is a result of receiving a considerable influx of nutrients from agricultural drainage via the Salmon River.

The lake's plant and animal life is quite varied. Emergent vegetation includes Horsetail (*Equisetum* sp.), Common Waterplantain (*Alisma plantago-aquatica*), Narrowleaf water plantain (*Alisma gramineum*), Rannoch-rush (*Scheuchzeria palustris*), Sweet Flag (*Acorus calamus*), Yellow Water Buttercup (*Ranunculus gmelinii*), Water Parsnip (*Sium sauve*), and Common Spike Rush (*Eleocharis palustris*).

Floating and submerged aquatic plants include Water Smartweed (*Polygonum amphibium*), Duckweed Fern (*Azolla filiculoides*), Yellow Water-lily (*Nuphar polysepalum*), Common Water-milfoil (*Myriophyllum exaltatum*), Water-milfoil (*M. ussurense*), Eurasian Water-Milfoil (*M. spicatum*), Flatstem Pondweed (*Potamogeton zosteriformis*), Robbin's Pondweed (*P. robbinsii*), Sago Pondweed (*P. pectinatus*), White-stalked Pondweed (*P. praelongus*), Curly Pondweed (*P. crispus*), Ribbon-leaf Pondweed (*P. ephyrinus*), Illinois Pondweed (*P. illinoensis*), Clasping-leaf Pondweed (*P. perfoliatus*), Small Pondweed (*P. pusillus*), Stonewort (*Chara* sp.), Brittlewort (*Nitella* sp.), Northern Water-starwort (*Callitrichia hemaphroditica*), Twoheaded Water-starwort (*C. heterophylla*), Pond Water-starwort (*C. stagnalis*), Common Mare's Tail (*Hippurus vulgaris*), Horned Pondweed (*Zannichellia palustris*),



Figure 9. The foreshore and waterfront at Salmon Arm, BC., where *Aechmophorus* grebes nest (centre of photograph), has changed significantly with human development and activity since this photograph was taken. 1 July 1991 (R. Wayne Campbell).

Beck's Water-marigold (*Bidens beckii*), Common Bladderwort (*Utricularia vulgaris*), Flatleaf Bladderwort (*U. intermedea*), Canadian Waterweed (*Elodea canadensis*), Nodding Water-nymph (*Najas flexilis*), Coontail (*Ceratophyllum demersum*), and Stargrass (*Heteranthera dubia*).

There has been a significant increase in Eurasian Water-Milfoil colonization of the littoral zone in parts of the lake.

See Stockner and Shortreed (1983) for a list of phytoplankton and zooplankton.

The fish fauna includes Sockeye Salmon (*O. nerka*), Chinook Salmon (*O. tshawytscha*), Rainbow Trout (*O. mykiss*), Dolly Varden Trout (*Salvelinus malma*), Lake Trout (*S. namaycush*), Lake Whitefish (*Coregonus clupeaformis*), Mountain Whitefish (*Prosopium williamsoni*), Redside Shiner (*Richardsonius balteatus*), Burbot (*Lota lota*), and Prickly Sculpin (*Cottus asper*).

Duck Lake: Duck Lake is 532 m in elevation. The following description for Duck Lake (Figure 10) has been extracted from Ohanjanian (1998).

A shallow, 1,500 ha open water lake in the northern Creston valley, with emergent communities restricted to bands along sections of the shoreline. Ohanjanian describes lake features as follows: *The northern shore is a very thick cattail stand. Along most of the eastern shore, large rocks with small clumps of cattail predominate. In the south-eastern*



Figure 10. Duck Lake, where both *Aechmophorus* grebes breed, is a large, shallow lake situated in the northern Creston valley, BC. 20 October 2001 (R. Wayne Campbell).

corner of the lake, a large stand of cattail occurs in a peninsula. The southern shore of Duck Lake consists of cobble-sized rocks and sediments along the cross-dyke. The western shore appears to be the only area in which nesting (relating to Western Grebe) could theoretically occur at Duck Lake other than on the mat of submergent vegetation in the open water.

The stem density of available bulrush stands on this shore is between 50-150 stems per m². Depths along the edge of the vegetation stands of the western shore of Duck Lake ranged from 0.5 to 1.35 m on August 9, 1997. Water was 36 cm shallower on May 28, 1997, when first nests [i.e., Western Grebe] were initiated on Duck Lake. By August, large deposits of milfoil had bent the bulrush over... This, plus on-site observations of the size and intensity of waves along this shore suggests that without protection, the western shore is not suitable habitat.

Water levels at Duck Lake were variable and extreme... For example in 1997, a total of 61 cm change in water depths between mid-May and 24 June. These changes in water levels, combined with storms, created a more unstable environment. The milfoil mat is a vital habitat component at Duck Lake.

Submergent vegetation is widespread throughout the marshes and includes Canadian Waterweed, White Water-crowfoot (*Ranunculus aquatilis*), Common Bladderwort, Coontail, Northern Water-milfoil (*M. sibiricum*), Common Mare's Tail, and numerous pondweeds including Floating-leaf Pondweed (*P. natans*), Clasping-leaf Pondweed, Sago Pondweed, Curly Pondweed, and others (Brayshaw 1985, Ohanjanian and Teske 1996).

Annual Occurrence

Clark's Grebe is present in the province throughout the year (Figure 11). It is a rare local breeder in south-central British Columbia and a migrant, and rare winter visitor, on the south inner coast in the vicinity of Juan de Fuca Strait and Strait of Georgia. Most records, as expected for the province, are from the interior during the peak nesting period in June and July (Figure 11). Wandering individuals, representing dispersing birds in summer and migrants in spring and autumn in the southern interior of the province

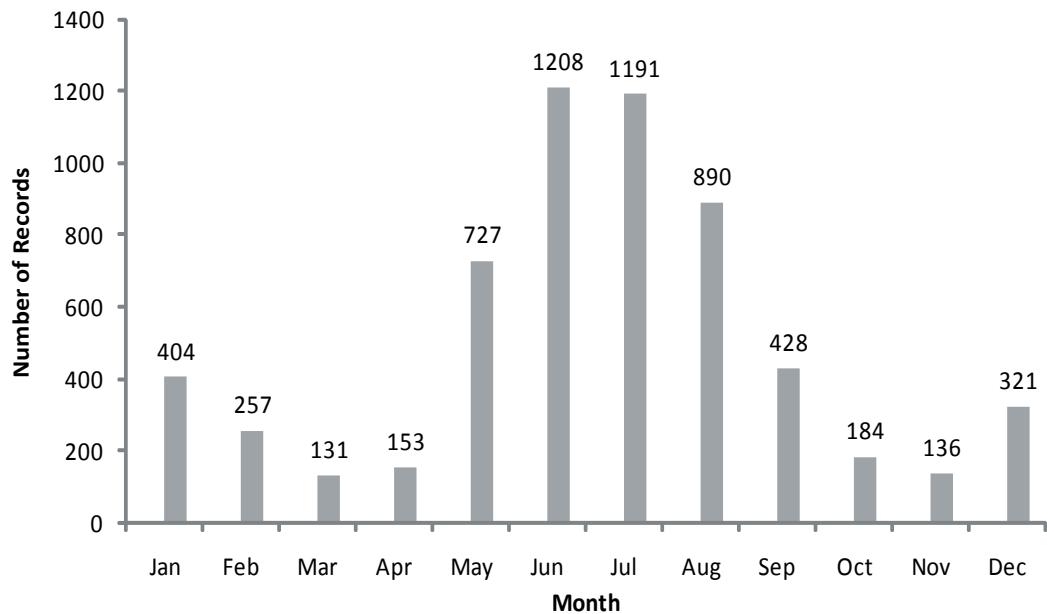


Figure 11. Total occurrence records, by month, for Clark's Grebe in British Columbia, 1928 – 2009.

are being reported more frequently now that the species is receiving more interest from birders.

The number of wintering records, all from the coast, is far fewer than for interior occurrences. Most coastal records are from December to February (Figure 12). Of these, most are from the southwest mainland coast in the vicinity of the Fraser River delta.

In the interior, Clark's Grebe has been recorded from 14 April to 15 October (185 days) and on the coast from 9 September to 28 April (232 days) with the exception of two isolated summer records in mid-July and mid-August.

The monthly summary and distribution for all records compiled for Clark's Grebe in British Columbia, from 1981 through 2009, is shown in Figures 13 to 24. Noteworthy comments and distribution locations are discussed in each of the monthly figure captions. All records are listed from south to north.

The breeding period, May through August, is the main residence period (see Figure 25).

Clark's Grebe has been reported annually in the interior of the province from 1988 through 2009. On

the coast, it has been reported each year from 1985 through 2009 with the exception of 1994, 2000, 2002, 2003, and 2004.

Migration

Coast: First migrants in autumn may appear as early as 9 September (Ross Bay, Victoria) but most Clark's Grebes arrive with waves of Western Grebes during the last two weeks of the month. During November and December small numbers disperse and become settled for the winter. By mid-February some birds have already left the coast and stragglers linger into March and April. The latest dates are 16 April (Cecile 2007c) and 25 April (Cecile 2001a).

Interior: Clark's Grebe is a short to medium-distance migrant arriving in extreme southern British Columbia each spring from wintering grounds on the central Pacific coast or from large inland lakes in south-western United States. The species is a nocturnal migrant and usually arrives as single birds (see Figure 26); Western Grebes often arrive in flocks.

Early arrival dates for Shuswap Lake ranged from

14 April to 6 May and late dates from 17 to 23 May with a 21-year average of 9 May. Early departure dates for Shuswap Lake ranged from 24 August to 3 September and late dates from 4 September to 15 October with a 21-year average of 14 September (Table 1).

At Duck Lake, migration dates are more inconsistent and varied. First dates ranged from 16 May to 26 June and departure dates from 8 August to 17 September.

Length of Stay

Coast: Of the 55 occurrences, 31 (56%) were reported only on a single day. The longest continuous length of stay was 101 days at Royal Roads (Juan de Fuca Strait) during the 1985-1986 winter. The average length of stay for all records was 14 days.

It should be remembered that the Clark's Grebe was not given full species status until 1985 and only in the past decade or so have birders been carefully scrutinizing flocks of Western Grebes for a Clark's Grebe.

Interior: The length of time Clark's Grebes remain in the vicinity of the extreme south end of

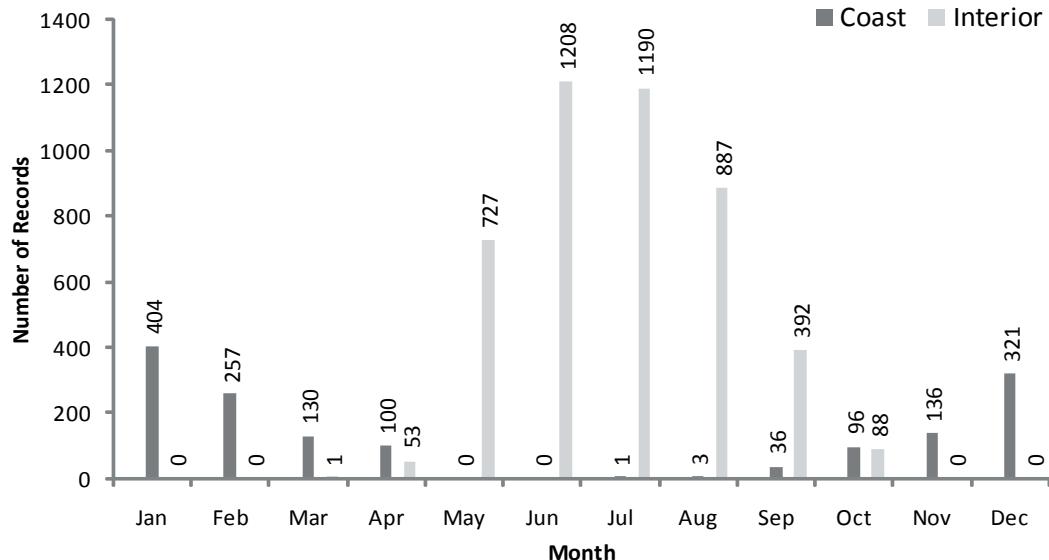


Figure 12. Total occurrence records by month, for Clark's Grebe in coastal (southern Vancouver Island and Lower Mainland) and southern interior of British Columbia, 1928-2009.

Table 1. Early, late, and average arrival and departure dates for Clark's Grebe at Shuswap Lake, BC, by decade, 1988-2009. The average date was calculated using Julian days (1 January = 1; 31 December = 365) and then back-converting to a Gregorian (modern) calendar date.

Period	Total Years	Spring Arrival			Autumn Departure		
		Early	Late	Average	Early	Late	Average
1988-1989	2	6 May	19 May	13 May	26 Aug	4 Sep	31 Aug
1990-1999	9	3 May	23 May	12 May	24 Aug	14 Sep	2 Sep
2000-2009	10	14 Apr	17 May	1 May	3 Sep	15 Oct	27 Sep



Figure 13. January: Coast - On southeastern Vancouver Island, an over-wintering bird was present, usually associating with Western Grebes, throughout the month in Parry Bay (Metchosin) (1992, 1996), Royal Roads (Juan de Fuca Strait) (1986, 1992, 1993, 2002, 2006), and Saanich Inlet (1996). Other records, of a bird on a single date, were from Sooke, French Beach, Jordan River, Sidney, Cherry Point, French Creek, Port Alberni, the Englishman River estuary, and Qualicum Bay.

On the southwest mainland coast, a single bird was present most of the month, in 1989, 1997, and 1998, swimming in the main river and backwaters of the North and Middle Arm of the Fraser River including Gilbert Beach (Richmond). Another bird was present in the Fraser River, off Inglis Road on Sea Island, in 1997, off Iona Island jetty in 1999, and off Westham Island in 2008.

On the Sunshine coast, a single bird was present for two days at Powell River in 2006, the only record for the area.

Interior – Not reported.



Figure 14. February: Coast - By the end of the month the overwintering birds at Parry Bay and Royal Roads had departed. There were no other locations reported for southeastern Vancouver Island.

On the mainland, a single bird was seen near Gravesend Reach (Tilbury Island) in Vancouver during the first half of the month in 1988. In 1997, the overwintering bird in the North Arm of the Fraser River remained throughout the month as did the bird at Gilbert Beach (Richmond) in 1989. The overwintering bird in 1998 departed on the 27th. There was a single record in 1999 for the same river system, another off Gilbert Road in Richmond in 2009, and another from Westham Island in 2008.

Interior – Not reported.



Figure 15. March: Coast - The only Vancouver Island record was an adult at River Jordan for a day in 2007. On the mainland, the overwintering bird in 1989 off Gilbert Beach (Richmond) and the adult in the North and Middle Arm of the Fraser River in 1997 remained throughout most of the month. In addition a single bird was observed in a sewage pond on Iona Island in 1996.

Interior – The only interior record was five Clark's Grebes counted off Kokanee Creek Park, in the West Arm of Kootenay Lake on 2 March 1997. This water body is one of the very few that remains ice-free in winter in the interior of the province.



Figure 16. April: Coast - On southern Vancouver Island, an adult was seen once at Jordan River in 2007 and a single bird was photographed near Port Alberni in 1988. A single bird was seen infrequently between 5 and 23 April 1985, along the east side of Fulford Harbour on Salt Spring Island.

The overwintering bird on the mainland that arrived in mid-December 1988 was last reported on 17 April 1989 and the overwintering bird in the North Arm of the Fraser River that arrived in January 1997 was last reported on 25 April. Single adults were seen at Iona Island (Richmond) in 1999 and 2001, at Gilbert Beach (Richmond) in 1991, and Westham Island in 2006.

Interior – Early migrants at Shuswap Lake have been found among arriving Western Grebes during the last two weeks of the month with first arrival dates ranging from 14 to 30 April. There is one record outside the breeding colony at Shuswap Lake from Wood Lake (Okanagan) late in the month in 2009.



Figure 17. May: Coast - A single Clark's Grebe was reported throughout most of the month from several locations around Vancouver including Stanley Park and Spanish Banks.

Interior – Most Clark's Grebes return to Shuswap Lake during the first two weeks of the month with first dates ranging from 3 to 23 May. Courting and pair-bonding occurs and rarely, towards the end of the month, nest-site selection and nest-building may commence. No nests with eggs have been reported.

The only spring arrival record for Duck Lake is 16 May.

Outside known breeding sites, spring migrants have been reported from Mission Creek (Kelowna), Nicola Lake, Okanagan Lake (Vernon Arm), Tranquille (Kamloops Lake), and Revelstoke (Columbia River).

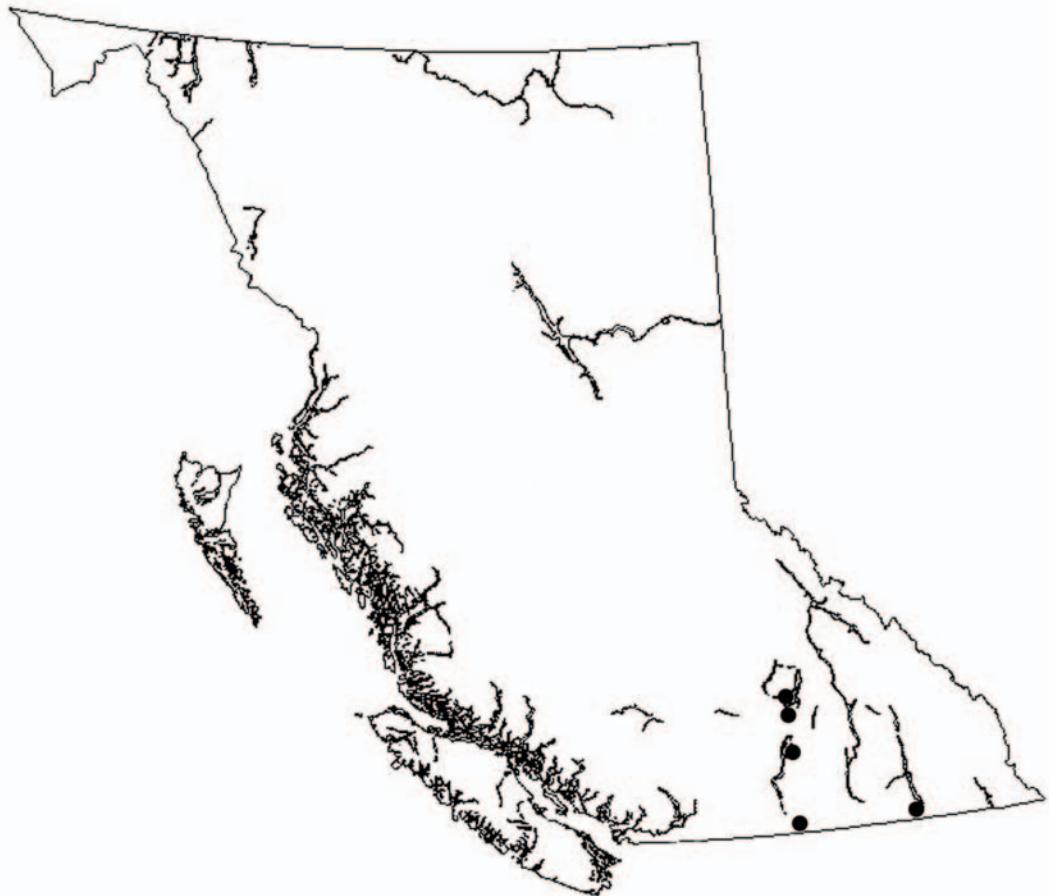


Figure 18. June: Coast – Not reported.

Interior – At Shuswap Lake, most nest-building, egg-laying, and incubation occurs during the first three weeks of the month. Early-hatching chicks have been seen on their parent's backs being fed in open water away from the colony. Replacement clutches, the result of local storms, wave action, and disturbance, may commence during the last week.

At Duck Lake, birds in some years may be seen for the first time in mid-June and may stay for the remainder of the month. One or two hatching dates occurred during the last week of the month.

Outside known breeding sites, a single bird was reported from Haynes Point (Osoyoos) and Swan Lake (Vernon).



Figure 19. July: Coast - The only coastal occurrence was an adult at Gordon's Beach, west of Sooke, for a day.

Interior – At Shuswap Lake, in normal years, most hatching occurs during the first and second week. Replacement clutches may occur as late as the last week with large young still being fed into early October. Families leave the natal site soon after hatching and move to open water where chicks grow steadily, being fed by their parents for the first few weeks.

At Duck Lake, non-breeding birds have been observed throughout the month in some years. The second breeding record had young hatch during the second week.

Outside known breeding sites, a single bird was reported from the south end of Okanagan Lake and an adult on Swan Lake (Vernon).



Figure 20. August: Coast - The only coastal occurrence was two adults present for three days near Port Renfrew in mid-month.

Interior – At Shuswap Lake, although young are large and feeding independently, there are no reports of fledging or first flights in August. Some adults and non-breeding birds, however, may depart during the last week of the month. Departure dates for seven years ranged from 24 to 31 August.

At Duck Lake, there is only a single record for the month.

The only record reported for other interior locations was an adult swimming with Western Grebes in Armstrong (North) Arm of Okanagan Lake.



Figure 21. September: Coast – Adult Clark's Grebes begin appearing with migrating flocks of Western Grebes early in the month. On Vancouver Island, up to three adults were reported at Sooke Harbour, Gordon's Beach (Sooke), and Ross Bay (Victoria) during the month.

The mainland records were from Point Grey (Vancouver), Spanish Banks, Locarno Beach (Point Gray), Chilliwack, and Harrison Hot Springs (at Harrison Lake).

Interior – At Shuswap Lake, the main autumn departure of adults and family groups occurs during the first and second week of September although after 2000 the main departure was a week later. Departure dates for 10 years in the month ranged between 1 and 30 September.

At Duck Lake, two departure dates were 1 and 17 September, the latter date being the latest for the Creston valley.

A single bird was present most of the month on Okanagan Lake off Penticton and north of Vernon at Head of the Lake.

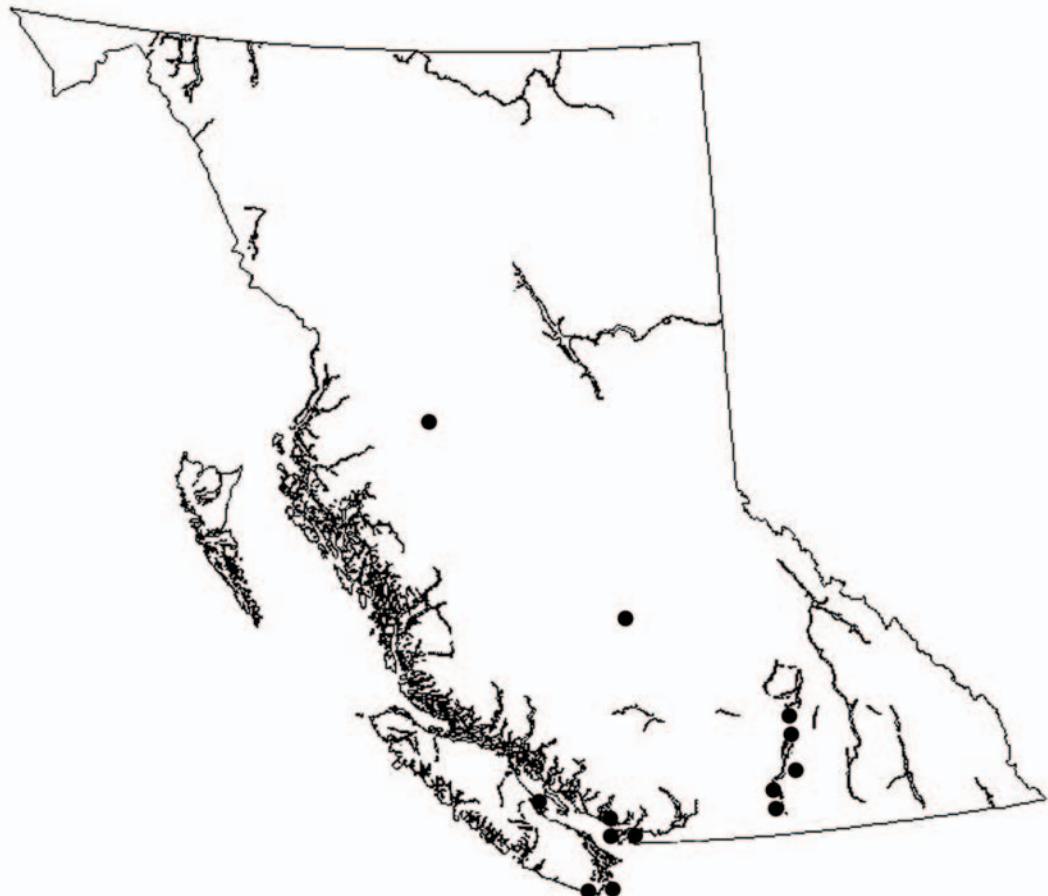


Figure 22. October: Coast - Three records of single birds on Vancouver Island from mid-month onwards at Whiffin Spit, Ogden Point, (Victoria; see Figure 61), and Union Bay.

On the mainland coast, a single bird was seen throughout the month at various locations in the Greater Vancouver region including Horseshoe Bay, Point Grey, “Acadia Beach”, Blackie Spit, and Iona Island. One grebe remained through November, the other through December, at the two of the locations.

Interior – At Shuswap Lake, the decade of the 2000s was the only period with October departure dates for British Columbia. This may, in part, be due to the new intensive program of monitoring *Aechmophorus* grebes by local naturalists. Departure dates for five years in the month ranged between 7 and 15 October, the latter date being the latest for Shuswap Lake.

There are three records outside known breeding sites. Two are from the Okanagan valley (one at the Penticton Yacht Club on Okanagan Lake, and one from Swan Lake north of Vernon). The third record was of a single bird seen on a lake near Smithers during the second and third weeks of the month.

Editor’s Note: During production of this issue of *Wildlife Afield* a single bird was seen on Callanan (Fish) Lake on 24 October 2009. This is the latest interior record for British Columbia and is included here for completeness.



Figure 23. November: Coast - As the last influx of Western Grebes moved to the coast to winter, Clark's Grebe was reported more frequently from more locations. On southeastern Vancouver Island individuals were reported from Sooke, Parry Bay (Metchosin), Royal Roads (Juan de Fuca Strait), Saanich Inlet, and Departure Bay (Nanaimo). There is one record from marine waters near Port Alberni.

There was one record for Otter Bay (North Pender Island) in the Canadian Gulf Islands.

On the mainland, one bird arriving in early and late October (*i.e.*, different years) remained through the month in the vicinity of the south jetty at Iona Island. Another was seen for a day in 1996. A single bird frequented nearshore areas between Ferguson Point and Siwash Rock in Stanley Park (Vancouver) and another around Lion's Gate bridge (Burrard Inlet). The only other record was an inland occurrence at Vedder Canal (Chilliwack).

Interior – Not reported.



Figure 24. December: Coast – Wintering birds were widely scattered. On Vancouver Island single birds were present throughout the month, or reported on a single day, at Amphitrite Point (Ucluelet), Port Renfrew, Sooke, Parry Bay (Metchosin), Royal Roads (Juan de Fuca Strait), Saanich Inlet, Little Qualicum River estuary, and Comox.

A single bird was reported at Fulford Harbour (Salt Spring Island) in the Canadian Gulf Islands. On the mainland, one or two birds were reported from Boundary Bay, Beach Grove, Gilbert Beach (Richmond), Iona Island (south jetty), North and Middle Arm of the Fraser River, English Bay (Vancouver), Ambleside Park (West Vancouver), and Sandy Cove (West Vancouver).

Interior – Not reported.

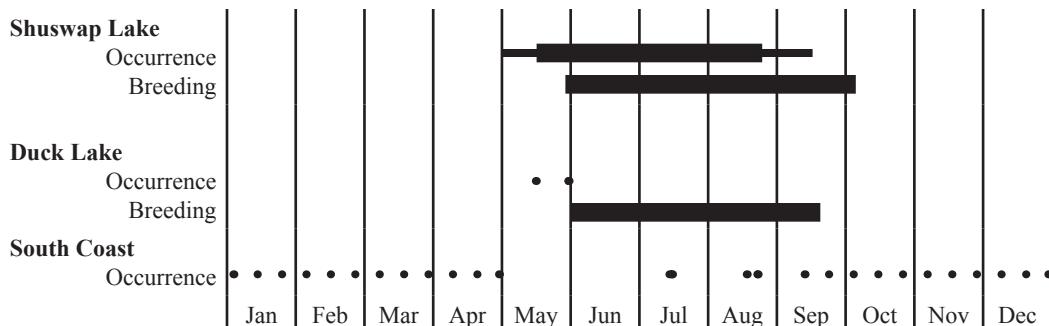


Figure 25. Annual occurrence and breeding chronology of Clark's Grebe in three regions of southern British Columbia, 1981-2009. Thick bars: common; Thin bars: uncommon; Dots: rare.

Shuswap Lake, as summer visitors on their breeding grounds, has ranged from 95 to 185 days with an average of 130 days or about four and one-third months (Table 2).

The average length of stay by decade for 21 years between 1988 and 2009 for the same location ranged from 111 to 150 days (Table 2). At Duck Lake, the longest length of stay was 85 days in 1983.

Summer Population

Annual Maximum Number of Clark's Grebes at Shuswap Lake: The Shuswap Lake Western Grebe colony attracts small numbers of Clark's Grebe each summer, few of which have been found breeding. Numbers of Clark's Grebes have been fairly consistent from the late 1980s through the 1990s ranging between one and three birds, with an average of 1.5 birds per year (Figure 27). Numbers after 2000 ranged from one to 12 grebes with an average of 2.9 birds per year. Excluding the influx of Clark's Grebes in 2009, the average number of birds for the 2000s is 2.2 per year.

The latter increase, however, may be the result of



Figure 26. Migrant Clark's Grebes in British Columbia arrive on breeding and wintering grounds as singles, unlike their close relative Western Grebes. Duck Lake, BC. 16 July 2008 (Linda M. Van Damme).

better scrutiny of flocks of breeding and nonbreeding Western Grebes by local naturalists in Salmon Arm.

The 22-year average is 1.8 Clark's Grebe reported per year.

Table 2. Shortest, longest, and average length of stay for Clark's Grebe at Shuswap Lake, BC, by decade, 1988-2009.

Period	Total Years	Length of Stay (days)		
		Shortest	Longest	Average
1988-1989	2	100	122	111
1990-1999	9	95	134	113
2000-2009	10	118	185	150

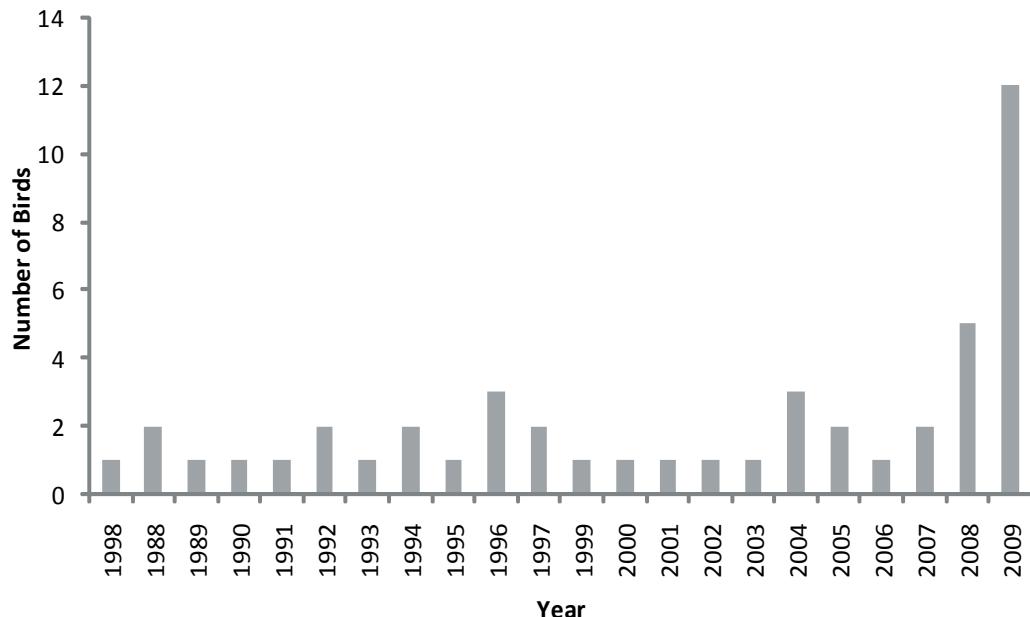


Figure 27. Maximum number of Clark's Grebes (excluding chicks and juveniles) recorded at Shuswap Lake, BC, 1988–2009.

Annual Summary of Occurrence and Breeding at Shuswap Lake: Available information for arrival and departure dates, numbers, and breeding evidence is summarized below for each year. Since all records are from nearshore locations, and Clark's Grebe is known to forage in deeper waters than the Western Grebe (Nuechterlein 1981a, Nuechterlein and Buitron 1989), the information may not fully represent the annual presence of the species.

We are also aware that there is significant overlap in black-and-white body plumage between Western and Clark's grebes (see Figure 3) and birds identified below as "hybrids" have face patterns that appear intermediate between the species.

All observations, unless otherwise stated, are from littoral waters from the Salmon River east along the Salmon Arm waterfront to "Christmas" Island, a shoreline distance of about 2.6 km (Figure 28). The area includes a river mouth, dense patches of shallow water emergent shoreline vegetation including Reed Canary Grass (*Phalaris arundinacea*), a government wharf and marina protected by a rock breakwater,

and a low island (e.g., "Christmas Island"; Figure 29) with small mounds covered with shrubs and grasses and a central marshy area of sedges. The latter is an alternate nesting site for grebes depending on lake levels. The traditional nearshore nesting ground is about 150 m west of the marina (Figure 30).



Figure 28. A large portion of Salmon Arm bay showing the marina, nearshore vegetation, and viewing boardwalk frequented by Clark's Grebe. Shuswap Lake, BC. 29 June 1997 (R. Wayne Campbell).



Figure 29. Christmas Island, as it is locally known, was created in 1986-87 from dredged material used to create a marina off Salmon Arm, BC. While small vegetated mounds of land are present, and used for nesting mainly by Ring-billed Gulls, a marshy interior is used for nesting by both Western and Clark's grebes when lake levels are suitable. 6 June 1996 (R. Wayne Campbell).



Figure 30. Traditional Western Grebe nesting site west of the marina showing extensive beds of Reed Canary Grass and other emergent vegetation. Starting in 1985, new residences and a hotel were constructed so that much of the shoreline bordering the sensitive nesting areas is now built up. Shuswap Lake, BC. 23 May 1993 (R. Wayne Campbell).

1981

The only date for the year is 6 June (see Munro and Munro 1987 and Figure 5).

The field notes of the late Derek Beacham (1970-1973) and park naturalist reports for Shuswap Lake Park area (see Stevens 1969, Stevens et al. 1970, Sirk et al. 1973) did not separate colour morphs of the

Western Grebe.

Although Clark's Grebe may have been present on Shuswap Lake in intervening years the next record was seven years later.

1988

Kime and Kime (2000) observed two male Clark's Grebes all summer (May to August) performing pair bonding rituals with female Western Grebes. In late summer, Frank noticed "behaviour patterns that would indicate that a male Clarke's Grebe was the parent of a female Western Grebe's family."

1989

A single Clark's Grebe was reported infrequently throughout the summer swimming alone mainly east of the marina from 6 May to 4 September. On 12 June it was identified as a male.

1990

No arrival or departure dates are available. In July, a male Clark's Grebe was observed participating in the caring of young with a female Western Grebe west of the marina. The number of young was not recorded (F. Kime pers. comm.).

1991

A single Clark's Grebe was seen infrequently from 22 May to 30 August mainly in the vicinity of the marina and traditional nesting grounds to the west.

On 8 July, an adult Clark's Grebe was noticed swimming in this area close to a Western Grebe with two tiny chicks (one to two days old) on its back. No feeding was observed but the pair remained "inseparable" for the 45 minutes of observation.

1992

One or two Clark's Grebes were present in the vicinity of the south end of Shuswap Lake from 19 May to 28 August. On 11 June one bird was swimming among the traditional Western Grebe

breeding site but no courtship behaviour was noticed. On 17 July another was seen diving in deep water “some distance from shore.”

The sex of the birds was not reported.

1993

A single Clark’s Grebe was present from 23 May to 26 August but was reported infrequently because it was mostly seen swimming alone in the middle of the lake “some distance from shore.”

The sex of the bird was not reported.

1994

One or two Clark’s Grebes were seen infrequently in Salmon Arm bay from 11 May to 24 August. It was assumed both birds were males as they were usually seen swimming apart. One bird was swimming among Western Grebes in a loose flock offshore on 18 July.

1995

One Clark’s Grebe was reported on seven occasions throughout the summer in the vicinity of Salmon Arm bay between 10 May and 1 September.

The sex of the bird was not reported.

1996

One or two Clark’s Grebes were seen frequently in Salmon Arm bay from 9 May to 8 September.

On 6 June, Michael Ward found a “pure” pair of Clark’s Grebes attending a nest with four eggs among a small colony of nesting Western Grebes on Christmas Island (Figure 31). On 25 July, two small chicks were “swimming with the adults” in the same general area (Campbell et al. 2001). This latter record is the first confirmed breeding of a pair of Clark’s Grebes for the province.

For the first time a pure, as well as a hybrid pair, successfully hatched young. In early July a male Clark’s Grebe was observed diving for food west of the marina and presenting it to a female Western Grebe who in turn fed three small chicks on her back (F. Kime pers. comm.).



Figure 31. Nesting habitat for Western and Clark’s Grebe in the flooded interior of Christmas Island, Shuswap Lake, BC. (R. Wayne Campbell).

1997

Two Clark’s Grebes, identified as males, were observed swimming and diving in Salmon Arm bay from 3 May to 31 August.

No evidence of breeding, including courtship activities, was observed.

1998

One Clark’s Grebe, a male, was seen frequently in Salmon Arm bay from 8 May to 9 September.

On 26 June a male Clark’s Grebe was swimming with a female Western Grebe with two tiny young on her back.

1999

A single Clark’s Grebe, a male, was present in Salmon Arm bay from 4 May to 14 September. It spent much of late May and early June swimming with Western Grebes in the traditional colony west of the marina.

On 16 June it was seen paired with a female Western Grebe (F. Kime pers. comm.; Shepard 1999c) but was not seen in the vicinity again.

The entire Western Grebe breeding season was unsuccessful due to predation and high water levels.

2000

A single bird was frequently seen swimming and/or diving, most often west of the government wharf, from 7 May to 3 September.

Although the bird occasionally associated with nesting Western Grebes it mainly kept to itself. Observations from 4 June to 30 July identified the grebe as a male.

2001

A single bird was present from 14 May to 8 September swimming and diving between the marina and Christmas Island. Between 14 June and 24 July it was identified as a male.

On 2 June it was noted that a single Clark's Grebe was paired with a Western Grebe (Ryan Tomlinson pers. comm.; Cecile 2001b). On 9 July, a Clark's Grebe, likely the same individual, was paired with a Western Grebe that had a tiny chick (Class 1A) near Christmas Island.

2002

A single bird was present, usually off the traditional Western Grebe nesting colony west of the marina, from 30 April to 15 September. Behaviour observed between 14 June and 19 August identified the individual as a male.

2003

A single bird, identified as a male, was observed regularly along the entire waterfront from 3 May to 9 October. It was frequently reported among Western Grebes inside the protected nesting boundaries (Figure 32).

Another, likely the same bird, was observed by experienced birdwatchers from a house boat well north of the marina breakwater, from 6 to 14 June. It was also seen throughout most of July in the same general area where the bird had probably moved to available food in deeper water.



Figure 32. To protect critical nesting habitat for Western and Clark's Grebes from increasing disturbance by boats at the south end of Shuswap Lake, BC, the Salmon Arm Bay Nature Enhancement Society set out buoys to restrict power craft from entering the sensitive area. 17 May 2003.

2004

A single bird, identified as a male, was present from 28 April to 14 October swimming along the Salmon Arm waterfront. From 23 July to 8 August two adult Clark's Grebes were spotted among many nesting Western Grebes near Christmas Island. No breeding was reported.

There may have been at least three Clark's Grebes present, as two birds were reported at different locations on 6, 7, 8, and 21 August, 12, 14, and 19 September, and 3 and 10 October.

2005

A single bird, identified as a male, was present from 23 April to 30 September swimming and feeding along the Salmon Arm waterfront. Most observations were between the marina and Christmas Island.

Two Clark's Grebes were seen on 10 May and 10 July. No breeding was reported.

2006

A single bird, identified as a male, was present from 15 April to 7 July in nearshore areas and from

deeper waters shortly afterwards until 6 September. No breeding was reported.

2007

A single bird, identified as a male, was present from 6 May to 12 October throughout the extreme south end of Shuswap Lake.

Shortly after arrival the Clark's Grebe participated in courtship behaviour with a Western Grebe and nesting began in early June. On 6 July three hybrid chicks were observed with one mixed pair of adults. The male Clark's Grebe was providing food for the female Western Grebe as well as the chicks. The three hybrid chicks had the yellow bill characteristic of a Clark's Grebe and the head pattern similar to a Western Grebe (F. Kime pers. comm.). The hybrid pair, now with two young, were seen again on 31 July and 10 August.

On 26 June, Frank Kime counted 204 Western Grebes in a long line spread over the Salmon Arm waterfront. These appeared to be new arrivals and the question arose as to where they came from. Many of these grebes participated in courtship activities and nest-building.

By 27 July there were 46 recently hatched Western Grebe chicks in the area. This unusually late nesting continued throughout August and September and in early October a pair of adult Western Grebes were still feeding young.

On 3 July two adult Clark's Grebes were noticed swimming together. They appear to have accompanied the late-arriving Western Grebes. On 12, 13, and 17 July the pair was actively participating in courtship activities. This included head-bobbing, weed exchange, rushing, and dancing. However, it is not known whether or not this lead to continued nesting activities. In view of the fact that Western Grebes were breeding at this time it is probable that the Clark's Grebes also nested.

The latest date this pair was seen was on 5 October as they swam and intermingled with adult and young Western Grebes.

2008

Single birds were observed from 17 May to 7 October along the Salmon Arm foreshore.

Before mid June four adult Clark's Grebes, two males and two females, and a hybrid female were observed among 25 or so Western Grebe nests west of the marina. In one of the small ponds a pair of Clark's Grebes was busy with breeding activities (Figure 33). They started building the nest, which was quite visibly exposed, on 14 June. The nest platform was built of reeds which both adults added to as the incubation period progressed. The nest was protected from the main body of the lake by approximately 25 m of reeds and canary grass and was never in danger of being washed out by inclement wind or wave action. During the whole nesting period a third Clark's Grebe, a male, was usually swimming in the immediate vicinity of the nest but was kept away at a distance by the nesting pair.

This nest was occupied until 11 July. The female was frequently observed turning the eggs but clutch size could not be determined because of its location, but from behaviour three eggs were suspected.



Figure 33. Adult female Clark's Grebe settling on nest, with mate resting nearby. Salmon Arm, BC. 16 June 2008. (Ian James).

A second nest was located 20 m from the first with a male Western Grebe and a female hybrid Clark's Grebe, in attendance. The female had a bright yellow lower mandible and a dull olive-coloured upper mandible. The black colouring of the head touched

the top of the eyes with no space between, and the black strip on the back of the neck was very narrow. The nest was also built in the small pond and was surrounded by reeds and canary grass, which grew during the nesting period and almost completely hid it. The nest was first noticed on 10 June and was vacated by 9 July. On 12 July the male Western Grebe was observed feeding two tiny chicks on the back of the female Clark's Grebe near the nest.

A third Clark's Grebe's nest was located east of the marina in front of the boardwalk towards Christmas Island. The adults were a male Western Grebe and a female Clark's Grebe. The nest was built in canary grass about 40 m from the main body of the lake and thus well protected. It was first seen on 10 June. The lake level was still rising and both adults were busy building up the nest to prevent it from being flooded. The nest had three eggs. The eggs probably hatched on 11 or 12 July as an adult was in incubating position on the evening of 11 July but was absent the following evening. The brood was never confirmed but presumably was intermingled with the approximately 300 Western Grebes scattered across the waterfront.

A second pair of pure Clark's Grebes probably nested on Christmas Island. On 20 July, Ed and Monica Dahl (pers. comm.) observed three very young chicks (Class 1A) with a pair of adults in the vicinity of Christmas Island. They also saw this family of five in the same area during the second week of September.

During the 2008 season it appears that nests of three Clark's Grebes, and Clark's/Western hybrids, were successful in the Salmon Arm bay area. Five chicks were confirmed and possibly another three were hatched for a total of eight, the most ever recorded.

2009

Up to 12 adult Clark's Grebes were found in Salmon Arm bay between Mallard Point and Sandy Point, and along the foreshore, between 14 April and 15 October.

No nests were located partly because much of the foreshore between Salmon River and Christmas Island had a dense, impenetrable growth of Reed

Canary Grass . From broods seen later, it appears that nesting took place all along the foreshore, not just in one or two spots, and was highly successful.

Once the grebes hatched they were soon spread all over Salmon Arm bay, from Mallard Point to Sandy Point, with concentrations from Christmas Island to the Salmon River. The Clark's Grebes were interspersed with the Western Grebes while feeding and resting. They did not appear to be separated out in any way, for example in deeper water, from the Western Grebes. This made finding them more difficult, particularly after the young were a week or two old and more out into the middle of the bay.

Three Clark's Grebe broods were observed. Parents of two broods were both Clark's Grebes and the other was a hybrid pair with a male Clark's Grebe and female Western Grebe. Single young were still being fed at late as 4 October.

The estimated totals for the breeding season are as follows: nine adult Clark's Grebes and three young; three or four adult hybrids and six or eight young. This makes a total of 12 or 13 adult grebes and nine or 11 young grebes, for a total of 21 to 24 Clark's Grebes.

The totals represent the highest ever reported for the Shuswap Lake colony.

Annual Summary of Occurrence and Breeding at Duck Lake (Creston): Twenty-six years after first reported on Duck Lake in 1983, Clark's Grebe is still considered a rare, and irregular, summer visitant (Van Damme 2009). There is no information on normal arrival dates typical for *Aechmophorus* grebes on Shuswap Lake. There are few departure dates and only two breeding records, both involving hybrids.

Details for occurrences, and breeding, are summarized below for each year the species was observed. No Clark's Grebes were reported for 1985-1986, 1988-1996, 1999, 2001-2004, 2007, and 2009.

All observations are from Duck Lake.

1983

On 26 June, a female Clark's Grebe, at this point still considered a colour-morph of the Western Grebe, was paired with a male Western Grebe. A small chick

was being fed on the back of one adult (Campbell et al. 1990a). The family was still together on 8 August.

1984

A single bird was present from 20 May to 12 August.

In late May and June, it was occasionally seen displaying with swimming Western Grebes but usually swam and foraged on its own.

1987

A single adult was identified on 8 July swimming among Western Grebes. No behavioural interaction was noticed. The adult was last seen on 12 August, swimming alone.

1997

A single adult was present from 8 July to 8 August.

On 8 July, the grebe was defending a nest site. On 8 August, it was resting on an old Western Grebe nest mound. The attendant Western Grebe was aggressive with bill jabbing and the Clark's Grebe dived.

1998

Two adults were recorded from 24 July to 1 August.

On 28 July, the pair was adding nesting material to a mound. The female got on the mound and the male copulated with her. On 1 August, the pair was again adding nesting material to the mound and one adult sat on the mound. Neither adult was seen during a 6 August visit.

2000

There were no reported visits until late summer at which time a single adult was present from 31 August to 17 September, the latest departure date for Duck Lake.

On 31 August, a Clark's Grebe young, three-quarters grown, was associating with, and being

fed fishes, by two adult Red-necked Grebes (Van Damme 2008). The young was constantly calling and begging. On the last visit, on 17 September, the Clark's Grebe was swimming alone. It appeared more adult-like in plumage and was preening but not observed catching its own prey.

The origin of the young Clark's Grebe is unknown. It is possible that a Clark's Grebe had parasitized another grebe's nest as Red-necked Grebe are known to rear Western Grebe chicks (Van Damme 2006).

2005

An adult seen on 19 July diving and associating with a Western Grebe was the only report.

2006

An adult was present from 19 to 21 June. It was unmated and mostly observed swimming in the Western Grebe nesting area.

2008

A single adult was present from 26 June to 1 September.

It was frequently seen in the Western Grebe nesting colony resting in the milfoil vegetation mat or diving for fishes. It was also heard calling and on 16 July was courting with a Western Grebe (Figure 34). On 1 September the bird was diving and gathering nest material which it added to a shallow, flimsy platform.



Figure 34. During the latter part of the 2008 nesting season at Duck Lake, BC., a single Clark's Grebe often associated with a Western Grebe in the milfoil vegetation. 16 June 2008 (Linda M. Van Damme).

Family Life

Breeding

Most of the information that follows on the breeding ecology and biology of the Clark's Grebe has been extracted from field studies of the similar Western Grebe. Differences, when known, are highlighted.

Courtship and pair formation occurs during spring migration and continues in intensity on the Shuswap Lake breeding grounds for only a few weeks after arrival. The pair is monogamous within the breeding season and remain together until the chicks are at least several weeks old. It is not fully understood if pairs share common wintering grounds or remain together the following year although James (1989) has twice observed mate feeding by Western Grebes in California in November and December. As Lack (1940) suggests, this behaviour is used to establish, strengthen, and maintain the pair bond.

The spring courtship display of Clark's and Western grebe (Figure 35) is among the most elaborate for any bird species in North America. The spectacular event consists of three well-defined and predictable rituals, the "Greeting Ceremony" (Figure 36), "Rushing Ceremony" (Figure 37) and the "Weed Ceremony" (Figure 38). The latter two are related to courtship activities.

The "Greeting Ceremony" includes five orderly segments: Advertising, Dip-shaking, Bob-shaking, Bob-preening, and Arch-clucking (Figure 36).



Figure 35. The spectacular courtship display of *Aechmophorus* grebes attracts naturalists and photographers to the Salmon Arm, BC nesting grounds each spring. 30 May 2008 (Ian James).

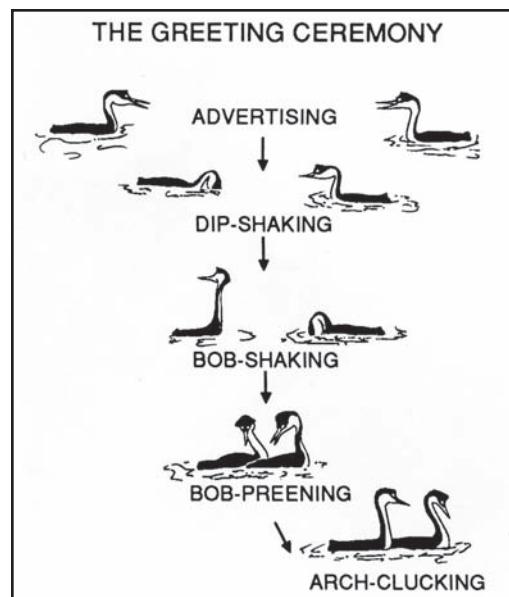


Figure 36. The "Greeting Ceremony" of *Aechmophorus* grebes is usually performed when a bonded pair has become temporarily separated. It can involve body movements and calls. (Reprinted from Storer and Nuechterlein 1992 with permission).

The "Rushing Ceremony" is comprised of a series of elaborate events (Figure 37). Two grebes, male-male or male-female, engage in various head movements and calls and then suddenly burst forward and run side by side (see Figure 35) pattering across the water for up to 20 m.

The "Weed Ceremony" includes Neck-stretching, Bob-shaking, Weed-diving, Weed-dancing, Bob-preening, and Arch-dancing (Figure 38). When both birds have weeds they greet with bodies out of the water and soon one discards the weeds and the display is over.

See Nuechterlein and Storer (1982) and Storer and Nuechterlein (1992) for detailed accounts of the individual ceremonies.

While courtship and pairing behaviour is almost identical in Western and Clark's grebes the advertising calls of Western Grebes are two-noted while those of Clark's Grebe are one-noted. Also, the calls of females are significantly shorter than

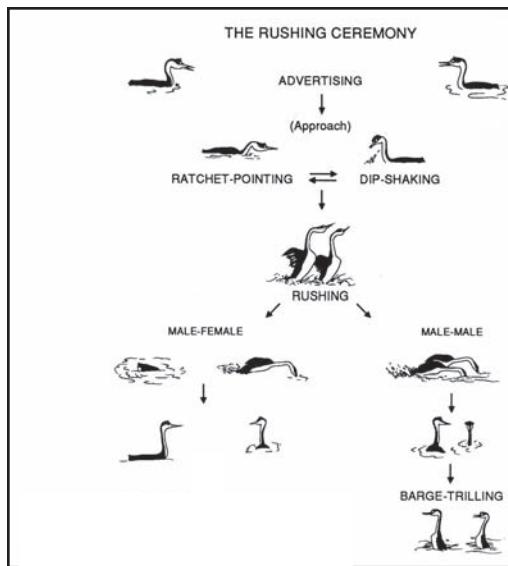


Figure 37. Early in pair-formation *Aechmophorus* grebes perform the “Rushing Ceremony” part of which includes the pair dancing across the surface of the water. (Reprinted from Storer and Nuechterlein 1992 with permission).

those of males and are also individually distinctive (Nuechterlein 1981c).

Throughout the history of the Clark’s Grebe on Shuswap Lake the breeding population has consisted mainly of mixed pairs (and intermediates) between Clark’s and Western grebes. Nuechterlein and Buitron (1989) have recently field-tested interspecific mate choice by late-courtship male Western Grebes which provides an explanation for why so many birds at Shuswap Lake have been observed in mixed pairs.

The researchers discovered that advertising calls by males and females played a critical role in mate choice and reproductive isolation in mixed breeding populations of Clark’s and Western grebes. Their results suggested that “*late-season hybridization between these two closely related species may be a result not of species misidentification, but of active and adaptive mate choice by individuals with limited alternatives.*”

Nest site selection and construction is part of courtship and/or pair-bonding that is accompanied by

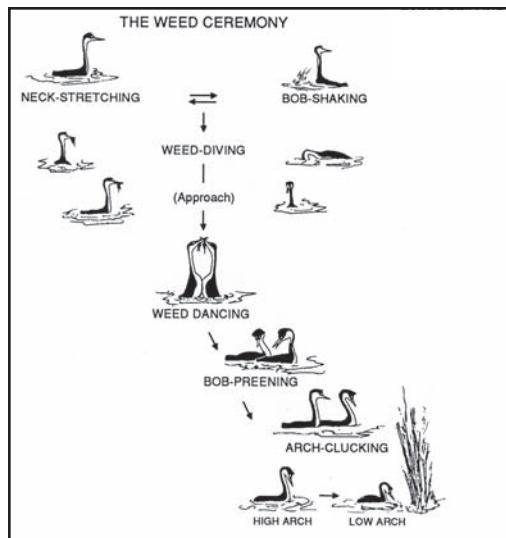


Figure 38. The “Weed Ceremony” occurs during the latter part of pair-formation and just prior to nest-building activities (Reprinted from Storer and Nuechterlein 1992 with permission).

displays. The male leads the female to a prospective site and if acceptable they both dive and bring up nest materials that start the base of the nest. Copulation takes place on the nest mound.

Once bonded, pairs stay together during most of the breeding season and both sexes share incubation and rearing duties. The age of first breeding may be ≥ 2 years old and adults probably breed annually thereafter. There is one brood per year but replacement clutches are common if the first nesting attempt fails early in the season. The time between replacement clutches is unknown.

Courtship, that also functions to maintain pair bonds, includes mate guarding and feeding, especially through the egg-laying period.

Although solitary nests of Clark’s Grebes have been found at Shuswap Lake, most are within a much larger colony of Western Grebes. In other North American colonies, Clark’s Grebes also nest in association with Eared Grebe (*Podiceps nigricollis*), Black-crowned Night-Heron (*Nycticorax nycticorax*),

Franklin's Gull (*Larus pipixcan*), and Forster's Tern (*Sterna forsteri*; see Campbell et al. 2008).

Reproductive success each year depends on the impact of fluctuating lake water levels, food availability, predation, and human disturbance.

Clark's Grebe vigorously defends a territory around the nest site. Adults will attack conspecifics through threat displays and other species by stabbing them from under water. Red-necked Grebe (*Podiceps grisegena*), Mallard (*Anas platyrhynchos*), and American Coot (*Fulica americana*) have been found dead from stab wounds from Western Grebes.

Annual Cycle

In British Columbia, most Clark's Grebes arrive at Shuswap Lake during the first two weeks of May. The earliest arrival date is 15 April, the latest 23 May. The grebes arrive paired, courtship activities continue with increased intensity, and nest-building commences. The latter depends, to a great deal, on optimal water levels on the lake. This varies greatly among years. Both male and female are involved in

nest building, incubation, and rearing the family.

Hybrid pairs of Clark's Grebes usually have a much delayed activity pattern.

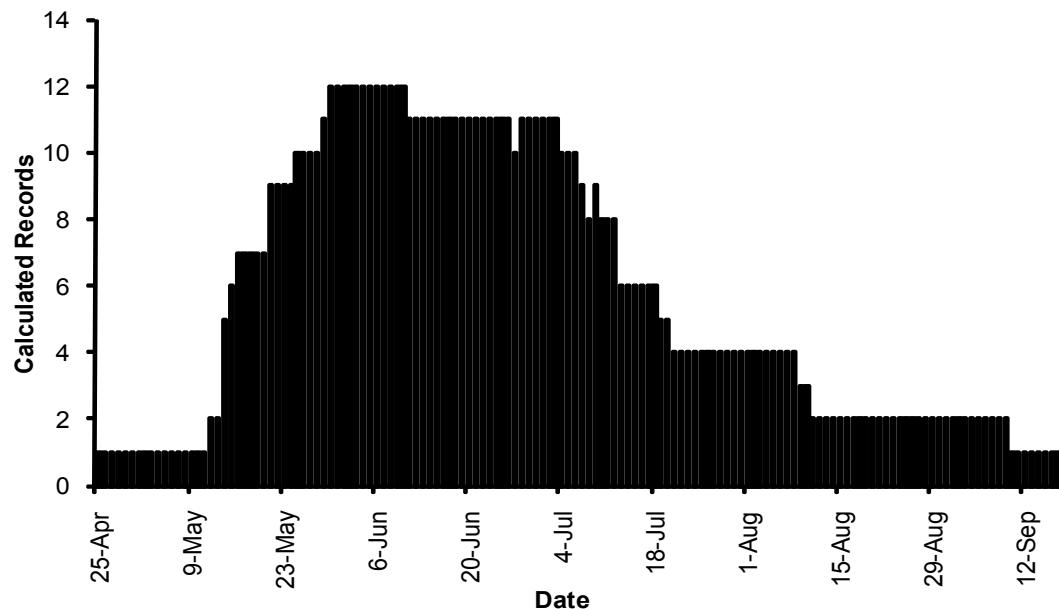
Nests with eggs have been found from 28 May to 18 July (see Figure 39). The initial peak egg-laying period occurs during the first two weeks of June.

Nests with newly hatched chicks have been found from 26 June to 20 July. Chicks leave the nest on the back of adults who swim away to deeper water to forage as a family. Both parents feed the young for several weeks.

The full breeding period for the province extends from 28 May (earliest nest-building) to 15 September (latest known fledging), a period of 111 days. The peak breeding period occurs between 25 April and 17 September (Figure 39). Adults have been observed feeding large young as late as 15 September.

Only one brood is raised per season.

Most Clark's Grebes depart during the second and third weeks of September. The earliest and latest dates are 8 July and 14 October respectively. Western Grebes are still present in Salmon Arm bay as late as



the beginning of November so it is entirely possible that Clark's Grebes may be present, but are too far out and intermingled with Western Grebes, to be identified.

Nests

Nests are built on the water among or anchored to emergent vegetation such as Reed Canary Grass or sedges (*Carex* sp.), or constructed on top of floating plants such as Water-milfoil or Sago Pondweed (Figure 40). Nests in emergent vegetation provide some protection from wind and wave action. Water depths for nests at Shuswap Lake ranged from 90 cm to 160 cm.

Both male and female dive to bring up pieces of aquatic plants, usually close to the potential nest site. Materials vary between coarse stems, which provide the floating base, and algae and stringy plants for binding. No list of specific plant species is available.

Most nest-building occurs in the morning but can be carried out through the day. Although the nest is continually added to during the incubation period, after one to three days the platform (see Figure 33) can support eggs and even the weight of an adult. Each nest has a shallow depression on top to hold the eggs.



Figure 40. Dense, buoyant mats of wind-generated and new growth aquatic plants provide the necessary nest substrate for Aechmophorus grebes nesting in the northern Creston valley. Duck Lake, BC. 17 July 2006 (Linda M. Van Damme).

Nests, even if intact, are not used in subsequent years.

One nest in British Columbia measured 48 cm in diameter and 8.5 cm high.

Eggs

Eggs are long elliptical to subelliptical, some tending toward oval. They are unmarked, smooth, but not glossy, and often have small calcareous lumps scattered over the surface. Their background colour is pale greenish to bluish when first laid, later becoming white to buff, and as incubation advances eggs become stained brownish.

Eggs of Clark's Grebe are slightly smaller than those of Western Grebe. In 95 eggs measured from Utah (Ratti 1977), the average size was 57.3 mm in length and 38.5 mm in width at the widest point.

Only four nests with eggs have been reported for Clark's Grebe in British Columbia: two eggs (1 nest), three eggs (2 nests), and four eggs (1 nest). Clutch size for Western Grebe in British Columbia (n=433; Figure 41) ranged from one to seven eggs with most (66%) having three or four eggs (Campbell et al. 1990a).

Egg-laying commences as the nest is being constructed. Most eggs are laid in mid-morning at intervals of one to two days apart. Incubation



Figure 41. The eggs of Western and Clark's grebes are very similar. The egg shells in this clutch have been stained from nest materials and the two lighter eggs were probably laid as replacements as they are lighter in appearance. Duck Lake, BC 7 July 2006 (Linda M. Van Damme).

begins between laying of the first and second eggs and usually averages 24 days at colonies studied in Utah (Lindvall and Low 1982). Both sexes incubate and will aggressively defend the immediate nest site from interspecific intruders of either sex. Incubation is almost continuous with partners rarely leaving eggs unattended.

Replacement clutches can occur and “dump” nests are known (Storer and Nuechterlein 1992).

In British Columbia, there is a single instance of a Pied-billed Grebe egg being found in an incomplete Clark’s Grebe nest with two eggs.

Young

From one to two days prior to hatching, young can be heard peeping in the egg off and on during the day.

Adults are more attentive during this period and at least one remains at the nest. Hatching between eggs may take one or two days. Less than 30 minutes after the egg is first pipped the chick emerges. Still wet climbs onto an adult within minutes of hatching and nestles under the back feathers. Parents may or may not get rid of egg shells.

Like all grebes, the young are precocial at hatching, covered in down, and eyes are open. Soon after hatching the family leaves the nest and swims to more open water where food is available. Sometimes the group forages many kilometres from the breeding grounds. The chicks are brooded on the back of parents on the water for two to four weeks and do not return to the nest.

Once dry the newly hatched chicks have well patterned heads and uniform coloured bodies (Figure 42). Harrison (1997) description follows: *“Triangular bare spot on crown orange, becoming red during excitement; bare loral spot orange. Color of down almost uniform; dull gray above, pale gray to whitish below and on face. Faint indication of pattern visible on close examination. Bill black. Legs and feet grey with greenish lobes.”*

The young are fed and protected by the parents for six to seven weeks. By day 70 the flight feathers are fully grown and the young make their first short flights (Ratti 1977). The family remains together until migration after which their relationship is unknown.

Ten broods have been reported for British



Figure 42. Newly hatched chicks of Clark's Grebe are similar to those of Western Grebe. Shuswap Lake, BC. July 1978 (R. Wayne Campbell).

Columbia; one young (1), two young (5), and three young (4). Brood size for Western Grebe in British Columbia ($n=26$) ranged from one to four young with one-half having two young (Campbell et al. 1990a).

Lifespan

There is no longevity information available for Clark's Grebe. The oldest banded Western Grebe, ringed as an adult, was eight years old making the individual at least nine years old. One Western Grebe fitted with a nasal tag was seen 14 years later (Storer and Nuechterlein 1992). Other band recoveries, at minimum ages, were six and one half years old and seven years old (Klimkiewicz and Futcher 1989, Eichhorst and Parkin 1991).

Feeding and Diet

There are no food habit studies for the Clark's Grebe in British Columbia (Figure 43). Elsewhere in North America, the species is generally considered mainly piscivorous in its food habits throughout the year and is assumed not to be significantly different from the diet of the Western Grebe, for which fish comprise 81% (Lawrence 1950) to 100% (Wetmore 1924) of foods taken.

Both Western and Clark's grebe pursue schooling fishes underwater which they spot initially while swimming on the surface with their head projecting



Figure 43. There are no food habit studies of Clark's Grebe in British Columbia but anecdotal information, as this photograph of an adult with a yellow perch in its bill, give clues to food items. Duck Lake, BC. 16 July 2008 (Linda M. Van Damme).

just below the water. Grebes must surface after dives to replenish their oxygen stores. Ydenberg and Forbes (1988) determined that the total amount of dive and surface (*i.e.*, pause and recovery) time spent by hunting Western Grebes at Duck Lake, BC, allowed them to exploit fish schools more fully than if full recovery followed each dive.

While some prey may be speared by their long dagger-like bill, many fishes are grabbed between the mandibles and brought to the surface for swallowing (Figure 44). Smaller prey is often swallowed under water.

The general diet is quite varied as both species are opportunists when hunting and take advantage of suitable species of fish as they are available. Diet also changes from fresh-water to marine prey between breeding and wintering grounds.

Inland, at Duck Lake, Forbes (1985) studied the diet of the Western Grebe and determined that of the 10 species of fish available only juvenile Yellow Perch (*Perca flavescens*; Figure 44) and Pumpkinseed (*Lepomis gibbosus*) were eaten. Both species were abundant, could easily be grasped and swallowed, and the former species formed dense schools as juveniles. See Campbell et al. (2008, page 267) for the life history of the Yellow Perch and its importance to other fish-eating birds in the Creston valley.

Pumpkinseed, an introduced schooling species in British Columbia, thrives in the shallow vegetated waters of Duck Lake. Spawning usually takes



Figure 44. Adult Western Grebe with a Yellow Perch at Duck Lake, BC. 26 September 2009 (Brent Wellander). It is assumed that Clark's Grebe also prefers Yellow Perch and Pumpkinseed while visiting the Creston valley.

place during late spring and early summer (Scott and Crossman 1973). The young-of-the-year grow fairly quickly within their first summer and juveniles school in shallow water often 0.1 – 0.5 m in depth (Reid 1930, Emery 1973).

Other species of fish available, but not consumed, include Largemouth Bass (*Micropterus salmoides*), Black Bullhead (*Ameiurus ictalurus melas*), Northern Squawfish (Northern Pikeminnow) (*Ptychocheilus oregonensis*), Redside Shiner (*Richardsonius balteatus*), Largescale Sucker (*Catostomus macrocheilus*), Peamouth (*Mylocheilus caurinus*), and Longnose Sucker (*C. catostomus*) (Forbes 1985, Ohanianian 1986).

Ten species of fish, all different species, occur in the cooler waters of Shuswap Lake, but their use by grebes is unknown.

The winter diet of the Western Grebe, and hence the Clark's Grebe, on the Pacific coast has received some attention by biologists due to the grebe's suspected predation on salmon stocks and the killing of diving grebes in nets by salmon fishermen in the Puget Sound region (Phillips and Carter 1957). Thirteen birds were collected in Washington and food identified included Pacific Herring (*Clupea pallasi*), Sea Perch (*Cymatogaster* sp.), Pacific Tomcod (*Microgadus proximus*), and fragments from Surfperches (Family Embiotocidae), and Sculpin (Family Cottidae). Other incidental marine foods

reported include Topsmelt (*Atherinopsis affinis*), Jacksmelt (*Atherinopsis californiensis*), and Eulachon (*Thaleichthys pacificus*) (Wetmore 1924, Chatwin 1956).

In the Strait of Georgia, which supports the largest population of wintering Western Grebes (and Clark's Grebes), Robertson (1973), Vermeer and Ydenberg (1989), and Clowater (1998) analyzed food from stomachs of collected Western Grebes. Food items included juvenile Pacific Herring, including eggs, and Shiner Perch (*Cymatogaster aggregata*).

Other food items reported for inland sites elsewhere in their range included a salamander (*Ambystoma* sp.), crustaceans, insects (grasshoppers and a variety of aquatic forms), and polychaete worms that suggests grebes may forage along the bottom (Storer and Nuechterlein 1992).

Mortality

Although Western and Clark's grebes face some of the same threats as other water-associated species they differ from them in requiring shallow wetlands which are usually situated in prime agricultural areas. Over the past 100 years it has been estimated that up to 50% of wetlands have been lost in the United States and huge hydro-electric projects have created reservoirs that alter local water cycles and river runoff making habitats unsuitable for nesting grebes.

Aechmophorus grebes require six basic requirements for successful breeding (Nuechterlein 1975, Kraft 1983, Forbes 1984, Storer and Nuechterlein 1992, Burger 1997):

1. Freedom from human disturbance,
2. Stable water levels while nesting,
3. Protection of nests from wind,
4. Sufficient water depth at the nest site for diving,
5. Access to open, weed-free water with sufficient fish populations, and
6. A sufficiently long ice-free period to permit the growth of emergent vegetation and allow time for all phases of nesting.

During the grebe's breeding and nonbreeding periods they are also susceptible to natural and

human threats that may include predation, diseases, toxins, habitat degradation, oil-spills (Figure 45), and mortality in fishing nets.

Little is known about direct mortality and indirect threats to Clark's Grebe in the province but we have listed several categories that have been known to affect *Aechmophorus* grebes in North America.



Figure 45. This Western Grebe was found oiled on a beach in Vancouver, BC., in November 1972. It was treated and later released into English Bay. (R. Wayne Campbell).

Nest and Egg Loss

Flooding: Fluctuating or decreasing water levels have been a major cause of nest and egg loss in *Aechmophorus* colonies in North America. Depending on the location and attachment of the nest to emergent vegetation, nests may become flooded by rising water or tipped, broken apart, or left in water too shallow for swimming by dropping water levels. This natural event has been reported for Western Grebes at Shuswap Lake (Buffam 1964, Dahl 2008; Figure 46) and Duck Lake, Creston (Forbes 1985, Butler et al. 1986).

For example, in 2008 at Shuswap Lake, water levels were rising rapidly between 28 May and 4 June, the peak nest-building and egg-laying period for *Aechmophorus* grebes. It peaked at 348.74 m on 9 June which was about 24 cm above 2007 levels. As a result, grebes had to rebuild nests (Dahl 2008).

At Duck Lake, where *Aechmophorus* grebes nest on milfoil mats in open water, Goossen et al. (1982) suggested that recent dyking and water control may have allowed grebes to nest there by eliminating former June flooding by the Kootenay River.

Nests may be re-built after egg loss and



Figure 46. Each year fluctuating water levels in Shuswap Lake, BC, in May and June greatly impact nesting waterbirds, as evidenced by the water line along this fence. 10 June 1998 (R. Wayne Campbell).

refurbished during nest-relief by the non-incubating bird.

Artificial manipulation of water levels through damming, drainage, dyking, and channelization threatens many marshes, but increases the suitability of others. Stabilizing such water bodies reduces their suitability over time through stagnation. Floating nests of grebes within a stand of vegetation are more likely to remain intact than those closer to the edge of the stand (Campbell et al. 2009).

Storms: The primary cause of nest and egg loss is from waves generated during storms. Single storms are sometimes responsible for considerable loss of eggs and even young, but loss is often ongoing and depends partly on density of adjacent vegetation, and direction of prevailing winds (Campbell et al. 2009). Also, nests may be displaced considerable distances, as happened during a storm at Duck Lake in 2006 (Van Damme 2006; Figure 47).

Seasonal summer storms passing through the Creston valley each year, accompanied by heavy winds and rain, often result in the single highest mortality factor for nesting Western Grebes and other open surface-nesting species. In some years, nesting (including re-nesting attempts), may be wiped out completely. For example, in 1976, high winds destroyed 65 Western Grebe nests at Duck Lake (Burger 1997).



Figure 47. Three grebe nests blown ashore at Duck Lake, BC., during a summer storm. 7 July 2006 (Linda M. Van Damme).

The nesting colony at Shuswap Lake is better protected from weather due to its location in tall stands of emergent vegetation such as Reed Canary Grass.

Predation

Direct: The only instances of direct predation reported for *Aechmophorus* grebes in British Columbia in summer include eggs taken by Ring-billed Gulls (*Larus delawarensis*; Figure 48), Herring Gulls (*Larus argentatus*), American Crows (*Corvus brachyrhynchos*; Munro 1941), and Common Ravens (*Corvus corax*), and chicks snatched from the surface of the water by Northern Harriers (*Circus cyaneus*) and Common Ravens. Most of these incidents occurred during periods of human disturbance.

Elsewhere in North America, mammalian predators such as American Mink (*Neovison vison*) and Raccoon (*Procyon lotor*) are known to raid colonies (Nuechterlein 1975).



Figure 48. Ring-billed Gull predation on eggs and chicks is a direct threat to nesting *Aechmophorus* grebes in British Columbia. Shuswap Lake, BC. June 1996 (R. Wayne Campbell).

Indirect: It is not clear whether brood parasitism occurs in *Aechmophorus* grebes or whether eggs of other species are simply dumped into an available nest. Mixed clutches have been reported for terns, ducks, and coots (Bent 1919), Pied-billed Grebe (*Podilymbus podiceps*), Eared Grebe, American Coot, Forster's Tern (Storer and Nuechterlein 1992), and Red-necked Grebe (Van Damme 2006).

Parasitism

At least two external and 16 internal body parasites (*i.e.*, trematodes, nematodes, and an acanthocephalan) occur in Western Grebes. At least nine of these are grebe specialists (Lawrence 1950, Malcomson 1960, Edwards 1965, Stock 1985).

No information is available on their effects and no diseases have yet been documented.

Shooting and Vandalism

Market hunters killed tens of thousands of grebes from the early 1880s through the early 1900s for their silky breast and belly plumage that was used in the millinery trade to make capes, coats, and hats (Storer and Nuechterlein 1992). Some large colonies (*i.e.*, Lower Klamath Lake, OR) were decimated completely (Finley 1907, Chapman 1908). Shooting became illegal with the 1919 International Migratory Bird Treaty Act and enabling legislation and has not been a major mortality factor since.

While some grebes are still shot by hunters each

year the annual mortality is low. Vandalism, however, still remains an unpredictable factor. Recently three men were fined \$16,000 for shooting "ducks and grebes" in July near Saskatoon, SK (Coolican 2009).

Hypothermia

Exposure, resulting in hypothermia to eggs and chicks, occurs annually at nesting colonies and is caused by both natural and human-related events. When disturbed, parent grebes quickly move off their nests making eggs and young vulnerable to chilling, over-heating, or predation. This can be caused by a response to researchers, predators, sudden loud noises, diving Ospreys, recreational activities, and low-flying helicopters.

Boat traffic among flocks of feeding *Aechmophorus* grebes with small young on their backs may cause the parents to dive leaving the chicks on the surface to become separated and die of exposure (Ivey 2004).

Recreational Boat Traffic

Since 1985 we are aware of three adults and six chicks being killed by small speeding craft in Salmon Arm bay. On one occasion the mortality was deliberate. It is not known what the impact of boat traffic has in separating small dependent chicks from their family groups.

Miscellaneous

Occasionally *Aechmophorus* grebes are caught on lures or become entangled in nylon lines of sports fishermen both on the breeding and wintering grounds (Chatwin 1956, Campbell 1967). At Shuswap Lake, two Western Grebes were caught on a narrow silver-yellow fishing lure by the same fisherman in the summer of 1983 and another was found entangled in nylon filament line in 1987. All were successfully liberated.

Conservation and Management

Clark's Grebe Populations and Trends

No continent-wide survey of all breeding colonies for *Aechmophorus* grebes in North America is available. Population estimates are based on

peak numbers tallied during the National Audubon Society's Christmas Bird Counts.

The peak continental count for Western Grebe is 107,000 birds (in 1990) and Clark's Grebe at 3,750 birds (in 2003) (National Audubon Society 2004). Kushlan et al. (2002) estimates the minimal global population for Western Grebes at 110,000 birds and between 10,000 and 20,000 for Clark's Grebes.

Ratti (1981) reported that in winter counts in California and Nevada 11.6% of 2,098 *Aechmophorus* grebes were *A. clarkii* and summer counts in northern California, southern Oregon, and Utah showed 49.2% of 1,584 *Aechmophorus* grebes were *A. clarkii*.

Trend information for the breeding period is not available as no widespread monitoring information is available for *Aechmophorus* grebes (Figure 49). The standard reference for summer trend information is the North American Breeding Bird Survey, and for the period 1966-2007, Sauer et al. (2008) indicate no significant trend throughout the breeding range of Western and Clark's grebes. Generally, the North American Breeding Bird Survey methods are inadequate for surveying colonial waterbird populations.



Figure 49. Nesting *Aechmophorus* grebes are not likely to be sampled adequately in British Columbia using the North American Breeding Bird Survey because the species are habitat specialists and are patchily distributed. Shuswap Lake, BC. 10 June 1998 (R. Wayne Campbell).

The two breeding sites in British Columbia are peripheral for the Clark's Grebe in North America and numbers contribute very little to the continental population. However, we have stewardship

responsibilities to maintain the integrity of current habitats for biodiversity and consider alternate suitable nesting sites within British Columbia that could be used for expansion by pioneering birds.

Some direct and indirect threats to Clark's Grebe in British Columbia include the following topics.

Effects of Human Activity

Pesticides and chemical contaminants: The United States Fish and Wildlife Service (2002) estimate that a minimum of 72 million birds die annually as the direct result of chemical contaminants in the United States.

Chemicals accumulate in fresh-water and aquatic marine food chains from a variety of local, urban, and agricultural sources as well as globally from industrial pollution. Because of their dependency on fishes *Aechmophorus* grebes are particularly vulnerable to contamination and have been impacted on both their breeding and wintering grounds.

Bioaccumulation of certain chemicals, even at low levels, can affect reproductive fitness of adults, eggshell thickness, hatching, and chick development. A well documented impact of bioaccumulation on nesting *Aechmophorus* grebes occurred at Clear Lake, California in the late 1950s. Prior to DDT spraying for insect control the breeding population was >1,000 nests (Hunt and Bischoff 1960). Following application, large numbers of grebes were found dead and only 30 remained in 1960 and only 16 nests were found in 1961 (Herman et al. 1969). Low level contamination is still causing eggshell thinning and by the early 2000s the colony had recovered to about half its pre-DDT levels (Ivey 2004).

Clark's and Western grebes are also susceptible to contamination from heavy metals, especially mercury. At Clear Lake, reproductive success was lowered considerably compared to mercury-free lakes nearby (Elbert and Anderson 1998).

Closer to home, in Puget Sound, Washington, significant levels of mercury, arsenic, DDE, PCBs, and chlordane were found in wintering *Aechmophorus* grebe tissues (Henny et al. 1990).

In British Columbia, the liver and/or breast muscle of grebes and seaducks were analyzed for polychlorinated dibenzo-p-dioxins, dibenzofurans, biphenyls, organochlorine pesticides, and

chlorophenol-related compounds at industrial and other sites on the coast (Elliott and Martin 1998). Western Grebes and Common Mergansers (*Mergus merganser*) contained the highest levels of all contaminants. Since British Columbia supports some of the highest numbers of wintering Western Grebes along the Pacific coast the recorded bioaccumulations are of great concern.

It is not known what impact the runoff of fertilizers, insecticides, rodenticides, and herbicides have on nesting colonies at Shuswap Lake and Duck Lake (see Priestley 2002).

Habitat alteration and degradation: For many decades habitat degradation has been identified as a major threat to many species of birds, especially specialists like marsh-nesting grebes (Riske 1976). Threats originate from the on-going draining of wetlands for residential, industrial, recreational, or agricultural uses. Emergent vegetation, a critical component for grebes at Shuswap Lake (Figure 50), may be removed for dock or marina developments or wetlands may be filled to accommodate cottage developments for direct access to open water.

Altering water levels, permanently or short-term, by dyking can also pose a significant threat to nesting and foraging grebes by impacting water quality and prey base.

The *Aechmophorus* colony at Duck Lake is the most protected under the Creston Valley Wildlife Act and is also the only site historically where grebes nest on surface milfoil mats of vegetation in the open. Although management practices are developed and carried out locally, water levels were controlled by an International Joint Commission that uses Duck Lake as a buffer against flooding (Burger 1997). That responsibility today is carried out by staff of the Creston Valley Wildlife Management Area.

A potential threat to nesting habitat in British Columbia is from snowmobiles driving over emergent shoreline or other frozen marsh vegetation in winter which results in broken plants that do not recover the following spring or may remain submerged. This situation has been reported in Alberta where nests were more susceptible to exposure from wind and waves, avian predators, and competition from other wetland-nesting species (Berg et al. 2004).

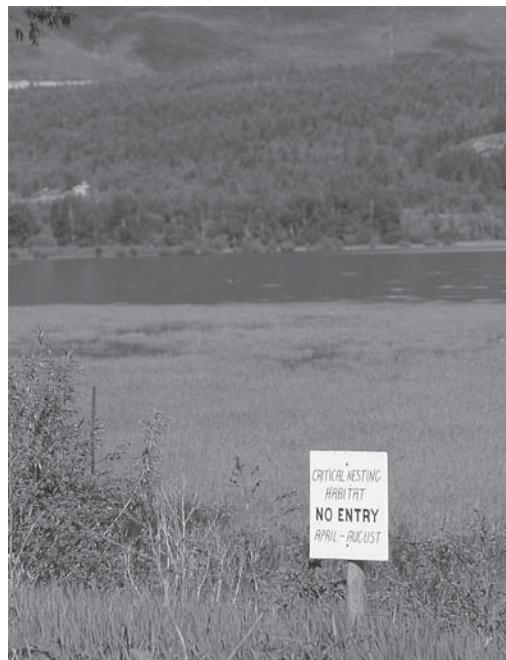


Figure 50. Posting signs to identify critical habitats for rare and local-nesting waterbirds in British Columbia is helpful until protective status is obtained to secure the wetland from human disturbance. Shuswap Lake, BC. 23 May 1993 (R. Wayne Campbell).

Availability of food sources: During the breeding season *Aechmophorus* grebes obtain their food by diving in open water near the colony. Some studies suggest that the size of prey is more important than the species of fish captured. At Clear Lake, California, fish ranged in size from 27-88 mm long from analyses of 27 stomachs (Lawrence 1950).

Populations of prey fishes, within the preferred size class at Shuswap Lake, appear stable but human recreational activity may interrupt foraging periods.

Although the introduction of non-native fish species has been suggested as a concern for nesting and foraging grebes in summer (Yanch 2006), the *Aechmophorus* grebes at Duck Lake thrive on the introduced species.

Recreational boat traffic: Shuswap Lake is zoned for intensive recreation and is a very popular destination for beach and water-based activities from early July to early September each year. Many government and privately-owned marinas are located around the lake. While boat access and recreational activity is somewhat curtailed at the nesting colony by restricted-area buoys, water-based activities such as boating (including house boats), water-skiing, and personal watercraft use can impact families with small chicks.

Soon after hatching, mainly throughout July, families move to open water where the young are raised. If young become separated from their parents they may not reconnect and consequently die. Also, the impact is greater each year as the number of boats, size of motors, and types of water activities increase (see Hanus et al. 2002, Found 2004).

In the Creston valley there has been an increase in recreational use of waterways that include rowboats, canoes (Figure 51), paddle boats, kayaks, and fishermen casting from inflated tubes (Campbell et al. 2008). While some areas allow motorized boats there are restrictions on Duck Lake.

Duck Lake is a popular bass-fishing destination and in some cases, when on the lake, anglers may remain stationary for several hours while they cast their lures. The recreational boat activity here is greatest from late May to mid-June after which numbers taper off during the rest of the summer. Ohanjanian (1998), during her work on Western Grebes at Duck Lake, noticed that boating activity caused grebes to leave their nests which could result in over-heating of eggs and chicks due to exposure from the sun. In an example of Western Grebe disturbance in 1997, she reported that four incubating grebes at the colony site were flushed off their nests when a boat was put in the water from the south dyke and on two occasions in 1998, birds flushed off nests by boaters once as far away as 400 m. Up to 30 birds were off nests at one time and three birds remained off eggs for 45 minutes.

The maintenance of the “non-motorized only” regulation on Duck Lake (and nearby Leach Lake) is vital to the conservation of Clark’s and Western grebes, as well as other marsh-nesting species that use those water bodies.



Figure 51. Over the past decade or so, lakes, sloughs, and rivers in the Creston valley have become more popular with boating enthusiasts. Duck Lake, BC. 7 April 2007 (Linda M. Van Damme).

Human disturbance on breeding grounds:

Nesting *Aechmophorus* grebes avoid human disturbances near their colony by quickly leaving nests and diving and swimming to open water until the threat has passed. Oftentimes there is not time to cover the nests with vegetation so contents are vulnerable to predation and high temperatures. If the disturbance catches grebes suddenly, eggs may be knocked into the water and small chicks may become separated from their parents or if left in the water may die as a result of hypothermia (Kristensen and Nordstrom 1979).

Aircraft over flights: Low-flying aircraft, notably helicopters, in the vicinity of *Aechmophorus* colonies, during the egg and early chick stage (late May through mid-July) can indirectly impact nesting grebes through predation and chilling. Unattended nests with eggs and small chicks are vulnerable from a variety of avian predators including Herring, California, and Ring-billed gulls, Northern Harrier, American Crow, and Common Raven.

Interspecific interactions

In larger mixed-*Aechmophorus* colonies in North America, Clark’s Grebe associates mainly with its own kind (Ratti 1979). In British Columbia, the opposite is true as *A. clarkii* is most often seen with Western Grebes but this may be due to the small numbers of birds. Only four of the 15 breeding

records (27%) for the province represent pure *A. clarkii* pairs.

Occasionally male Westerns and Clark's will interact with rushing and weed ceremony displays when courting a nearby female.

Competition for food resources with other piscivorous birds: *Aechmophorus* grebes must compete for food year-round with other fish-eating birds, especially species that pursue prey underwater. While foraging methods, optimal prey size, and similar diets may vary between species the combined impact on the prey base may be great. It should be noted, however, that fish-eating birds reduce competition for food resources where they co-exist by foraging on different sizes, and kinds, of fish (Knopf and Kennedy 1981). Also, the numbers of prey could increase to make up from losses from predation.

There is no information available on interspecific competition for food resources for *Aechmophorus* grebes on their breeding grounds on Shuswap Lake or coastal wintering grounds. At Duck Lake in the Creston valley, this concern has been addressed during research on Western and Red-necked grebes (Forbes 1984, Ohanjanian 1986, 1998).

The Creston valley is home to at least 15 species of piscivorous birds which forage and feed at Duck Lake. During the 1980s and 1990s it appeared that populations of introduced fishes at Duck Lake were satisfactory to support birds with fish diets. The numbers of colonial fish-eating species in the Creston valley, however, changed dramatically in the 2000s with the arrival of breeding Double-crested Cormorants (Van Damme 2004, 2007) and summering non-breeding American White Pelicans (Ohanjanian 1998; Figure 52). This has created a potential conflict involving other fish-eating birds, especially Western Grebe and Forster's Tern, both of which are red-listed in British Columbia.

A recent study estimated that summering American White Pelicans consume 6,375.62 kg (6.4 metric tons) of fish in three distinct areas in the northern Creston valley: Six Mile Slough, Leach Lake, and Duck Lake (Ohanjanian 1998). It is not known whether the pelicans are having a negative impact on the food supply of other fish-eating birds



Figure 52. With the recent arrival of a summer non-breeding population of American White Pelicans in the Creston valley competition for food resources between fish-eating waterbirds is becoming intensified. Duck Lake, BC. 11 June 2009 (Brent Wellander).

in the valley.

Creating artificial nesting islands for American White Pelicans, another Red-listed species, is being considered for the Creston valley. Ohanjanian (1998) states: *No enhancement activities directed at American White Pelicans are recommended at present. Western Grebes and Forster's Terns, both "Red-listed", fish-eating birds, are currently nesting at the Creston Valley Wildlife Management Area. It would be premature to attempt to entice the pelicans to nest or to artificially increase their numbers at the Creston Valley Wildlife Management Area prior to understanding the extent and reliability of the prey base, and the potential impacts that increased numbers of pelicans may have on other "Red-listed" birds. Little is known about the prey base of the pelicans and other piscivorous birds in the Creston Valley Wildlife Management Area. Fish studies are recommended.*

However, in the 2004 Habitat Management Plan developed for the Creston Valley Wildlife Management Area, Wilson et al. (2004) state: *consider encouraging pelicans to nest by providing a combination of fine gravel, sand, and soil with no shrub or tree cover on existing islands.*

Management Recommendations

The Clark's Grebe is protected by the International Migratory Bird Treaty Act (1919). Provincially it is not considered a "Red List" or "Blue List" candidate by the British Columbia Government, probably because information on the bird's status, ecology, distribution, and population size in the province is lacking. Never-the-less, other peripheral species, with small and local populations are listed such as its close relative the Western Grebe.

Along with Forster's Tern, Clark's Grebe has the smallest breeding population of any fresh-water colonial water bird species in British Columbia (Campbell et al. 1990a, 1990b, 2009). From one to three pairs may breed (often as hybrids with Western Grebes) most years at Shuswap Lake and very infrequently at Duck Lake in the Creston valley.

Since the life history of the Clark's Grebe in British Columbia involves fresh-water and marine habitats, management considerations must include both summer and winter grounds.

Most of the following management recommendations suggested for Western Grebe are also applicable to Clark's Grebe.

Breeding Grounds

Shuswap Lake: Nesting habitats and foraging locations require different approaches for management options.

Aechmophorus grebes usually breed at their traditional site west of the municipal marina but have been reported nesting successfully in the lakeshore marshes from Salmon River east to and including Christmas Island. In 1986, local naturalists concerned about rapid development and increased tourism around Shuswap Lake, and the threat to nesting grebes, formed the Salmon Arm Bay Nature Enhancement Society (SABNES). Their mandate was to assist in developing a management plan for the Salmon Arm Bay area, with nesting grebes being a high priority, and provide interpretive material for visitors. Access to the marshes is now restricted during the grebe breeding period including free-roaming domestic stock (Figure 53). In addition, an area surrounding the colony sites, including some foraging areas, has been established and marked with



Figure 53. The Salmon Arm Bay Nature Enhancement Society has been instrumental in protecting nesting habitat and educating local residents about the significance of the Western Grebe nesting colony at Salmon Arm, BC. 1 July 1991 (R. Wayne Campbell).

restrictive buoys (Figure 54). While this appears satisfactory some boat traffic still enters the sensitive area.

The Salmon Arm Bay Nature Enhancement Society (SABNES) is proactive in encouraging awareness of the restricted area for nesting grebes. A house boat company and a Sea Doos rental firm, who use part of the lake off the grebe breeding grounds for training, are reminded annually to instruct their clients not to venture beyond the marker buoys into the sensitive nesting areas. A sign has also been erected at the public boat launching ramp to highlight sensitive areas for boating enthusiasts. As well, a program is being implemented to inform resort owners around the lake to advise their customers about the plight of the nesting grebes and communicate to them that some areas of the lakeshore are off limit to humans.

Dahl (2008) notes another indirect disturbance



Figure 54. Salmon Arm residents Ron Wedman (left), Gary Lomax, and Carl Curtis prepare to set out marker buoys to establish a disturbance-free buffer zone for nesting grebes on Shuswap Lake, BC. The activity was funded by the Shuswap Community Foundation (Tom Brighouse).

to nesting grebes. He wrote “*During the July 1st celebration fireworks, the grebes, being more vulnerable to disturbances at this time, sounded agitated and could be seen leaving the area around Peter Jannink Park during the light flashes of the fireworks.*” Perhaps a new location could be recommended to minimize this disturbance.

Duck Lake: Wilson et al. (2004) suggest the following prescription for managing habitat within the Creston Valley Wildlife Management Area for unique or sensitive nesting species:

- minimize the rapid rate of water level increase in Duck Lake during spring and early summer;
- restrict boat access near nest colonies to create disturbance-free zones of 400 m around nest sites (Figure 55);
- provide artificial nesting platforms; and
- explore provision of nesting platforms at other sites such as the south end of Kootenay Lake.

It appears that a stable water regime is essential for the success of nesting *Aechmophorus* grebes. Water levels must be suitable to provide a stable base for nest mounds to prevent flooding, and dislodging



Figure 55. At Duck Lake, BC., fishing too close to active nesting colonies of *Aechmophorus* grebes can increase the risk of predation when incubating birds are flushed from their nests. Creating a 400 m buffer zone around known colony sites would help minimize disturbance. 25 June 2006 (Linda M. Van Damme).

during sudden increases in water levels caused by storms.

Human Access to Colony Sites

As prolonged or frequent human activity also can pose a significant threat, access to marshes with nesting populations or the portions of the marshes used by the grebes should be curtailed or limited during the breeding season from early-May through July. Fishing, boating, and related activities should not be permitted in the vicinity of any colonies when nesting birds are present. Where boating is permitted nearby, speeds should be low enough to minimize wave action. In the Creston area, boating activities at Duck Lake, including loading boats into the water, have been observed to disrupt *Aechmophorus* grebe incubation.

Artificial Nesting Platforms

See Campbell et al. (2009) for a discussion on the suitability and use of nesting platforms for *Aechmophorus* grebes.

Aquatic Vegetation

It appears that the submergent vegetation mat in Duck Lake provides valuable nesting habitat for *Aechmophorus* and Red-necked grebes as well as

Forster's Terns (see Figure 40). Without it, successful nesting could not occur, except in rare years when winds and storms are virtually non-existent. Its presence in a lake which is rich in prey species may contribute positively to the energy budgets of the fish-eating birds that use it, allowing them to nest in close proximity to their food source. The mat should be examined over several years, under differing weather regimes to determine whether it is providing adequate habitat over the long-term, or if the site is, in fact, a population sink. These mats also provide food for fish. While it is thought that by maintaining relatively low water levels in Duck Lake the milfoil mat may grow more quickly and attain a critical mass suitable to protect both tern and grebe nests earlier in the spring, this may not always be practically possible. Water levels on Duck Lake will continue to be beyond the control of the Creston Valley Wildlife Management Area, as pumping to lower them early on in the season is costly, and the rate at which water levels rise will always be a function of precipitation, the Kootenay River (as controlled by the Libby Dam), the size of the snowpack, and the timing of the spring run-off.

At Shuswap Lake, the only threat to nesting substrate is from dredging for lake access and destruction of aquatic vegetation by cottage owners who regard it as "weeds" and unsightly.

Environmental Pollutants

As grebes are high up on aquatic food "chains" or "webs," they would be expected to be highly susceptible to the effects of biomagnifications of several pollutants, as suggested by the research summarized in the Mortality section above. Further research on the immediate and longer-term effects of such pollutants on *Aechmophorus* grebes is desirable for management of their populations as well as those of their nesting associates. At Shuswap Lake, pollutants from agricultural activities along the Salmon River and entering the lake should be examined.

Wintering Grounds

Aechmophorus grebes winter in large flocks, sometimes in the thousands, in protected waters along the Pacific coast. This behaviour makes them

extremely vulnerable to oil spills. It is assumed that breeding *Aechmophorus* grebes in British Columbia winter along the coast and conceivably a single large spill could eliminate much, or all, of the provincial breeding population of 200 or so pairs.

The impact of major oil spills on *Aechmophorus* grebes along the Pacific coast, including the Puget Sound region, has been well documented (Smail et al. 1972, Speich and Thompson 1987, Bayer 1988, Roletto et al. 2000).

Aechmophorus grebes appear to be food specialists in winter, feeding on juvenile Pacific Herring in the evening, when they are most vulnerable during their vertical migration. This puts the two grebe species in a more precarious position than more generalist predators. Since there is a Pacific Herring fishery in British Columbia, over-harvesting would directly impact distribution of wintering flocks, especially within the Strait of Georgia.

Large wintering grounds should be identified as sensitive areas and local fishermen, boaters, and other water users should be encouraged to adjust their activities to minimize disturbance to resting grebes.

Public Extension Information for Minimizing Human Disturbance

Most people care about animals and do not want to harm or disturb them unnecessarily. In areas of high seasonal human activity, especially during the summer recreational months, people and colonial-nesting birds often come into conflict. To lessen disturbance, and protect nesting birds during the sensitive periods in their life, an information brochure would be helpful to announce conservation concerns.

A model on-line information leaflet has already been produced by the Idaho Department of Fish and Game (<http://fishandgame.idaho.gov/sites/Wildlife/.../grebe.pdf>) (Figure 56) and could be modified for British Columbia. In Idaho, like elsewhere, *Aechmophorus* nesting coincides with the busy boating and fishing season and to help protect nesting colonies state biologists recommend:

1. Avoid Nesting Areas: Stay 300 feet away from colonies and avoid prolonged presence near the colonies.
2. Watch Your Wake: When moving near colonies, go slowly and quietly to avoid swamping nests and minimize disturbance.
3. Take A Scenic Detour: Motor, sail, or paddle *around* flocks and colonies instead of *through* them.
4. Avoid Boat Strikes: Watch for grebes in open water, especially between May and September, to avoid killing collisions.
5. Respect Buoys and Limits: Obey buoy markers and posted speed limits for the safety of all.
6. Pack Out Your Trash: Adults and young can become tangled in fishing line, and other plastic trash, and drown.
7. Educate Others: With everyone's help, we can ensure the survival of these beautiful waterbirds.

IDENTIFICATION
Learn to recognize the differences between Western and Clark's grebes.

Western grebe

- black on head below eye
- bill is yellow-green
- two-note call

Clark's grebe

- black on head above eye
- bill is yellow-orange
- one-note call

HELP PROTECT NESTING GREBES
Grebe nesting coincides with the busy boating and fishing season. Please:

- AVOID NESTING AREAS** Boats and wake can dislodge and destroy nests.
- WATCH YOUR WAKE** Reduce your speed and quietly pass around nesting sites to avoid swamping nests and minimize disturbance.
- TAKE A SCENIC DETOUR** Motor, sail, or paddle around flocks and colonies instead of through them.
- AVOID BOAT STRIKES** Watch for grebes in open water, especially between May and September, to avoid killing collisions.
- RESPECT BUOYS AND LIMITS** Obey buoy markers and posted speed limits for the safety of all.
- PACK OUT YOUR TRASH** Adults and young can become tangled in fishing line, and other plastic trash, and drown.
- EDUCATE OTHERS** With everyone's help, we can ensure the survival of these beautiful waterbirds.

WESTERN & CLARK'S GREBES

The Migratory Bird Treaty Act protects grebes. It is illegal to hurt, harass, kill, or disturb grebes and/or their eggs.

Sharing our lakes with these unique waterbirds.

© Idaho Department of Fish and Game, 2009

Research and Monitoring of Clark's Grebe in British Columbia

The biology and ecology of Clark's Grebe is less known than any other species of North American grebe primarily because it was not recognized as a full species until 1985. Therefore, almost any aspect of the bird's natural history will provide new information for a small peripheral population at the northern limit of its breeding range. It would be helpful to document and report disturbance and mortality from human activities, especially boating, so proper management actions can be taken. A more detailed investigation into the effects of recreational boating on *Aechmophorus* grebes in Salmon Arm Bay is urgently required.

The diet of *Aechmophorus* grebes on their breeding and wintering grounds is little known. Field methods to determine summer foods should be non-invasive.

Studies on the potential impact of non-breeding Ring-billed Gulls on the eggs and chicks of *Aechmophorus* grebes at Duck Lake and breeding Ring-billed Gulls at Shuswap Lake would be helpful in preparing comprehensive management plans for each area.

Annual monitoring by telescope, from pre-established shore observation stations, should be continued at least four times during the breeding

You're just visiting, but for these birds the water is home.

Putting on a Show
Western grebe performing courtship ceremony. © Brian Lenz

Raising the Family
Human Impacts

Habitat Destruction
Loss of nesting habitat due to dredging of front waterways on lakes, marshes, and sloughs. The wetland has lost over half of its historic wetlands, and many remaining areas are threatened by further destruction.

Pesticides
Like many birds, grebes have been historically impacted by DDT and DDD spraying. Although these particular pesticides have been banned since the late 1970s, DDT persists in the environment. Other persistent pesticides are still in use and pose a serious threat.

Grebes at Risk

Direct Disturbance
The greatest threat to nest success is the adult grebe that is nesting. They are having difficulty finding nesting sites and are being disturbed by humans and their pets.

Boat wakes swamp nests, drowning eggs. Any eggs left in the water after a boat passes are exposed to excess heat, abandoning nests to overheating and predators. In open water, adults may drown if they cannot find a place to land. They may be forced to dive to escape water craft. A boat wake can also knock a female off her partner, where they will struggle, become chilled, and may drown.

Nesting on the water can be tough.

Figure 56. A colourful on-line brochure summarizing the life history of Clark's and Western grebes following the Idaho Department of Fish and Game example would help mitigate disturbance to nesting colonies at Shuswap and Duck lakes in British Columbia.

season. At the present time this activity is being carried out by the Shuswap Naturalist Club at Salmon Arm. The results should be placed for permanent archive in the province's central repository for breeding information (see Campbell et al. 2009).

Flocks of Western Grebes discovered anytime of the year in British Columbia outside the known breeding locations should be carefully scrutinized for Clark's Grebes.

Like many other monitoring programs for colonial-nesting waterbirds, a complete survey of *Aechmophorus* grebes should be carried out every five years searching all potential habitats.

Databases

This account is based on 6,030 single occurrence records and 15 individual breeding records that include nests reported with eggs, adults swimming with chicks on their backs, or developing young being fed by parents (Table 3). These breeding records include Western/Clark's grebe hybrid pairs.

The databases have a short history of development since the Clark's Grebe was not officially recognized as a separate species until 1985 and populations are local and small.

Did You Know?

Why Lobed Feet?

While it is common knowledge that lobes on the feet of some diving birds, and legs placed well back in the body, (e.g., grebes and cormorants), is an adaptation for swimming and chasing prey underwater, the mechanism of why this works has

only recently been explained.

The asymmetrical lobes on grebe's feet, with a narrower skin flap on the lateral side of the toe, enable these waterbirds to swim very efficiently. Researchers Johansson and Norberg (2000, 2001) concluded that the Great Crested Grebe (*Podiceps cristatus*) "uses a hydrodynamically lift-based foot (power) stroke to propel itself underwater, with the separated toes functioning as multiple slots to increase the lift-to-drag ratio. The asymmetric lobes are an adaptation for self-stabilization of the toes during the power stroke, and the toes themselves act as separate hydrofoils, each producing lift and each being twistable individually under hydrodynamic load."

Adaptation for Swallowed Fish Bones?

Grebes swallow their own feathers as well as occasional feathers floating on the water from moulting waterbirds. Most feathers are from the birds' flanks and scapulars which are in constant moult and come out during preening. Also, some naturalists have observed that the first "meal" a chick gets is a feather from its parent.

The function of this behaviour is not fully understood. Examination of dead grebes has shown that stomachs lined with feathers forms a "plug" in the pyloric exit between the stomach and the small intestine. It is suggested that swallowed feathers may provide protection from sharp fish bones by keeping bones in the stomach, and also to reducing indigestible material that may cause build-up of gastric parasites. Piersma and Van Eerden (1989) postulated that the feathers may provide the necessary bulk for regular regurgitation of bone-filled pellets.

Table 3. Differences in distribution information, and size of databases used in the Clark's Grebe account published in *The Birds of British Columbia* (BBC; see Campbell et al. 1990a, Campbell et al. 2001) with the current account from updated databases housed in the Wildlife Data Centre (WDC) in 2009.

	Distribution ¹		Database	
	Occurrence	Breeding	Occurrence	Breeding
BBC	4	2	28	2 ²
BCFWS	35	2	6,030	15
% Increase	775	0	21,435	650

¹Based on the total number of 1:50,000 National Topographic System grids occupied.

² See Campbell et al. (2001) for update.

Catching Food in Darkness

Some seabirds, including wintering Western and Clark's grebes, usually feed at night in protected bays and inlets along the south coast of British Columbia. The question that biologist James Clowater asked himself was "How can a nocturnal predator see what they are doing?" During his research in Saanich Inlet, on Vancouver Island, Clowater (1998) learned that their principal prey, Pacific Herring, migrate vertically at night toward the surface and that bioluminescence, a natural light emitted by tiny marine organisms in the water, may assist grebes in locating and capturing prey.

A Swimming Marvel

Grebes spend most of their life on, or under, the water and therefore require special adaptations that allow them to swim and dive. These include slender necks, small heads, dense waterproof plumage, lobed toes, laterally compressed tarsi to minimize resistance when the legs are drawn through the water, legs placed far back on the body to aid foot-propulsion, short tails to minimize drag, and well-developed oil glands to help waterproof feathers. An unusual characteristic, not fully understood, are flattened claws on the toes, somewhat like human fingernails.

Water, Water, Everywhere ... and Not A Drop To Drink

Clark's Grebes spend over half of their lives in salt water where concentrations of salt are higher than in body fluids. The question then is "How can a fresh-water nesting bird migrate to the ocean and live drinking salt water all winter?"

To rid kidneys of excess salt, birds and other marine animals that spend part of their lives on the ocean, must ingest lots of fresh water. Without this source of water tissues soon dehydrate and death follows. Grebes, like many marine-associated birds, have adapted to a marine life by a developing a desalinization system that involves specialized salt glands. The grebe's system moves ingested saltwater in the blood into the salt glands, located in the head just above the eye sockets. Here, Sodium becomes highly concentrated and then is expelled outside the bird's body.

The Internet

There is scant electronic information available on the biology and ecology of Clark's Grebe in North America and even less for British Columbia.

The following sites have some useful information for British Columbia.

Birds of North America: www.bna.birds.cornell.edu/bna/species

Birds of Washington State: www.birdweb.org

British Columbia Ministry of Environment (Rare Birds of BC): <http://www.env.gov.bc.ca/wld/documents/spsum/ABNNM08090.pdf>

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): <http://www.cosewic.gc.ca>

Idaho Department of Fish and Game: <https://fishandgame.idaho.gov/sites/Wildlife/.../grebe.pdf>

National Audubon Society - The Christmas Bird Count Historical Results: <http://www.audubon.org/bird/cbc>

Waterbird Conservation for the Americas: <http://www.waterbirdconservation.org/pubs/ContinentalPlan.cfm>

Finding Clark's Grebe in British Columbia

Clark's Grebe, like many peripheral species in British Columbia, is a species that birders seek for their provincial lists and photographers for their collection of bird images. The only reliable spot to find Clark's Grebe is at the south end of Shuswap Lake in the vicinity of Salmon Arm where the species has been reported annually since 1988. The site is very accessible but numbers are small and patience is often required to locate a bird.

Duck Lake, in the northern Creston valley, is the only other site where Clark's Grebes nest but the bird's occurrence is erratic, being recorded in only nine of the past 26 years.

In winter, the best chance of locating a Clark's

Grebe is to scan flocks of Western Grebes with a telescope in protected waters such as bays and inlets in the vicinity of Juan de Fuca Strait and Strait of Georgia. Most records have been from marine waters at Royal Roads off Esquimalt Lagoon on southern Vancouver Island.

Shuswap Lake

The south end of Shuswap Lake, with its riparian trees and shrubs, extensive marshes and mud flats, rock jetties, islets, and open water, is quickly becoming a favourite destination for visiting birders in the province.

The best place to see Clark's Grebe on Shuswap Lake is from the wharf in Salmon Arm. To get to the municipal wharf, travel on the Trans Canada Highway (Hwy #1) to Salmon Arm turn into town (north) at the traffic light on 4th Street N.E. (*i.e.*, at the Kentucky Fried Chicken sign). After two short blocks turn right (east) on Lakeshore Drive, and then immediately left to cross the railway tracks. The wharf is straight ahead. The city of Salmon Arm has incorporated the importance of the grebe nesting colony into their promotional material for tourists (Figure 57).

Clark's Grebes may be seen in the boat basin in the vicinity of the wharf, from the end of April to the first week of October. However, after mid-June the grebes will be sitting on nests, usually with the partners close by. Most years the nests are difficult to see.

Clark's Grebes nest both west and east of the wharf in the Reed Canary Grass or in the bulrushes. To the west they will nest along the foreshore as far as the Salmon River, approximately 1.5 km away. They may also nest in a small "pond" connected to Shuswap Lake near Peter Jannink Nature Park, 0.5 km from the wharf. To the east they may nest in some years along the foreshore as far as Christmas Island, about one kilometre from the wharf. The latter site can be reached by a well-maintained trail.

Once the chicks have hatched, Clark's Grebes move to open water and remain scattered throughout Salmon Arm Bay, north to Mallard Point and Sandy Bay, usually mixed with Western Grebes.

Patience, good lighting, and a good spotting scope will usually reward the keen observer.

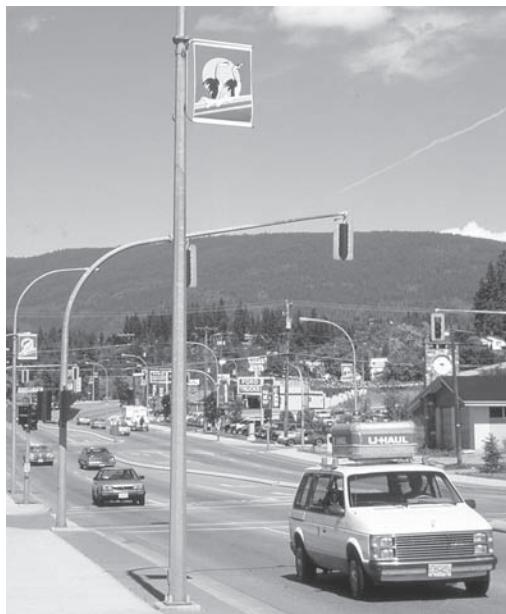


Figure 57. The city of Salmon Arm, BC. embraces the "Dance of the Grebes" with colourful banners lining their main streets. 1 July 1991 (R. Wayne Campbell).

Duck Lake

The following bird-finding site has been extracted from *Creston Valley Birds – when and where to find them* (Van Damme in press; Figure 58).

This site is the most popular and well-visited birding locale in the valley. To reach the lake arriving from the west, follow Highway 3 for about 8.6 km from the Summit Creek bridge and veer right onto Highway 21; continue 0.5 km and turn left onto Lower Wynndel Road through the tunnel. Travel 6.8 km north to Duck Lake Road. Slow down to make this left downhill turn and be sure to stay to the right of this narrow lane as logging trucks exit here and visibility is reduced. If arriving from the east and traveling through downtown Creston, follow Canyon Street to the last traffic light, continue north as it turns into Northwest Boulevard, leaving the town boundary at the junction of Highway 3 and 3A. Drive north on Highway 3A about 7.5 km and turn left onto Lower Wynndel Road before the Wynndel Country

Store. The Duck Lake Road turn is less than 0.4 km from this junction.

Once on Duck Lake Road, continue for 1.2 km, cross the Old Goat River channel and make a right turn onto Channel Road – a sign is posted “Duck Lake 6 km”. Channel Road merges into a dyke at the south end of Duck Lake where there are pullouts for viewing the lake and the cattail marshes to the south. Clark’s Grebes may be observed from late May through mid-September swimming in open water with Western Grebes but their presence is unpredictable.

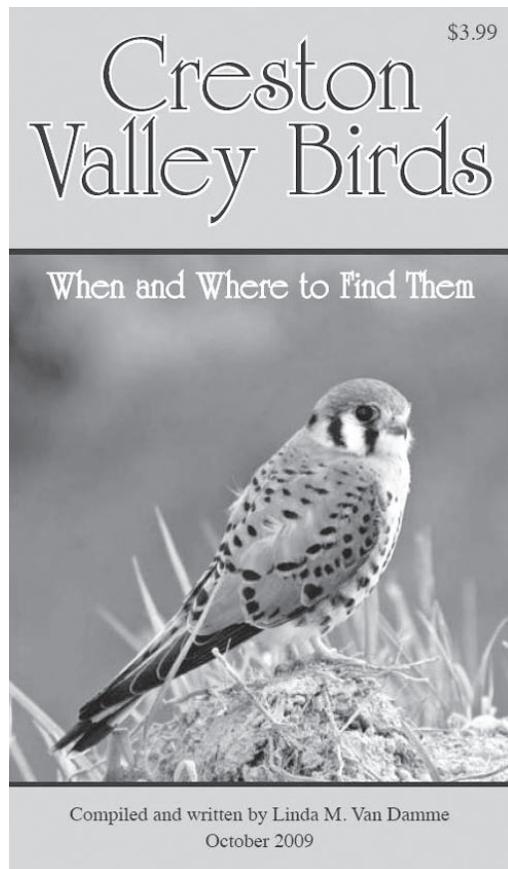


Figure 58. A 35-page booklet, including a checklist and site guide to the birds of the Creston valley is currently being developed and will be available in October 2009 from lvd2@shaw.ca.

Acknowledgements – Sharing Your Data

The records compiled for this account have been obtained from a variety of published, reported, and unpublished field records of Clark’s Grebe in British Columbia.

We are grateful to David Allinson, Gerry, Stephen, and Wendy Ansell, John Bain, Daniel Bastaja, Jack Bowling, Tom Brighouse, Richard Brouillet, Clive Bryson, Roger Burrows, Clyde H. Burton, R. Wayne Campbell, Peter Candido, Steve R. Cannings, Richard J. Cannings, Russell Cannings, Donald G. Cecile, Chris Charlesworth, Ed and Monica Dahl, Cameron Eckert, Kyle Elliott, Kayla Feldman, Jamie Fenneman, Michael Force, Trevor Forder, David F. Fraser, Kylea Gardner, Wayne Gardner, J.E. Victor and Margaret E. Goodwill, Hilary Gordon, Leona Haggert, Gail Harrop, Louis Haviland, Werner H. and Hildegard Hesse, Ted Hillary, Richard R. Howie, Doug Janz, Gary Jenkins, Dale Jensen, Kevin Jones, Brian M. Kautesk, Frank and Doris Kime, Ed Klassen, Burke Korol, Doug Kragh, Jack Lloyd, Jo Ann and Hue Mackenzie, Chris McDonald, Bob McKay, Martin K. McNicholl, Lyn Miller, Guy L. Monty, Daryll Myhr, Laure Neish, Ed Pellizon, Roy W. Phillips, Ilya Povalyaev, Michael Price, Syd Roberts, I. Laurie Rockwell, Chris Sanders, Ron and Joy Satterfield, Brian Self, Chris Siddle, Bernie and Prue Spitman, Don Stevens, W. Stevens, David



Figure 59. Most of the recent information for Clark’s Grebe on Shuswap Lake, BC., has been gathered by Ted Hillary during regular birding trips along the waterfront. Salmon Arm, BC. 4 October 2009 (Barbara Hillary)

Tang, Keith Taylor, Roger Taylor, Ryan Tomlinson, Rick Toochin, Danny Tyson, Linda M. Van Damme, Audrey Viken, John Vooys, Michael Ward, Wayne C. Weber, Marcus Womersly, Mark Wynja, and Tim Zurowski for making their observations available.

We often underestimate, and do not fully appreciate, the commitment that many individuals have made to summarize regional bird information and make it available to a wide audience through national and local publications like *Audubon Field Notes/Field Notes/American Birds/North American Birds* (National Audubon Society; Figure 60), *The Wandering Tattler* (Vancouver Natural History Society; see Figure 69), *Muskrat Express* (Williams Lake Field Naturalists), and annual bird reports (Victoria Natural History Society and Vancouver Natural History Society).

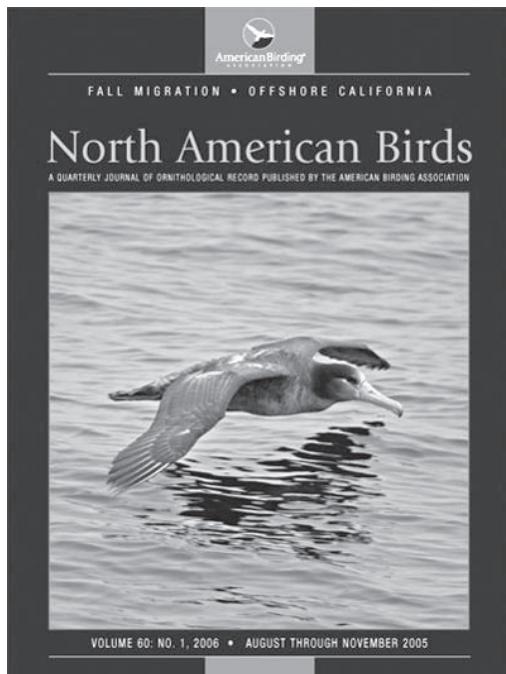


Figure 60. The seasonal summaries of noteworthy bird sightings published by the National Audubon Society for various regions of North America has been a helpful source of records for the Clark's Grebe in British Columbia.

Tens of thousands of volunteer hours have been freely donated by compilers Barbara Begg, Jack Bowling, R. Wayne Campbell, Richard J. Cannings, Donald G. Cecile, Larry Cowan, A. R. Davidson, Rudolf H. Drent, Linda Durrell, Kyle Elliott, Michael Force, David F. Fraser, Wayne Gardner, J. E. Victor Goodwill, Jude Grass, Werner and Hilda Hesse, Tom Jacobson, Dale Jensen, Laura Jordison, Rex Kenner, John and Vi Lambie, Kevin Louth, Bruce A. Macdonald, Tom Plath, G. Allen Poynter, Phil Ranson, Anna Roberts, Thomas H. Rogers, Zella M. Schultz, Michael G. Shepard, Chris Siddle, Jim Sims, David Stirling, Jeremy B. Tatum, Jean Waite, Wayne C. Weber, and Mark Wynja. It is this unselfish passion that has been a major contribution to our knowledge of birds in British Columbia.

The visionary *The Birds of North America* accounts, published jointly by The Academy of Natural Sciences (Philadelphia, PA) and The American Ornithologists' Union, Washington, DC., have quickly become the first "go to" literature for species on the continent and have been invaluable in preparing this account (see Storer and Nuechterlein 1992).

Although all photographers are acknowledged with each image, the amount of personal time and field experience required to obtain the photographs is appreciated. Everyone we contacted willingly allowed us to use their photographs and many sent us enhanced electronic files so their best image could be published. These people included Frank Kime, Laure W. Neish, David Tang, Brent Wellander, and Tim Zurowski (Figure 61).

Tim Gallagher, Editor of *Living Bird*, Ithaca, NY, kindly granted permission to reproduce the drawing of the *Aechmophorus* grebes from Storer (1965) (see Figure 4).

Colleen Moulton, biologist with the Idaho Department of Fish and Game, Boise, ID, was very co-operative in allowing us to scan the cover of their brochure, and highlighting mitigation for disturbance to nesting grebes, as a proposed model for British Columbia.

Michael Preston voluntarily prepared the figures requiring manipulation and formatting of the Wildlife Data Centre databases for Clark's Grebe.

Patricia Mitchell provided thorough review and

editorial comments that completed the final stages of the manuscript.

Finally, the Salmon Arm Bay Nature Enhancement Society (SABNES) should be congratulated for their commitment to protect nesting habitat and monitor productivity for Western and Clark's grebes in the southern Shuswap Lake region.



Figure 61. This Clark's Grebe was the first documented by photograph for Vancouver Island. Ogden Point, BC. 18 October 1986 (Tim Zurowski). BC Photo 1142.

Dedication

Frank Kime (Figure 62) was born in North Yorkshire, England, in 1923. He was raised by his grandparents on the North Yorkshire moors. It was from his grandfather, who was a gamekeeper, that Frank developed his love and respect for birds and all of nature. Every weekend, and more often if he could, Frank was on the moors observing birds and other wildlife learning their habits and developing his birdwatching skills.

When Frank was 15 he joined the Royal Air Force as an apprentice aircraft engineer, and in 1943 he became a pilot. After the war he was stationed in Egypt, Singapore, the Maldives Islands, and St Louis, Missouri in the United States. He retired to England in 1969 and immigrated to Canada and Salmon Arm in 1983 to be close to his three children.

Wherever Frank has lived he remained an ardent birdwatcher. He has visited all continents, except for the Antarctic, to pursue his passion. In Salmon Arm,



Figure 62. Frank Kime was instrumental in arousing public interest to successfully protect the nesting grounds of the Western Grebe, and other waterbirds, in Salmon Arm bay from human disturbance and development. His knowledge of the habits of the Western and Clark's grebe came from 20 years of experience. Salmon Arm, BC. 6 February 2009 (Ted Hillary).

he was largely instrumental in getting much of the foreshore of the Salmon Arm bay preserved from development. As part of his strategy to protect the nesting grounds of the Western Grebe, Frank, with his wife Doris, compiled the results of their 20-year study in Salmon Arm bay and published a coloured booklet "*Dancing in the Bay*" – *The Western Grebe and Clark's Grebe in the Salmon Arm Bay of the Shuswap Lake from the years 1990-2000* (see Figure 70). This attractive and informative publication increased awareness about the plight of the nesting grebes off the Salmon Arm waterfront.

Frank's passion for nature, and the lives of animals, is exhibited in one of his favourite musings entitled "*I Wonder*"

*I wonder why as I sit, rain or shine on lofty crag,
to view with varying patience a scene that holds the*

nature of things

*Perhaps damp, hot, prey to any harboring insect
viewing not a thing for time uncounted*

*I wonder at the eagle as but a speck above a
majestic mountain he views the world as he sees it
and I cannot as on effortless wings he soars, glides,
and drops to his unseen prey then to rise again and
as suddenly becomes as a speck in the sky so clear*

*I wonder at the Harlequin as through the ocean
surf he plunges and bobbing as a cork showing
plumages so handsome so beautiful with nary a
feather disturbed*

by a birdwatcher

Literature Cited and Useful References

The following list of citations is only a sample of many articles that were used to develop our databases and prepare this account. We have included only literature that was a main source of records and biological information or a significant contribution to developing the conservation and management section. Only information for specific supporting statements, or direct sources of data, are cited in the text.

All references with an asterisk (*) indicate a hard copy is filed in the Wildlife Data Centre library.

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Auk
Grebe
Auklet
Guillemot
Loon
Puffin
Dovekie
Murre
Murrelet

Arthur Cleveland Bent

Life Histories of North American Diving Birds

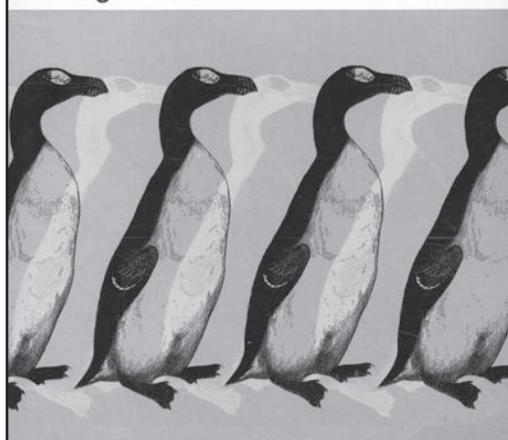


Figure 63. Nearly 90 years after publication, Bent's life histories of diving birds is still the base source for reliable natural history on the lives of these waterbirds in North America.

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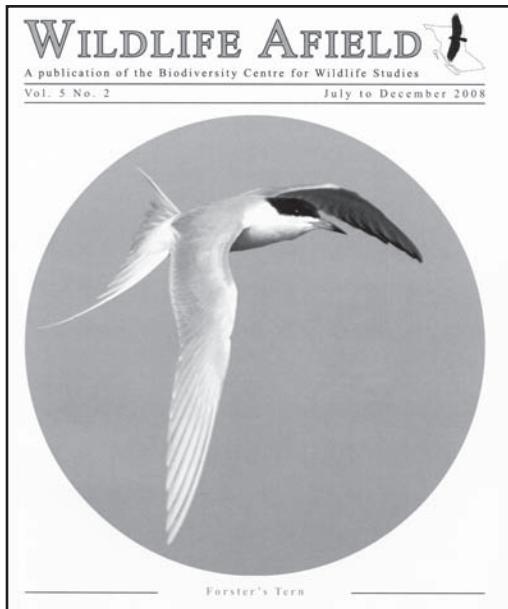


Figure 64. Oftentimes conservation and management recommendations in summary accounts are similar for many wetland-nesting species. Since the Forster's Tern and Clark's Grebe nest in similar habitats at Duck Lake, BC. we relied heavily on feeding ecology and conservation issues previously published for Forster's Tern for this account.

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**SHUSWAP
NATURALIST
CLUB**

*To know Nature
and keep it worth knowing*

**NEWSLETTER
SEPTEMBER 2008**



photo by Karen Beggs

Great Horned Owlets - Kee-Two Working for You

Regular Club Meetings
1st Tuesday of month
• September: 11 AM - Sunnybrae Park
• October to May: 7 PM
Library, Sullivan Campus of
Salmon Arm Secondary School
• June: 4 PM – meeting & potluck
Peter Jannink Nature Park

Mailing address
Box 1076
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Member of BC Nature - the Federation of BC Naturalists

Figure 65. Information compiled on *Aechmophorus* grebes in British Columbia, and useful anecdotes, came from a wide variety of sources including naturalist club newsletters.

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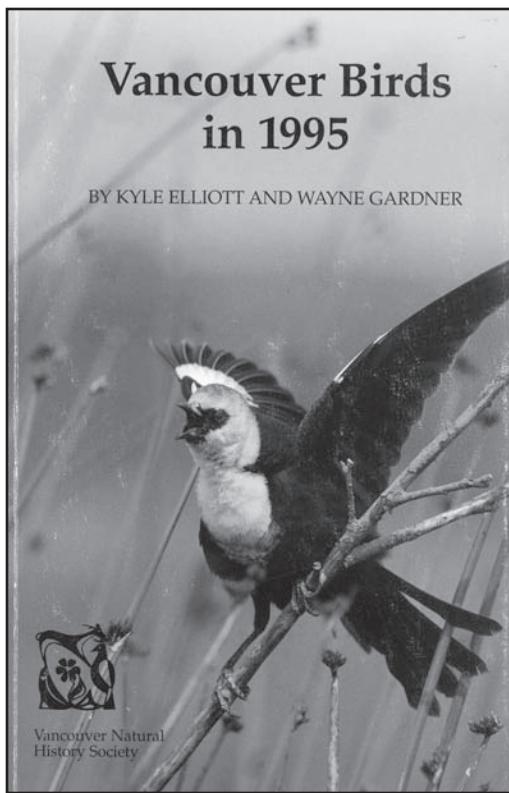


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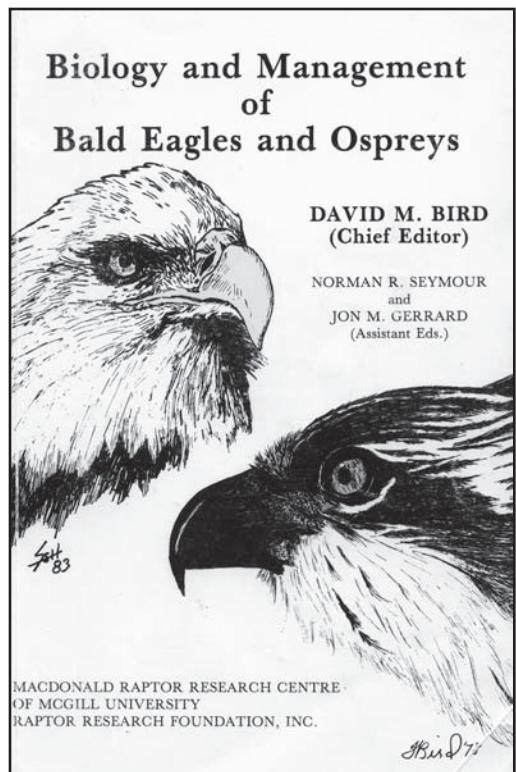


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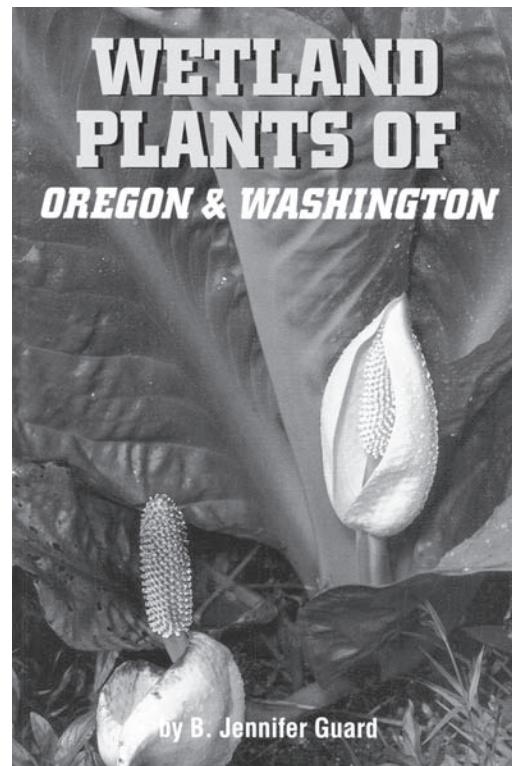


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The Wandering Tattler
September 1992 Vol. 16, No. 1 \$1.00

"BUT OUR PIPITS HAVE DARK LEGS,
DON'T THEY?...WHAT IS 'OUR' PIPIT,
ANYWAY?"

"Our" pipit, the American Pipit, has legs that are usually shown in field guides as dark, or black. Leg colour may not even be mentioned in the text. The *Audubon Master Guide to Birding* is more helpful. Although the text says "Legs brown to black", for some dark-legged birds, the text reads "...legs brown to black. Some full birds have pale legs." (emphasis mine).

American Pipit is a common transient in the Vancouver area from mid-April to mid-May, and mid-September to late October. Look for them in fields, on beaches, and other open places during migration. Try to see their legs. If you see pink, instead of the usual blackish legs, don't assume that you are looking at a transgressor from Asia. Scratches may remain in our area, and other northern locales, all winter.

James F. Clements, in his *Birds of the World's Wetlands* (1991), gives the Common name of *Anthus rufulus* as Buff-bellied Pipit instead of American Pipit. Giving the species a more descriptive common name (which I personally suppose the choice) seems to me to be a sensible step, as not all *Anthus rufulus* are "American", or even North American.

Written by Jo Ann MacKenzie

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Put Pen to Paper	Page 3
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Figure 69. The summary of noteworthy bird sightings from the Greater Vancouver area published in the Vancouver Natural History Society Birding Section newsletter *The Wandering Tattler* has been an important reference to complete the distribution and occurrence for Clark's Grebe in the southwest mainland coast.

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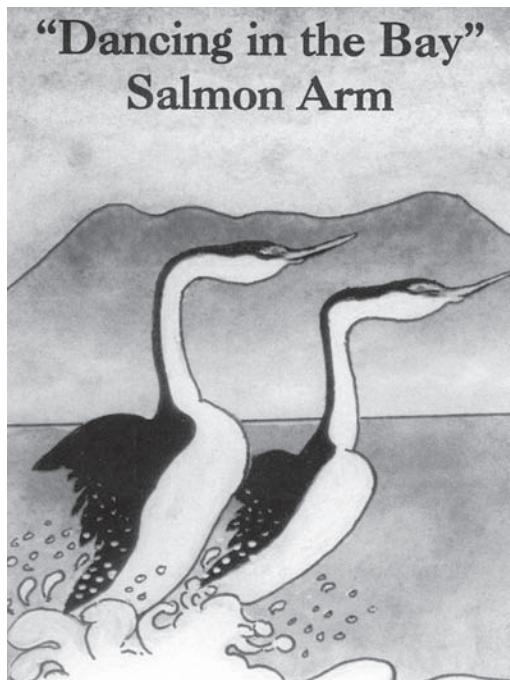


Figure 70. Regional booklets that are published independently are an invaluable source of information when they contain specific details that can be used in developing species' profiles for British Columbia. Frank and Doris Kime's publication provided the essential summary of regional field observations that contributed greatly to the Clark's Grebe account.

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Figure 71. A pair of Western Grebes in courtship display at Shuswap Lake, BC. 30 May 2008 (Ian James).

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HANDBOOK OF North American Birds

VOLUME 1

Loons through Flamingos



Edited by Ralph S. Palmer

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Figure 72. The 11-page account on Western Grebe in Ralph Palmer's ambitious project *Handbook of North American Birds* to update the Arthur Cleveland Bent series for North American birds was an important reference for new information for the Clark's Grebe account.

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Figure 73. *The Birds of North America* accounts, now completed for all regularly-occurring species in North America, provide useful summary information on all aspects of the life of the Western and Clark's grebe on the continent. The latter species account, only four pages long, is a good start at summarizing the scant information available for this newly described species.

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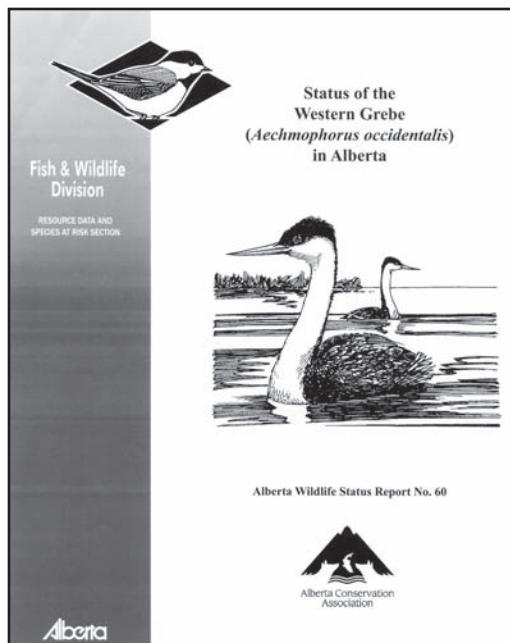


Figure 74. Reports on the status of *Aechmophorus* grebes in provinces and states adjoining British Columbia helped put the status of the Clark's Grebe in perspective for the province.

About the Authors

Ted was born in Saskatchewan and like many prairie boys became interested in birds through egg-collecting. He moved to British Columbia, leaving his precious egg collection behind, and enrolled at the University of British Columbia where he received a Bachelor of Arts degree in 1962 with a double honours in Latin and Greek.

With a British Commonwealth Scholarship in hand he attended the University of Sydney, in Australia, and graduated with a Master of Art degree in Ancient History in 1965. He returned to Canada and worked as a social worker with the now Ministry of Children and Family Development in Prince George. He returned to UBC for a Master of Social Work (1971) and later upgraded his credentials with a Diploma of Public Administration from the University of Victoria in 1975. He became supervisor for the Ministry of Children and Family Development responsible for programs in Salmon Arm, Revelstoke, and Golden in 1987. Ted retired in 1997.

After retirement, Ted's interest in birding was rekindled and he became actively involved in a host of volunteer activities, including executive positions with the Shuswap Naturalists. He has also served on the executive of the Shuswap Family Resource and Referral Centre, the Rotary Club of Salmon Arm, and the Shuswap Probus Club.

When time permits, Ted also enjoys collecting stamps and reading history of the prairies and western Canada.

Over the past 15 years Linda has documented the success and failure of the Western Grebe colony at Duck Lake in the Creston valley and she will continue her monitoring program in 2010. As a long time participant in the BC Nest Record Scheme, and co-author of its annual reports, Linda spends about half the year in the field looking for nests and broods. Usually her nest-finding season starts in March with Great Horned Owls and sometimes continues into early September for late broods. This year she will explore more of the mountainous country in the Creston valley.