The Wilson Journal of Ornithology 121(3):600–609, 2009

HIGH MOUNTAIN LAKES PROVIDE A SEASONAL NICHE FOR MIGRANT AMERICAN DIPPERS

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ABSTRACT.—We studied summer use of high elevation lakes by American Dippers (*Cinclus mexicanus*) in the Trinity Alps Wilderness, California by conducting repeated point-count surveys at 16 study lakes coupled with a 5-year detailed survey of all available aquatic habitats in a single basin. We observed American Dippers during 36% of the point-count surveys and found birds at 10 of 16 study lakes. Over 90% of the American Dipper sightings were in lentic habitats in Deep Creek Basin. Bird presence at a lake was positively correlated with steep rocky littoral zones and high densities of caddisfly (*Trichoptera*) larvae. We also observed numerous successful foraging bouts on juvenile life stages of lentic-breeding amphibians. We did not find any nests at the lakes but did observe juvenile dippers. American Dippers are highly adapted to flowing waters, and our findings coupled with incidental observations from the literature and other researchers suggests that high elevation lentic waterbodies have been largely overlooked as a seasonal niche for migrant dippers. *Received 8 September 2008. Accepted 2 February 2009.*

Study of avian migratory strategies has been of intense interest to ornithologists, especially when bird species exhibit broad variation in seasonal habitat use (Alerstam 1990). Many species of passerines make seasonal altitudinal migrations to high elevation habitats during spring and summer to exploit resources when the climate is mild and productivity is high (Dixon and Gilbert 1964, Rabenold and Rabenold 1985, Hahn et al. 2004, Hollenbeck and Ripple 2007). Birds that use this migratory strategy can take advantage of the early spring bounty available at low elevations, move up in the mountains for the summer to exploit delayed seasonal resources after snow has melted and temperatures increase, and move down in fall before the onset of harsh winter conditions.

The American Dipper (*Cinclus mexicanus*), is an example of a highly aquatic passerine that commonly migrates upstream from low elevation wintering areas along rivers to higher elevation habitats (Dixon 1943, Packard 1945, Price and Bock 1983, Morrissey et al. 2004, Willson and Hocker 2008). Morrissey et al. (2004) found the majority (79–90%) of a marked American Dipper (hereafter ‘dipper’) population in British Columbia completed seasonal migrations from a low elevation river to completely segregated higher elevation tributaries in spring. Most migrants returned to low elevation rivers during fall prior to the onset of winter. Several studies report migrant dippers readily bred at higher elevation tributaries (Morrissey 2004, Middleton et al. 2006, Willson and Hocker 2008). Studies by Packard (1945) and Price and Bock (1983) in Colorado identified ice formation at higher elevations as the ultimate cause for dippers to exhibit downstream migration in fall.

Characteristic habitat for dippers has been described as fast-moving, clear, unpolluted streams with cascades, riffles, and waterfalls (Price and Bock 1983, Kingery 1996). Dippers dive for a variety of aquatic prey in these habitats, including invertebrates, fish (salmonid eggs and juveniles, cottids), and amphibians (Ehinger 1930, Bakus 1959, Sullivan 1973, Kingery 1996, Morrissey and Olenick 2004). Nest locations vary, but are usually on cliffs, banks, boulders, woody debris, and bridges in direct association with the stream channel (Hann 1950, Morrissey 2004, Loegering and Anthony 2006). Thus, dippers are primarily considered an obligate stream species (Price and Bock 1983, Middleton et al. 2007).

Dippers have been recorded foraging in both low elevation ponds and lakes during winter (Willson and Hocker 2008), and high elevation lakes during summer (Palmer 1927, McEneaney 2002). We predicted lentic waterbodies provide a significant seasonal habitat for migrant dippers. Breeding in California occurs between March and June depending on elevation (Wheelock 1904,

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Dawson 1923, Beedy and Granholm 1985, Harris 1991) and birds usually fledge by late June in higher elevation regions (Cogswell 1977). We predicted that both adult and juvenile dippers forage at high elevation lakes but that breeding does not occur since lakes are often frozen into late May or early June. No study has assessed the potential importance of these stillwater habitats for migrant dippers.

Our objectives were to: (1) describe the prevalence of American Dippers in lakes and correlate dipper occurrence with lake resources in the Trinity Alps Wilderness, California, USA; (2) describe foraging behavior on prey unique to lentic waters in the region; and (3) summarize published and confirmed observations of dippers using lakes throughout western North America. We focused on characteristics of lakes where dippers were found, frequency of occurrences, duration, and specific foraging behaviors that may indicate which high elevation lakes could be important to this species.

METHODS

Study Area.—The Trinity Alps Wilderness (212,713 ha) is in a glacially characterized portion (Sharp 1960) of the Klamath Mountains of northern California (Fig. 1) with many mountains in this sub-alpine region exceeding 2,300 m. Lakes, ponds, and meadow systems are common aquatic features and are predominantly in mixed conifer to sub-alpine habitats at terminal positions in drainages. High gradient outlet streams of most lentic waterbodies provide aquatic corridors to lower elevation streams. Deep winter snow accumulation in this region causes lentic waterbodies to remain completely frozen from late-November until June during average precipitation years.

We surveyed 16 headwater lakes throughout the eastern half of the wilderness. We chose lakes that had low recreation use, occurred at similar elevations, and were relatively small. Lakes were between 1,896 and 2,210 m in elevation, ranged from 0.3 to 1.98 ha in size, and were between 2.4 and 11.3 m deep. We also conducted a repeated basin-wide survey for dippers to examine high elevation lotic and lentic habitat use. Deep Creek Basin is a medium size (342 ha) glacial cirque in the southeast portion of the wilderness (Fig. 1). Aquatic habitats included a lake, several permanent ponds, a matrix of 12 wet meadows, and 5.8 linear km of perennial streams. Aquatic habitats ranged in elevation from 1,960 to 2,279 m.

Bird Counts.—Each of the 16 lakes was surveyed every 2 weeks between June and September 2003–2006 with six survey periods in summers 2004 and 2005, and five in 2003 and 2006. We conducted 5-min double-observer point counts (Nichols et al. 2000) around each lake during each survey period on two consecutive mornings starting within 15 min of dawn. Points were within 25–40 m of shore and were separated by at least 100 m. The number of points per lake depended on lake size and ranged from three to six. Number, distance, and method of identification (sight or sound) of all dippers observed were recorded. The maximum number of birds observed at one time during one point count on either day of the survey was considered the number of birds for that survey at the lake. We followed the point count with a directed search for nests along the shoreline and inlets and outlets when dippers were found at a lake.

We conducted 50 basin-wide censuses (~10/year) of all aquatic habitats in Deep Creek Basin over 5 years (2003–2007). The only lake in the basin (Echo Lake) was included in the 16 lakes study, but habitat comparisons were limited to observations during basin-wide censuses to ensure equal search effort among available habitats. Surveyors systematically searched all aquatic habitats within the basin from June through October noting the location, date, and number of dippers seen. Foraging behavior was noted in 2005 and 2006 at two lentic waterbodies (Echo Lake and Snowmelt Pond) where dippers were frequently encountered. We observed dippers foraging on invertebrates (e.g., larval caddisflies, Trichoptera) on occasion, but we limited foraging descriptions to amphibian predation due to its prevalence at these two waterbodies and absence in the literature. Amphibian prey was identified to species at close range with binoculars when conditions allowed. We recorded feeding behavior, prey type, and time spent foraging when birds were encountered at these sites.

We recorded the number of individual dippers observed incidentally outside of the primary study lakes but in the wilderness on a particular date at a given lake from 2001 to 2008. These observations were summarized and added to the total number of lakes having dipper observations but were not included in statistical tests.

Food Resources.—Aquatic invertebrates were sampled from the benthos of the littoral zone of each of the 16 lakes on every survey trip in 2006.

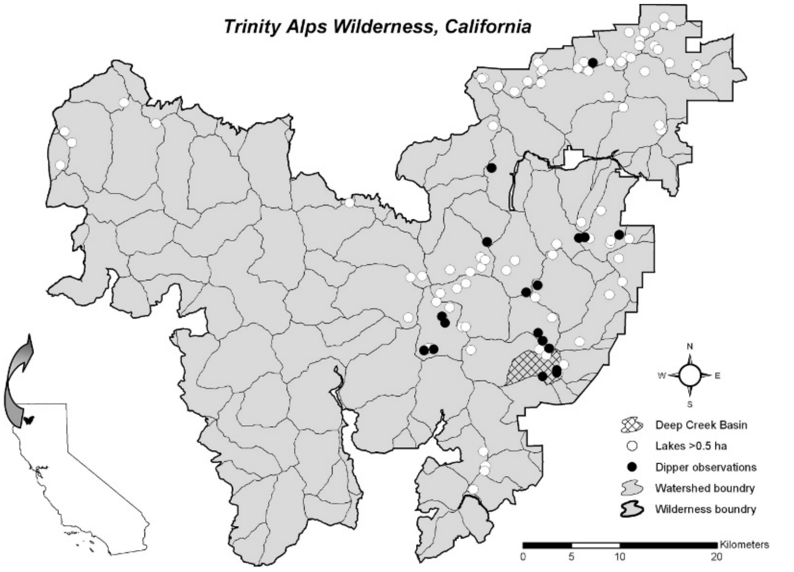

FIG. 1. American Dipper sightings within the Trinity Alps Wilderness, California. White circles represent all headwater lakes >0.5 ha within the wilderness (n = 101). Black circles represent 18 individual lentic waterbodies where American Dipper observations occurred between 2001 and 2008.

Three D-net sweeps were taken at ~0.1, 0.5, and 1.0 m deep at four equally spaced transects around the lake shore. Invertebrates ≥4 mm were sorted in the field, identified to Order and counted. Counts of each taxon were averaged across the season.

Amphibians were sampled during each survey trip at the 16 study lakes using visual encounter surveys (VES), (Crump and Scott 1994). Crews counted all life stages (egg masses, larvae, juveniles, and adults) during each VES for each amphibian species seen while searching shoreline and littoral habitats, looking under banks and logs and in the littoral zone substrate. We used the mean number of larval amphibians counted during each year per site as the amphibian larval abundance for the lake.

Habitat Characteristics.—Littoral zone habitat characteristics were measured by sampling from ~25 evenly spaced transects around the perimeter of each study lake. Depth and substrate at each transect were recorded at three distances from shore (0.1, 0.5, and 1.0 m). Littoral zone slope was calculated by obtaining the slope of a least-squares line through the locations of the three depth measurements. The slopes for each transect were averaged to obtain a mean littoral zone slope for each lake. Littoral zone substrate categories were defined by dominant particle size. We pooled substrate categories with average particle sizes >75 mm into a rock category for analyses.

Statistical Analyses.—We used a binomial nonparametric regression with a LOESS smoothing function (Cleveland and Devlin 1988) to relate dipper presence with survey period (where survey 1 = 12–30 Jun and survey 6 = 3–16 Sep depending on the lake and year). The LOESS smoothing function relaxes the assumption of linearity between dependent and predictor variables by fitting a series of local quadratic curves using weighted least squares (Cleveland and Devlin 1988). We used multiple regression with the mean number of dippers seen per lake during count surveys as the dependent variable and lake characteristics and food resources as the predictor variables. The continuous variables: littoral zone slope, amount of rock substrate, abundance of caddisfly larvae, and density of amphibian larvae were selected *a priori* based on existing literature or field observations that suggested their importance in affecting dipper occurrence. Most results reported were significant at $P \leq 0.05$, but we also present trends to avoid excessive Type II error. Regression analyses were conducted using S- Plus 4.5 (S-Plus 1997).

TABLE 1. Physical characteristics and number of American Dipper observations for 18 lentic waterbodies within the Trinity Alps Wilderness, California, 2001–2008.

Waterbody	Elev (m)	Size (ha)	Max depth (m)	Dominant littoral zone substrate	Years surveyed	Years birds detected	Total detections	Max birds[a]
Adams[b]	1,873	0.5	5.8	Silt	5	4	17	3
Big Boulder	1,851	3.2	8.3	Silt	1	1	2	2
Boulder Creek	1,760	1.4	5.0	Silt/Boulder	2	2	3	1
Deer[b]	2,177	1.3	5.5	Silt/Boulder	4	4	20	3
Eden[c]	2,136	0.03	1.3	Silt/Boulder	3	1	1	1
Echo[b]	2,215	1.1	5.3	Silt/Boulder	7	7	121	5
Forbidden	1,870	0.8	2.9	Silt	1	1	1	1
Foster	2,209	2.7	5.9	Boulder/Silt	1	1	1	1
Lion[b]	2,133	1.5	11.6	Bedrock/Boulder	4	4	19	2
Little Caribou[b]	2,180	1.0	5.2	Silt/Bedrock	4	2	11	2
Lower Canyon	1,720	5.7	33.2	Silt/Bedrock	1	1	1	1
Luella[b]	2,111	0.9	3.2	Silt/Boulder	3	2	4	1
Mavis[b]	2,049	1.7	5.0	Silt	4	1	2	1
Salmon[b]	2,180	0.7	5.2	Silt	4	3	13	2
Snowmelt[c]	2,226	0.2	1.5	Silt/Boulder	5	3	14	3
Ward[b]	2,171	2.0	7.5	Silt	5	4	7	2
Upper Canyon	1,730	10.1	26.2	Silt/Bedrock	1	1	1	1
26062[b, c]	2,055	0.3	3.2	Silt	4	3	12	2

[a] Maximum number of individual American Dippers detected during a given survey.
[b] Waterbody part of the systematic 16-lake study.
[c] Pond (<0.5 ha).

RESULTS

We recorded 250 individual sightings of American Dippers from 2001 to 2008 at 18 lentic waterbodies in the Trinity Alps Wilderness (Fig. 1, Table 1). Both adults and juveniles were observed but no nests were found. Observation dates ranged from 14 June to 10 October. Ninety of these sightings (36%) were of individuals, 45 (36%) were of two individuals, 13 (16%) were of three individuals, four (6%) were of four individuals, and three (6%) were of five individuals. The 18 waterbodies varied in elevation (1,720–2,226 m), surface area (0.03–10.1 ha), and maximum depth (1.3–33.2 m) (Table 1). Fifteen were lakes and three were ponds less than 0.5 ha in size. All waterbodies had outlet streams, but six had outlets that dried completely in midsummer each year.

Dippers were found at 10 of the 16 study lakes (Table 1) and observed 35.5% of the time during the 214 point-count surveys conducted over 4 years. They were observed in all 4 years at three lakes, 3 of 4 years at four lakes, 2 years at two lakes, and only 1 of the 4 survey years at one lake. Dippers were most often observed after the first survey in mid-June with no difference in the probability of occurrences during the rest of the surveys in July through mid-September (Fig. 2).

Dipper occurrence at a lake was related to habitat and food variables (adjusted $R^2 = 0.70$, $P = 0.001$, Table 2). Lakes frequented by dippers had steeper littoral zone slopes, more caddisfly larvae, and tended to have more rocky substrate than lakes without dippers (Table 2). Density of amphibian larvae was not related to dipper occurrence ($P = 0.95$).

Dippers were most commonly encountered in lentic waterbodies within Deep Creek Basin. Individuals were observed as early as 30 June and as late as 10 October. Echo Lake had 70.6% of the total observations in the basin with 2–5 dippers detected every year. Snowmelt Pond had fewer observations (20%) with 1–3 dippers detected in 3 of 5 years. Observations of dippers away from these waterbodies were rare with six (8%) occurring in streams and one at a small isolated pond.

Dippers were observed foraging on both larval and recently metamorphosed amphibians on six occasions at Echo Lake or Snowmelt Pond. Dippers preyed on 47 individual amphibians (44 larvae and 3 froglets [metamorphosed young of the year]) during the observations. Seven prey items were confirmed as Cascades frog (*Rana cascadae*) (4 larvae and 3 froglets) and four were Pacific treefrog (*Pseudacris regilla*) larvae. We

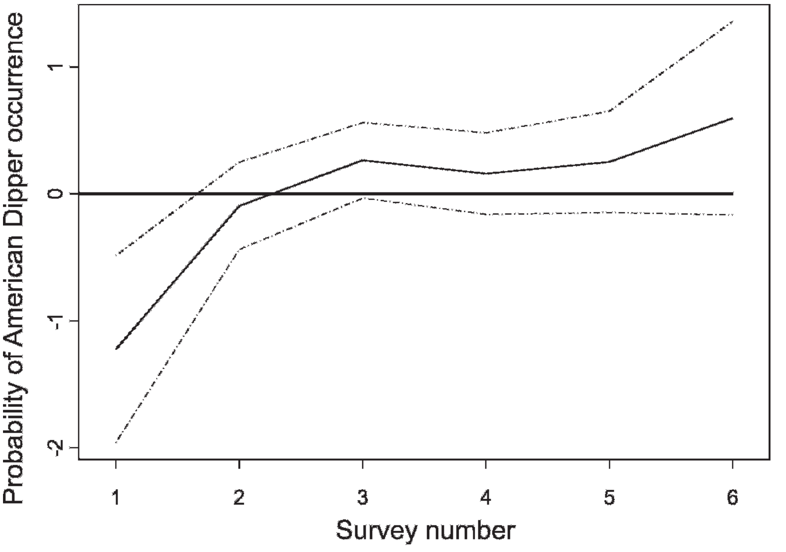

FIG. 2. Estimated probability of American Dipper occurrence by survey period. The first survey occurred in mid-June each year. Additional surveys followed every 2 weeks with the sixth survey conducted in early- to mid-September. Dashed lines on either side of the response curve represent 95% confidence intervals. Probability of occurrence is significantly lower when the response curve and the confidence intervals are completely below the average effect line.

were unable to identify prey species for most (77%) predation events, but Cascades frogs and Pacific treefrogs were the only anuran species present at the two waterbodies. The maximum predation rate for an individual dipper was 21 anuran tadpoles consumed in 13 min.

DISCUSSION

American Dippers have long been considered unique among passerines by having a life history primarily dependent on lotic environments. Dippers are highly adapted to flowing water, but some birds successfully use high elevation lakes for summer habitat. Previous detailed studies on the spatial ecology of dippers have focused solely on populations in single watersheds covering large linear transects (Price and Bock 1983, Morrissey et al. 2004). The designs of these studies were sufficient in revealing seasonal migration patterns of dippers in stream environments but, by design, could not reveal whether alternative high elevation habitats were also seasonally used.

Our findings suggest headwater lakes are frequently used by dippers during the summer. Dippers were found at 10 of 16 study lakes and were detected during a third of all point-count surveys at the lakes. We found dippers using the majority of the study lakes over multiple years and throughout the summer. Previous studies

TABLE 2. Results of the multiple regression analysis relating dipper occurrence at the 16 study lakes with caddisfly abundance, amphibian larval abundance, littoral zone slope, and percent rock in the littoral zone.

Source	df	*SS*	*MS*	*F*-ratio	*P*
Model	1	0.77	0.77	9.71	0.001
Residual	11	0.18	0.0016		
Terms					
Trichoptera	1	0.17	0.17	10.12	0.009
Amphibian larvae	1	0.0001	0.0006	0.004	0.95
Slope	1	0.11	0.11	6.69	0.03
% rock	1	0.06	0.06	3.78	0.08

using marked dipper populations showed individuals can have high annual fidelity to both winter (67%) (Morrissey et al. 2004) and breeding (70%) territories (Middleton et al. 2006). We suspect individual dippers return annually to specific lakes in our study area during the summer months. We did not identify and mark individual birds and this hypothesis warrants further investigation.

Ninety-two percent of all dipper observations over 5 years in Deep Creek Basin occurred at lentic waterbodies. It remains unclear why few dippers used the available lotic habitats in the basin. One explanation may be that some high elevation lentic habitats contained more aquatic prey than streams since stillwater habitats have higher habitat stability. Surface water discharge increases to raging torrents during peak snowmelt in these high gradient streams, likely making them inhospitable to many invertebrate and amphibian species. Macroinvertebrate communities, which provide an important prey source for dippers, can have lower species richness (Brewin et al. 1995, Jacobsen et al. 1997) and relative abundance (Sandin and Johnson 2000) in high elevation versus low elevation streams. We did not quantify aquatic invertebrate densities in Deep Creek Basin, but their densities appeared to be low in streams and high in lentic habitats. In addition, we observed numerous large-bodied caddisfly larvae grazing on exposed boulders in lentic habitats but rarely in lotic waters. The two streams in Deep Creek Basin where dippers were observed contained populations of larval tailed frogs (*Ascaphus truei*) (J. M. Garwood, unpubl. data), a known prey species of dippers (Daugherty and Sheldon 1982, Morrissey and Olenick 2004).

We found 24 references from 1870 to 2008 that noted dippers on at least 48 occasions at montane lakes across seven states in western USA and five regions in British Columbia, Canada (Table 3). Sixteen of these references were prior to 1970. Lake elevations ranged from 580 m in Olympic National Park, Washington to 3,537 m in the Sangre de Cristo Mountains, New Mexico (mean = 2,180 m). Observations of dippers at Crater Lake in Oregon (Farner 1952) demonstrate individuals can fly at least 1.6 km overland to summer at lakes completely isolated from streams.

Eighteen of the 28 occasions that recorded the number of individuals detected noted one bird, six noted two birds, two noted three birds, one noted 4 birds, and one noted 5 birds at individual waterbodies. Thirty-one (79%) of the 39 observations that provided dates were from July to September, one occurred in October, four occurred in June, two in April and one in May. Dippers were recorded foraging at lakes on four occasions (Cooper 1870, Muir 1894: 219–220, Palmer 1927, McEneaney 2002). Juvenile dippers were recorded at lakes on 12 occasions (Table 3). One reference reported a dipper nest along the shoreline of a 2,966 m elevation lake in Wyoming (Pattie and Verbeek 1966); however, the nest was considered old and not used that year.

Our model that correlated lake resources to dipper occurrence offers an explanation for favorable lake conditions. It appears that dippers select specific lakes based on both physical habitat characteristics and the abundance of food resources. For example, boulders from surrounding steep talus fields characterize the steep littoral zones of many lakes, creating small ''islands'' and intermittent complex shorelines. We commonly observed dippers resting and singing on boulder islands between foraging sessions. Lakes with shallow littoral zones and a minimal amount of large rock were presumably used less because of their lack of perches.

Aquatic insects are known to be important prey for dippers in stream habitats (Price and Bock 1983, Kingery 1996) and also seem to influence their distribution in lake habitats. The density of amphibian prey did not influence dipper distribution, but we suggest waterbodies containing amphibians likely serve as an important seasonal lake-derived resource for dippers, especially just prior to onset of winter. Larvae of lentic-breeding amphibians have been shown to provide a rich food source to avian predators in other systems (Beiswenger 1981, Crump and Vaira 1991, Pilliod 2002), as well as in the Trinity Alps where Clark's Nutcrackers (*Nucifraga columbiana*) and American Robins (*Turdus migratorius*) have been observed consuming both *R. cascadae* and *P. regilla* larvae in the same lentic habitats used by dippers in this study (Garwood 2006).

Nests of American Dippers have been found in streams up to 3,049 m in elevation (Hann 1950) and one nest has been reported along a lakeshore in Wyoming at 2,966 m (Pattie and Verbeek 1966). We did not find any evidence of breeding after thorough nest searches each year at lakes where we found dippers. We were less likely to find dippers early in the season but did find

TABLE 3. American Dipper observations at montane lentic waterbodies throughout their range in western North America.

State/Province	Region	Location	Elev. (m)	Period/Year(s)	Reference(s)
California	Sierra Nevada	Lily Lake	1,994	Jul/before 1902[b]	Barlow and Price 1901
		Bullfrog Lake	3,234	Aug/1916	Dixon 1943
		East Lake	2,866	1940, Aug/1941	Dixon 1943
		Evolution Lake	3,308	Sep/1940	Dixon 1943
		Lake (unnamed)	3,255	Sep/1940	Dixon 1943
		Reflection Lake	3,057	Aug/1941	Dixon 1943
		Lower Darwin Lake	3,506	Jul/1942	Dixon 1943
		''Lake''[a]	2,287	Winter/before 1894	Muir 1894
		''Mountain Lake''[a]	3,537	Before 1870	Cooper 1870
		McClure Lake	2,927	29 Sep/1955	Gaines 1988
Oregon	Cascade Range	Crater Lake	1,881	Aug, Sep/1896	Merriam 1897
				25 Jul/1934	Campbell 1934
				Aug/1936	Farner 1952
				11 Jul/1940	Farner 1952
				18 Aug/1946	Farner 1952
				Aug, Sep/1948	Farner 1952
				13 Aug/1950	Farner 1952
				Jul, Aug/1951	Farner 1952
Washington	Olympic Peninsula	Mirror Lake	1,570	Summer/1926[b]	Palmer 1927
		Lake Crescent	580	Apr/1920	Rathbun 1920
	Cascade Mountains	Lake Keechelus	767	May/1925	Edson 1926
New Mexico	Sangre de Cristo	''Glacial Lake''[a]	3,537	25 Sep/1903	Bailey 1928
		''Lake''[a]	2,896	16 Oct/1903	Bailey 1928
Montana	Missoula County	Little Lake	1,957	Between 1956–1957	Bakus 1959
		Glacier Lake	2,134	Between 1956–1957	Bakus 1959
	Bitterroot Mountains	McCalla Lakes	2,433	10 Aug/1947[b]	Bakus 1959
	Flathead County	Avalanche Lake	1,190	Sep/2006	R. M. Bourque, unpubl. data
	Sun River	''Mountain Lakes''[a]		Between 1911–1931	Saunders 1912
Wyoming	Yellowstone	Yellowstone Lake	2,373	Before 2002	McEneaney 2002
		''Ponds and Lakes''[a]		Before 1922	Skinner 1922
	Beartooth Mountains	Twin Lakes	2,966	Jul/1961	Pattie and Verbeek 1966
Idaho	Caribou Range	Gray's Lake	1,947	Between/1949–1951	Steel et al. 1956
British Columbia	Skagit Range	Foley Lake	940	Jun/2005[b], 2006, 2007[b], 2008	H. A. Middleton[c], I. B. Whitehorne[c]
		Chilliwack Lake	625	Jul/2006[b]	I. B. Whitehorne[c]
	Lillooet Range	Lower Joffre Lake	1,220	Aug/2004[b], 2006[b]	C. A. Morrissey[c]
		Upper Joffre Lake	1,590	Aug/2004[b], 2006[b]	C. A. Morrissey[c]
	Okanagan Range	Pyramid Lake	2,070	Aug/2005[b]	D. J. Green[c]
	Canadian Rockies	Hungabee Lake	2,225	27 Aug/1975	Campbell et al. 1997
		Lake O'hara	2,019	08 Aug/1982[b]	Campbell et al. 1997
		Summit Lake	1,621	04 Apr/1983	Campbell et al. 1997
	Cascade Range	Flash Lake	1,244	10 Jul/1974	Campbell et al. 1997

[a] Exact waterbody could not be identified based on description.
[b] Juvenile American Dipper(s) noted.
[c] Personal communication.

several juvenile dippers with adults, and surmise that fledgling dippers follow their parents to high elevation lake habitats from lower elevation stream nest locations.

Middleton et al. (2007) investigated provisioning rates by adult dippers to young during the post-fledging period and found food delivery rates declined significantly during the second week. We did not observe begging juvenile dippers or food provisioning behavior by adult dippers when observed together at lakes. This strongly suggests lakes are used primarily as post-breeding habitats. This migratory strategy is also evident in our literature review where most observations occurred from July through September. Adult and fledgling dipper observations at high altitudes continued throughout the summer similar to observations in the Sierra Nevada Mountains, California (Gaines 1988), and in the Rocky Mountains, Colorado (Packard 1945).

We demonstrated that dippers use high elevation lentic habitats frequently throughout the summer months in the Trinity Alps Wilderness. These observations, coupled with those from our literature review, suggest lakes have been largely overlooked as a seasonal niche for migrant dippers. Understanding the full complement of a species' resource use is essential to understanding its ecology. We recommend future studies of American Dippers consider high elevation lentic waterbodies as potential seasonal habitat during the annual cycle. For example, assumptions of capture-mark-recapture analysis need to be carefully considered for lower elevation studies of dipper populations in watersheds containing an abundance of high elevation lake habitats. Future studies assessing both seasonal and annual site fidelity, as well as general behavioral and foraging ecology of dippers at lakes should offer valuable insight into explaining why some dippers migrate to these habitats.

ACKNOWLEDGMENTS

We thank the excellent field biologists who helped collect the data. J. D. Alexander and N. D. Seavy of the Klamath Bird Observatory helped with bird sampling design on the 16-lake study. H. A. Middleton, I. B. Whitehorne, C. A. Morrissey, and D. J. Green provided valuable information on lake use by American Dippers in British Columbia. H. A. Middleton, S. L. Miller, R. S. Studebaker, D. J. Green, C. A. Morrissey, and C. E. Braun offered helpful insights and comments on previous versions of this manuscript. B. D. Howard provided data base support. Funding for the Echo Lake Basin study was provided by the U.S. Forest Service, California Department of Fish and Game, and the National Fish and Wildlife Foundation. The 16-lake study was funded by California Department of Fish and Game (ESA Section 6 grants E-2-F-21 and E-2-F-27), National Science Foundation (grant DEB 0415505 to S. P. Lawler, University of California [UC] Davis), UC Water Resources Center (grant W-987 to S. P. Lawler), and the UC Davis Wildlife Health Center. KLP received additional support from UC Davis Ecology Block Grants and the U.S. Forest Service, Redwood Sciences Laboratory.

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