The Black-chinned Hummingbird is widespread in western North America, nesting mainly in riparian and oak woodlands. Its nesting ecology has been investigated in various areas, but in this issue of *Western Birds* Joseph C. Ortega and Catherine P. Ortega report a study from a new area, southwestern Colorado. The rate of apparent nest success they observed, 42%, is similar to that reported elsewhere. All nest failures were due to predation, and predation of eggs was much more likely than predation of nestlings. A nest’s chance of survival increased through the nesting cycle.
Nesting Bald Eagle Population Numbers, Density, Territorial Resources, and Relationship to Human Development in Northern Colorado’s Front Range
Dana J. Bove, Holly A. Anderson, Matthew A. Smith, and Theo A. Kuhn

David F. DeSante’s Birds of Cabo San Lucas, Fall 1968: A Historic Account
David F. DeSante, Richard A. Erickson, Gerardo Marrón, and Peter Pyle

First Record of Tricolored Blackbirds in Idaho
Peter J. Olsoy and Katie J. Sorenson

Factors Influencing Survival of Black-chinned Hummingbird Nests in Southwest Colorado
Joseph C. Ortega and Catherine P. Ortega

Second Prebasic Molt of a Black-headed Gull at Anchorage, Alaska
Robert L. Scher

NOTES
American Crow Cracks Open Bivalve via Automobile
Sierra R. Glassman and Emily Y. Banno

Front cover photo by © Dana J. Bove of Boulder, Colorado: Bald Eagle (Haliaeetus leucocephalus), Broomfield, Colorado, June 2018. The prey the adult male is delivering is a Black-tailed Prairie Dog (Cynomys ludovicianus)—which Dana J. Bove, Holly A. Anderson, Matthew A. Smith, and Theo A. Kuhn found to dominate the prey taken at a third of Bald Eagle nests in northern Colorado’s Front Range urban corridor. Thus habitat sufficient to sustain a flourishing population of prairie dogs is vital to sustaining the regional population of Bald Eagles at its current level.

Back cover photo by © Gerardo Marrón of La Paz, Baja California Sur, Mexico: adult Broad-winged Hawk (Buteo platypterus), San Antonio de la Sierra, Baja California Sur, Mexico, 16 April 2014. The Broad-winged Hawk was among the species first found on the Baja California Peninsula by the late David F. DeSante during his pioneering survey at Cabo San Lucas in 1968—summarized for the first time in this issue of Western Birds by Richard A. Erickson, Gerardo Marrón, and Peter Pyle. The several Broad-winged Hawks noted by DeSante correspond with the species’ currently known status as an annual uncommon fall and winter visitor in the peninsula’s cape region.

Western Birds solicits papers that are both useful to and understandable by amateur field ornithologists and also contribute significantly to scientific literature. Particularly desired are reports of studies done in or bearing on North America west of the 100th meridian, including Alaska and Hawaii, northwestern Mexico, and the northeastern Pacific Ocean.

Send manuscripts to Daniel D. Gibson, P. O. Box 155, Ester, AK 99725; avesalaska@gmail.com. For matters of style consult the Suggestions to Contributors to Western Birds (at https://westernfieldornithologists.org/publications/journal).
NESTING BALD EAGLE POPULATION NUMBERS, DENSITY, TERRITORIAL RESOURCES, AND RELATIONSHIP TO HUMAN DEVELOPMENT IN NORTHERN COLORADO’S FRONT RANGE

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ABSTRACT: To better understand the population of the Bald Eagle (Haliaeetus leucocephalus) nesting along northern Colorado’s Front Range, from 2016 to 2022 we studied 86 occupied nests within an area of 20,586 km². From 2017 to 2020, 279 juveniles fledged from 237 nesting attempts in a smaller, main nest-study area with 68 nests. The nests’ success over these four years ranged from 52 to 70%, and their productivity varied from 1.1 to 1.3. The average nearest-nest distances for three discrete areas in the Front Range (5.03 to 7.26 km) are at least 2.8 to 4.0 times greater than these distances in four nesting populations in wetter regions but shorter than distances observed between nests in drier Arizona. In our study area the coverage of buildings within 400 m of Bald Eagle nests is relatively low by comparison to the coverage around randomly selected points, averaging 1344 m²; for 63% of the nests this coverage was less than 800 m². We classified the 86 nest territories into eight categories that describe the dominant resource habitat and predicts the eagles’ reliance on Black-tailed Prairie Dogs (Cynomys ludovicianus) versus fish as prey. Predation on fish was predicted to be dominant at 51% (n = 44) of the nests, predation on prairie dogs at 32% (n = 28).

Northern Colorado’s Front Range urban corridor (commonly referred to as simply the Front Range) is experiencing some of the fastest human population growth in the U.S. (U.S. Census Bureau 2020), and state wildlife-management policies have changed to adapt to Bald Eagles nesting in urbanized settings (CPW 2020b). Eight of Colorado’s 10 fastest growing counties are in the corridor, their growth rates from 2010 to 2020 ranging from 12.9 to 32.6% (U.S. Census Bureau 2020). Three of these counties still lack land-conservation or open-space programs (https://coloradoopenspace.org/about/), and habitat
loss due to rapid human development could have a profound effect on nest-
ing Bald Eagles.

One-third of Bald Eagle nests in south-coastal British Columbia are more
urbanized and lie near residential or commercial developments (Elliot et al.
2006, Goulet et al. 2021). This population's resource-rich environment falls
at the wet end of the climatic continuum. In contrast, the population nesting
in Arizona represents the other extreme, as its dry ecological setting and low
population density have been considered unique among Bald Eagle popula-
tions (Driscoll et al. 2006, Eakle et al. 2015, McCarty et al. 2020). Colorado's
urban corridor is semiarid with weather patterns being strongly influenced
by the Rocky Mountains immediately to the west (Hansen et al. 1978). The
rapid development of the Front Range raises the question of how Colorado's
Bald Eagle population compares with populations at each end of the rainfall
extremes. Has it become more urbanized like that found in the wet climes of
British Columbia? Or is it perhaps closer in character to that in drier Arizona?

Bald Eagles prefer fish as prey, even in arid to semiarid regions (Wright
1953, Stalmaster 1987, Gerrard and Bortolotti, 1988, DeLong 1990, Knight et
their propensity to nest near fish-containing bodies of water (Buehler 2000,
Boal et al. 2009). This preference is evident in Colorado's Front Range, where
about 60% of the nest territories encompass larger streams or water bodies.
Although fish are a dietary preference, the Bald Eagle is an opportunistic and
generalist predator whose short-term diet usually reflects the local abundance
of most available prey (Buehler 2000, Thompson et al. 2005). In the Front
Range, the Black-tailed Prairie Dog (*Cynomys ludovicianus*) is a valuable prey
source. Its prevalence and importance as prey for the Bald Eagle vary from
nest to nest. In addition to the Bald Eagle, many other raptors, including
the Golden Eagle and Ferruginous Hawk (*Buteo regalis*), also depend on the
Black-tailed Prairie Dog as prey, and the Burrowing Owl (*Athene cunicularia*)
depends on its burrows for nesting (CPW 2020a).

In this study, we address the density, nest numbers, productivity, and
success rates of the Bald Eagle population of the Front Range. We clarify the
spatial relationship of nest sites with respect to human population density.
We compare these aspects of the Bald Eagle's biology in this semiarid region
to those in a more verdant region and in the desert Southwest. Finally, we
seek to develop a baseline understanding of the Bald Eagle's resource use in
a landscape of rapid human population growth and development.

METHODS

Study Area

Our study area encompasses 86 occupied nests divided into three areas of
interest comprising a total area of 20,586 km² (Figure 1). The three study areas
and their minimum bounding areas (polygonal areas around nests calculated
by the convex-hull tool in ArcGIS) include (1) the main study area with 68
nests occupied during 2020, extending north from Denver to Fort Collins and
from the foothills east about 60 km onto the plains (5095 km²); (2) a subset
of the main study area (the “midwestern field”) containing 18 nests with a
minimum bounding area of 689 km²; and (3) the northeast study area, which includes a minimum bounding area of 6506 km² to the northeast and east of the main study area, added later in the study with 18 nests (Figure 1). Data from Colorado Parks and Wildlife (CPW) indicate that >120 occupied Bald Eagle nests are present in northeastern Colorado (R. Conrey pers. comm.), and many of them are located in our combined 20,586-km² study area.

There are >250 known occupied Bald Eagle nests in all of Colorado, most in the semiarid plains along major waterways in the Front Range (R. Conrey pers. comm.). With the steep decline in population from DDT (Grier 1982, Bowerman et al. 1995, Stinson et al. 2007), Bald Eagles were rarely noted in the Front Range from the early 1940s until the early 1980s (Henderson 1909, Boulder County Nature Association unpubl. report). The first documented nest representing recovery in our study area was established at Barr Lake in 1986 (CPW 2020b), followed by one at Standley Lake in 1993 (Colorado Bird Observatory 1993).
Average precipitation values for the main study area and the northeast study area are 414 and 404 mm, respectively, with a total combined average of 409 mm.

**Mapping and Defining Nest Territories**

We define a nest territory as essentially equivalent to a core-use area (Burt 1943, Kaufmann 1962, Ewer 1968, Samuel et al. 1985), comprising the nest, known perches, and a significant proportion of the pair’s foraging habitat. A core-use area comprises over half the area an animal uses and may be much smaller than its entire home range (area of year-round or multi-year usage) (Samuel et al. 1985). Because a Bald Eagle’s core-use area is commonly calculated on the basis of the wider home range—well beyond visual tracking—it is commonly based on telemetry. However, the equivalence of core-use areas for nesting eagles can be reliably determined by careful field studies that integrate locations of perches and defense against other eagles. We define a perch as any fixed location on which an eagle has been observed. Nest-territory size for eight nests in the midwestern field area averaged 3.7 km² and ranged from 2.4 to 4.8 km² (Table 1). Then we calculated the nest territory as the area encompassed by a line tightly fit around all mapped perches and within 2 km of the nest, near the maximum distance a territorial Bald Eagle defends against other Bald Eagles in our study area (Bove unpubl. data).

**Nest Locations and Productivity**

We obtained data on Bald Eagle nest locations and productivity in the main study area from 2017 to 2020 from the Bald Eagle Watch program of the Bird Conservancy of the Rockies. Nest observations typically began in January or early February and continued to nest failure or when young fledged. Visiting nest sites at least twice monthly, the program’s trained volunteers verified the location, condition, and status of each nest. New nests located by volunteers, CPW staff, wildlife researchers, and the public were verified by Bird Conservancy of the Rockies staff and volunteers and assigned for observation by the Bald Eagle Watch coordinator. Volunteers entered data online, and the coordinator checked them periodically to verify

**Table 1  Territory Sizes and Numbers of Perches Used by Eight Pairs of Bald Eagles Nesting in Colorado’s Front Range**

<table>
<thead>
<tr>
<th>Nest</th>
<th>Map number</th>
<th>Territory size (km²)</th>
<th>Total perches (N)</th>
<th>Perches &gt;2 km from nest (N)</th>
<th>Study hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MALA</td>
<td>1</td>
<td>4.2</td>
<td>11</td>
<td>0</td>
<td>93</td>
</tr>
<tr>
<td>STEA</td>
<td>2</td>
<td>4.8</td>
<td>157</td>
<td>3</td>
<td>2013</td>
</tr>
<tr>
<td>LYON</td>
<td>3</td>
<td>2.9</td>
<td>144</td>
<td>2</td>
<td>912</td>
</tr>
<tr>
<td>WHRO</td>
<td>4</td>
<td>2.6</td>
<td>30</td>
<td>2</td>
<td>192</td>
</tr>
<tr>
<td>DACO</td>
<td>5</td>
<td>2.4</td>
<td>14</td>
<td>2</td>
<td>45</td>
</tr>
<tr>
<td>SULL2</td>
<td>6</td>
<td>4.8</td>
<td>99</td>
<td>13</td>
<td>1812</td>
</tr>
<tr>
<td>BOCR</td>
<td>7</td>
<td>3.3</td>
<td>66</td>
<td>9</td>
<td>1051</td>
</tr>
<tr>
<td>BCIC</td>
<td>8</td>
<td>4.3</td>
<td>97</td>
<td>3</td>
<td>1020</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>3.7 ± 0.97</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*See Figure 1.*
that data-entry guidelines were followed and to detect errors. The program’s senior coordinator independently inspected each nest before monitoring and intermittently through the nesting season to ensure that volunteers’ data were consistent and representative. Data were downloaded at the end of each nesting season and edited to remove errors, duplicates, omissions, and inconsistencies, prior to analysis.

The Bald Eagle Watch program considers a nest to be “successful” if at least one young has fledged or survived to at least eight weeks of age (Steenhof and Newton 2007). An “occupied” nest is defined as one that a Bald Eagle pair used during a given year. A “nesting attempt” is an observation of a bird in an incubating position at an occupied nest, or a nest with eggs or young. We calculated mean apparent nest success by dividing the number of successful nests by the total number of occupied nests in which nesting was attempted. We calculated the productivity of nesting attempts by dividing the number of fledglings by the total number of nesting attempts.

Definitions related to nest activity and productivity used in some other studies differ slightly, affecting comparisons. Researchers in Louisiana (Smith 2014, Seymour 2018), Chesapeake Bay (B. Watts pers. comm.), and northern Colorado and southeastern Wyoming (Kralovec et al. 1992) also followed the convention Bald Eagle Watch used in determining nest success.

Field Methods

In addition to the productivity monitoring by the Bald Eagle Watch program, staff and volunteers with Front Range Nesting Bald Eagle Studies observed other activities. During each timed session, typically 90 minutes to two hours long, they recorded data at 3-minute intervals on up to six Bald Eagles. Data recorded include perch location, behavior, flight type (hunting, soaring, perch change, flight distance relative to territorial boundary, or high-speed gliding), flight direction, interactions with other species, and the type and distance to nest of any prey acquired. We transferred field data to a standardized digital datasheet and reviewed it for quality control.

Nearest-Nest Distances

For all occupied nests in the three study areas we measured the distance to the next nearest nest by using QGIS 3.24 (www.qgis.org). We compared our results to those from five other areas: (1) 24,185 km² of riverine habitat in central Arizona with 48 occupied nests (Arizona Game and Fish Department unpubl. data), (2) 3745 km² in southern Louisiana with 195 occupied nests in 2017/2018 (Seymour 2018, M.A. Seymour pers. comm.), (3) 80 km² along the lower Susquehanna River in Chesapeake Bay with 34 occupied nests (Watts and Paxton 2019), (4) 700 km² in central Florida south of Kissimmee with 112 occupied nests in 2021 (https://cbop.audubon.org/conservation/about-eaglewatch-program), and (5) 4800 km² in the Upper Mississippi River National Wildlife and Fish Refuge with 53 active nests (Mundahl et al. 2013).

We calculated average precipitation for the main and northeast study areas from the Global Summary of the Year dataset by NOAA (Lawrimore et al. 2016). Specific stations used for each of the study areas can be found in Appendix 1 at www.westernfieldornithologists.org/bove_et_al_Bald_Eagle_appendices.pdf.
Data Analysis

Our analysis of resource selection in the main study area was based on GIS files containing all 68 locations of nests attempted in 2020 and coverage of buildings in our entire study area in 2021 (https://www.ecopiatech.com). We considered this file with coverage of each building to be the best and most recent proxy for human development in the study area. With this, we calculated the total area occupied by buildings within 0.25 km around each nest within the main study area. We then compared the results to the coverage of buildings within 0.25 km of 1000 randomly generated points also within the main study area, provided that the coverage of buildings within a 30-m square including the point did not exceed 25%.

Prey and Resource Habitat Analysis

Two types of prey dominate the diet of territorial Bald Eagles in our study area—fish and prairie dogs. Therefore we defined four resource habitats—quarry ponds, water bodies, rivers, and prairie dog colonies—and mapped them within each of the 86 nest territories. For this analysis, we defined the area of each nest territory as 4.5 km², which is near the maximum size of eight well-studied territories in the midwestern field area (Table 1). Because the Bald Eagles nesting in these territories spend a high proportion of their time in them year round, and acquire ample prey within these territories, we infer that 4.5 km² is a reasonable approximation of the area sustaining a territorial eagle in this region. At five nests studied intensively during the period of post-fledging dependence, the proportion of prey taken within 0.8 km of the nest (i.e., within 2.0 km²) averaged 34.4% and ranged from 18.1 to 53.1% (Table 2). This radius is thus well within the 1.2-km radius corresponding to an area of 4.5 km².

Table 2  Prey Brought to Seven Bald Eagle Nests in Colorado’s Front Range

<table>
<thead>
<tr>
<th>Nest</th>
<th>BOCR (7)</th>
<th>BCIC (8)</th>
<th>SULL2 (6)</th>
<th>LYON (3)</th>
<th>STEA (2)</th>
<th>STAND2 (C2)</th>
<th>WILD (C1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours monitored</td>
<td>747</td>
<td>612</td>
<td>775</td>
<td>506</td>
<td>1702</td>
<td>52</td>
<td>68</td>
</tr>
<tr>
<td>Number of prey items</td>
<td>58</td>
<td>68</td>
<td>133</td>
<td>95</td>
<td>150</td>
<td>54</td>
<td>85</td>
</tr>
<tr>
<td>Undetermined (%)</td>
<td>39.7</td>
<td>35.3</td>
<td>54.1</td>
<td>23.2</td>
<td>33.3</td>
<td>17.5</td>
<td>6</td>
</tr>
<tr>
<td>Prairie dog (%)</td>
<td>10.3</td>
<td>11.8</td>
<td>28.6</td>
<td>45.3</td>
<td>35.3</td>
<td>27.8</td>
<td>33.5</td>
</tr>
<tr>
<td>Undifferentiated mammal (%)</td>
<td>12.1</td>
<td>16.2</td>
<td>8.3</td>
<td>11.6</td>
<td>16.7</td>
<td>5.6</td>
<td>4.7</td>
</tr>
<tr>
<td>Rabbit (%)</td>
<td>1.7</td>
<td>1.5</td>
<td>3</td>
<td>1.1</td>
<td>2.7</td>
<td>11.1</td>
<td>5.9</td>
</tr>
<tr>
<td>Rodent (%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
<td>1.3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Squirrel (%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fish (%)</td>
<td>34.5</td>
<td>32.4</td>
<td>4.5</td>
<td>15.8</td>
<td>9.3</td>
<td>24.1</td>
<td>47.6</td>
</tr>
<tr>
<td>Reptile (%)</td>
<td>1.7</td>
<td>0</td>
<td>0.8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1.2</td>
</tr>
<tr>
<td>Bird (%)</td>
<td>0</td>
<td>2.9</td>
<td>0.8</td>
<td>1.1</td>
<td>1.4</td>
<td>14</td>
<td>1.2</td>
</tr>
<tr>
<td>Source of prey &lt;800m of nest (%)</td>
<td>34.5</td>
<td>30.9</td>
<td>18.1</td>
<td>53.1</td>
<td>35.3</td>
<td>ND</td>
<td>ND</td>
</tr>
</tbody>
</table>

*Not determined; prey brought to nest recorded by nest camera.*
We obtained digital maps of quarry ponds and gravel pits from the Colorado Division of Water Resources (https://maps.dnrgis.state.co.us/dwr/Index.html?viewer=mapviewer). This source did not include some quarry ponds evident in 2021 and 2022 Google Earth imagery so we hand-digitized them and merged the results into a single coverage. Many of the mapped quarry ponds originated from gravel mining beginning during the 1950s and 1960s (Wilburn and Langer 2000). Subsequent to mining, the pits filled with groundwater, and many now host an abundance of fish. Water bodies include lakes, ponds, and reservoirs other than ponds left over from gravel mining. We obtained digital maps of water bodies and streams from the U.S. Geological Survey’s National Hydrography Dataset (https://apps.national-map.gov/downloader/), again hand-digitizing from 2021 and 2022 Google Earth satellite images water features missing in that source. We included in our analysis all water bodies of >0.02 km².

To evaluate fishing habitat for Bald Eagles, we categorized each stream by five types based loosely on stream order, discharge (https://dwr.state.co.us/Tools/Stations?Stations=All), sinuosity (rated as per Horacio 2014), and the abundance of associated quarry ponds. Stream types 3–5 are defined as “rivers” in our study and have the greatest potential to provide fishing for Bald Eagles. Sinuosity is correlated with the number of deeper pools at stream bends that fish tend to prefer (Sullivan et al. 1987). We categorized lakes and reservoirs as fed principally by canals or ditches or as supplied at least in part by creeks.

Prairie dog colonies within the 86 nest territories were hand digitized in 2021 and 2022 by means of Google Earth satellite imagery. We outlined the colonies by following the outer boundary of all the burrows, regardless of the prairie dogs’ activity or inactivity. We validated the mapping by field-checking 16 of the 237 apparent colonies that were easily surveyed from nearby roads. Out of the 153 hectares of field-verified colony sites, only 14 hectares or 9% were false positives in which the satellite imagery closely resembled a prairie dog town but was an area with ant hills or similar features. Colonies were active, with prairie dogs observed, in the remaining 91% of the area that was field verified.

We were able to quantify the prey taken at only seven nests (Table 2), so were unable to devise a statistically significant model relating extent of the four foraging habitats to the quantity of prey actually taken. Still, we reasoned that a multiple linear regression should associate this extent with the relative abundance of these two main prey types in each nest territory. Therefore, to provide a basis for categorizing the territories by likely predominant prey, we used the ratio of recorded prairie dog prey to fish prey as the dependent variable in a linear model for all 86 nests based upon the percentage of their territory covered by prairie dog colonies, quarry ponds, rivers, and water bodies. The results ($R^2 = 0.55$, df = 2, $F = 0.627$, $p = 0.69$) indicate that the data did not have the best fit, as expected with a small sample size, but a reasonable amount of the prey ratio variability could still be explained with our habitat variables. Regression plots of the independent variables are displayed in Figure 2.

Using the results of this analysis, we categorized each nest territory on the basis of the predicted relative use of prairie dogs versus fish as prey for each...
nest according to the percent of the territory covered by the four foraging
habitats. Since our regression was not meant to be a true predictive model,
we reasoned that the model should still be sufficient to classify each nest ac-
cording to its dominant prey resources. We classified territories as “prairie
dog” if the weight of this input variable was >1.5× the combined weights of
the water resources in the model. Similarly, we classified territories as “fish” if
the converse was true. The \( y \)-intercept \( (b = 3.76) \) of this model was artificially
high because of its small sample size, skewing some nests’ results toward
prairie dog predation where this may not have been an accurate classification.
For this reason, we classified some nests as “resource-limited” if the absolute
value of the weights of the four variables in the model added up to less than

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Figure 2. Plots of the observed ratio of prairie dog to fish consumption by the
percentage of four source habitats within the seven territories where prey consumption
was quantified. Lines represent results of multiple linear regression. Evaluation of the
model’s normality by the Shapiro–Wilk test yielded \( p = 0.95 \), implying the data are
distributed normally. Evaluation of homoscedasticity by the Breuch–Pagan test yielded
\( p = 0.1971 \), so we cannot reject the hypothesis of homoscedasticity. Evaluation of
independence of errors by the Durbin–Watson test yielded a value of 1.35, indicating
a level of positive correlation, but not a particularly strong one. Evaluation of
multicollinearity with a correlation matrix yielded acceptable results with the strongest
value of correlation of –0.56.
15% of the absolute value of the weights plus the y-intercept. Any remaining
nests that did not fit these criteria were categorized as “mixed,” an imprecise
classification for which predicted prairie dog predation still outweighed
fish by a ratio between 2 and 5. Of these territories, those with a dominant
source of fish were classified as “mixed/water body” or “mixed/quarry pond,”
depending on the main source of fish. Territories where the dominant fish
source could not be distinguished we classified simply as “mixed.”

RESULTS

Nest Productivity

From 2017 to 2020 Bald Eagles attempted nesting at 237 nests in our study
area. The annual apparent nest success ranged from 52 to 70%, averaging
62% (Table 3). We observed 279 juveniles that either fledged or remained
in the nest for at least 8 weeks. The productivity rate varied from 1.1 to 1.3
per nest per year, averaging 1.1. Twenty-eight percent of successful nests
produced one young, 53% produced two, and the remaining 19% produced
three young (Table 3).

<table>
<thead>
<tr>
<th>Location and year</th>
<th>Average annual precipitation (mm)</th>
<th>Nest attempts (n)</th>
<th>Success rate (%)</th>
<th>Productivity ratio</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado (2017–2020)</td>
<td>404</td>
<td>237</td>
<td>62</td>
<td>1.1</td>
<td>This study</td>
</tr>
<tr>
<td>2017</td>
<td>40</td>
<td>70</td>
<td>1.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>58</td>
<td>52</td>
<td>1.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>71</td>
<td>62</td>
<td>1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>68</td>
<td>65</td>
<td>1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arizona (2017–2020)</td>
<td>345</td>
<td>253</td>
<td>55</td>
<td>1.2</td>
<td>McCarty et al. (2020)</td>
</tr>
<tr>
<td>2017</td>
<td>60</td>
<td>51</td>
<td>0.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>63</td>
<td>64</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>67</td>
<td>55</td>
<td>0.9</td>
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<td>2020</td>
<td>63</td>
<td>51</td>
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<tr>
<td>2018</td>
<td>264</td>
<td>95</td>
<td>1.3</td>
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<td>Seymour (2018)</td>
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<tr>
<td>Chesapeake Bay (2018)</td>
<td>1130</td>
<td>34</td>
<td>86</td>
<td>1.6</td>
<td>Watts and Paxton (2019)</td>
</tr>
<tr>
<td>Upper Mississippi (2009)</td>
<td>828</td>
<td>53</td>
<td>62</td>
<td>0.9</td>
<td>Mundahl et al. (2013)</td>
</tr>
<tr>
<td>Iowa (2021)</td>
<td>864</td>
<td>264</td>
<td>74</td>
<td>1.0</td>
<td>Shepherd (2021)</td>
</tr>
</tbody>
</table>
Nearest-Nest Distance

In 2020, the average distance to the next nearest nest of the 68 active nests in the main study area was $5.32 \pm 2.89$ km with a median of 4.97 km (Figure 3). In the midwestern field area this distance averaged $5.02 \pm 2.05$ km with a median of 4.65 km. In the northeast study area it averaged 7.26 ± 4.54 km with a median of 5.89 km (Figure 3). Figure 3 also compares the nearest-nest distances of 86 occupied nests in our semiarid study to those in four more verdant areas and to nests in Arizona’s desert. In the areas with higher precipitation, these distances ranged from 1.17 to 1.81 km, whereas in Arizona it was 7.86 km.

Resource-Selection Analysis

Within our main study area, the mean coverage of buildings within a 400-m (0.25 mile) radius of the nest was $1344 \pm 2424$ m², whereas the mean
coverage of buildings around the 1000 randomly generated points was nearly 13 times greater, 16,918 ± 29,905 m² (Figure 4). Of the 68 occupied nests, 63% had building coverages within 400 m of less than 800 m², which approximates the combined area of three to four medium-sized residential homes (Figure 5). Around only 12% of the occupied nests did the coverage of buildings within 400 m exceed 1 standard deviation of the mean or 3767 m² (Figure 6).

Prey Resource and Habitat Analysis

*Four Principal Resources and Habitats.* Quarry ponds were present in 23% of the 86 nest territories (n = 20) and are located along Type 2 through 5 streams (Figure 8), primarily at distances less than 35 to 50 km from the mountain front. The average areal proportion of quarry ponds within the nest territories was 2.6 ± 6.2% (Appendix 2 at www.westernfieldornithologists.org/bove_et_al_Bald_Eagle_appendices).

Water bodies ranged in size from 0.02 to 7 km², and the total proportion of water bodies within the 86 nest territories averaged 7.2% with a median of 0.7 ± 12.5% (Appendix 2). Of the 86 territories, 41 consisted of >1% water.

Of the 86 territories, 25% (n = 22) are bisected by rivers (streams of types 3, 4, or 5). Since the widths of these rivers are so similar, and each passes near the center of each territory, we assigned a uniform areal proportion of 4.4%
to all 22 territories bisected by rivers. The mean areal proportion of rivers within the 86 territories was 1.1% (Appendix 2).

Within these 86 territories, coverage of prairie dog colonies averaged 6.6 ± 11.1% with a median of 3.2%. Coverage of prairie dog colonies exceeded 1% in 65% of the territories (n = 56) (Appendix 2).

**Five Stream Types and Water Bodies in Relation to Fish Predation**. Bald Eagles were observed fishing along streams of types 3, 4, and 5 but not along those of types 1 and 2. Of the 86 territories defined as 4.5 km², 26 contained only small streams of types 1 or 2, and 33 contained no stream even as large as Type 1. Streams of types 3 or 4 passed through two and four of the territories, respectively. The South Platte River—Type 5—passes through 17 of the 86 territories (Figure 7). Quarry ponds were absent in 13 of the 17 nest territories along the South Platte River where it extends beyond ~35 to 50 km east of the mountain front (Figure 7). The soil’s gravel content and therefore quarry ponds diminish markedly beyond a prominent transition from gravel to sand-dominated alluvium about 47 km from the mountain front along the South Platte River, referred to as “the Delta” in Figure 7 (Cappa et al. 2000). Quarry ponds are absent farther east.

Lakes and reservoirs fed by canals or ditches were present within 22% of the 86 nest territories (n = 19). The extent of these water bodies aver-
aged 2.56 ± 2.01 km² and ranged from 0.15 to 6.98 km². None of these 19 territories was located along a clearly defined stream of types 1 through 5. In contrast, only 8% of the 86 nests \((n = 7)\) contain lakes and reservoirs and also lie within Type 1 stream drainages. Water bodies within these seven territories averaged 2.52 ± 4.0 km² and ranged in size from 0.06 to 10.72 km². All water bodies mapped for the resource analysis provided potential fishing for nesting Bald Eagles (Appendix 3 at www.westernfieldornithologists.org/bove_et_al_Bald_Eagle_appendices).

**Nest Territories and Relation to Prey Resources.** Prey brought to the seven nests where it was studied varied with local habitat (Table 2). At the two of these nests located near quarry ponds—with 15 to 22% quarry ponds in the territories—fish represented a larger percentage of the prey (32–35%) (Table 2). By contrast, in the two territories with the lowest water-body coverage (2%), the prey comprised 40–56% mammals and only 5–9% fish (Table 2). Prairie dogs were the dominant mammalian prey, constituting at least 10–45% and an average of 27.5 ± 12.6% of the prey brought to each nest (Table 2).

**Classification of 86 Nest Territories by Linear Regression Analysis**

On the basis of the linear model, prey consumption at 12% \((n = 10)\) of the 86 nest territories was dominated by prairie dogs (Figure 8, Appendix 2). At these nests, the mean predicted ratio of prairie dogs to all fish provided at these nests was 7.18 (Figure 9, Appendix 2). The coverage of prairie dog colonies in these 10 nest territories averaged 29.5 ± 19.4% with a median of 20%.

Prey consumption at 51% of the 86 nest territories \((n = 44)\) was dominated by fish. These may be categorized further by the habitat likely supplying the
fish: quarry pond \((n = 6)\), river \((n = 21)\), or other water body \((n = 17);\) Figure 8, Appendix 2). The mean predicted ratio of prairie dogs to fish provided at these nests was 0.17 (Figure 9). Water bodies covered an average of 29.5% of the 17 territories classified as “fish/water body.” Quarry ponds covered an average of 19.5% of the six territories classified as “fish/quarry.” Four of these six territories contained prairie dog colonies whose coverage of the eagle territory ranged from 4 to 8%. Thirteen of the territories classified as “fish/river” also had coverage of prairie dog colonies ranging from 2 to 15%.

At 21% of the 86 nests \((n = 18)\) the predicted ratio of prairie dog to fish predation ranged from 2.3 to 5.0, and we categorized their prey use as mixed (Figure 9). Nine of the 18 “mixed” nests were classified as “mixed/water body,” five were classified as “mixed/quarry pond,” and four were classified simply as “mixed” (Figure 8, Appendix 2). Coverage of prairie dog colonies averaged 2.9% in these territories and varied from 1.5 to 13.4%.

In the remaining 16% of the nest territories \((n = 14)\), the four resource variables were responsible for just 7% of the linear model’s predicted prairie-dog-to-fish ratio, so we classified these territories as “resource-limited”
Figure 8. Numbers and percentages of 86 Bald Eagle nest territories in northern Colorado’s Front Range by the eight categories defined by a linear regression model associating predominant prey and source habitats. The categories are grouped by the predicted relationship between the two predominant types of prey, fish and prairie dogs.

Figure 9. Average ratios of prairie dogs to fish taken in eight categories of Bald Eagle territories according to a linear regression model associating predominant prey and source habitats.
DISCUSSION

Nest Productivity

Nest productivity in our main Colorado study area was similar to that in several wetter regions of North America, as well as to productivity reported from previous studies in northern Colorado and Wyoming (Table 3). However, the average success rate in the main study area was notably lower than in these wetter regions, including British Columbia, Iowa, Chesapeake Bay, and Louisiana, where success rates ranged from 68 to 95% (Table 3). Success rates in our main study area were more similar to the rates found in Arizona and northern Colorado and Wyoming from 1981 to 1989, where average annual precipitation was closer to that in our Colorado study area (Table 3).

Heavy snowfall is common in the main study area with totals averaging 35 cm monthly from February through March (https://psl.noaa.gov/boulder/bouldersnow.html). Fragile old-growth plains cottonwoods (Populus deltoides monilifera) are the Bald Eagle’s primary nest substrate in our study area, and while the massive nests and nestlings are vulnerable to heavy late spring snows, they are perhaps even more vulnerable to the punishing windstorms. Lying on the lee side of the Rocky Mountains, the study area is subject to frequent windstorms sweeping downslope (Mercer et al. 2008). From the Boulder foothills east 20 km (https://psl.noaa.gov/boulder/wind.html), wind gusts during 332 storms over 51 years averaged 130 km/hr and ranged from 72 to 241 km/hr. Notably, 27% of these storms occurred from mid-February to the end of June, when Bald Eagle nests contain eggs or nestlings. During 2018, severe windstorms in late March and April resulted in the failure of five of 18 nests in the smaller 1000-km² midwestern field area. Four of these five failures resulted from the downing of the entire nest tree or collapse of the nest. Along the foothills of northern Colorado and in southeastern Wyoming, Kralovec et al. (1992) also noted that the most important factor causing failure of Bald Eagle nests was destruction of nest trees by heavy winds; a minimum of 11 nests with at least 10 eggs or young were lost between 1983 and 1989.

In Arizona, factors contributing to nest failures include heavy spring winds blowing nests or entire nest trees down, major floods during early spring, excessive heat later in the nesting season, and early May snowstorms at higher elevations (K. Jacobson pers. comm.). The higher nest-success rates in the regions with higher precipitation and less severe winters could be due to weather more equable than in eastern Colorado and Arizona. Also, raptors may be less likely to forage during inclement weather, which could affect both the female’s body condition prior to egg laying or provisioning of nestlings, ultimately leading to lower success rates (Sergio 2003). Steidl et al. (1997) concluded that a decrease in reproductive success after severe winters may be

(Figure 8, Appendix 2). Quarry ponds and rivers were absent in these 14 territories (Appendix 2), and their coverage of water bodies averaged only 1.1 ± 1.4% with a median of 0.7%. These territories’ coverage of prairie dog colonies averaged 1.5 ± 0.2% with a median of 0.1%.
associated with diminished availability of prey. For example, from December 2022 through February 2023 mean temperatures in the midwestern field area were the coldest over the past century, and monthly snowfall averaged 30 cm (Stephen Jones pers. comm.). Still waters were mostly frozen through that period, restricting eagles' fishing, and prairie dogs spent less time above ground than in previous winters (Bove unpubl. data). Under such extreme winter conditions, males may have been unable to deliver enough prey to keep females on or around nests. Thus females might have been obliged to forage over distances greater than normal, expending more energy, which may have contributed to failure to lay or the loss of eggs. In 2023 five of seven of the most intensively studied nests in the midwestern field study area failed—in three nests no eggs were laid (Bove unpubl. data). These failures may have been due not to the direct effects of cold but to a reduction in prey.

It is also probable that more prey are available in areas that receive more precipitation annually. More prey and thus less competition for food likely result in greater provisioning of food for young, also contributing to greater success rates. This may also explain the trend toward higher success rates in regions more verdant than our study area.

Nearest-Nest Distance

The average distance to the next nearest nest in all three of our Colorado study areas is at least 2.8 to 4.0 times greater than in four other areas with significantly higher annual precipitation (Louisiana, central Florida, Chesapeake, and upper Mississippi). The distribution of nearest-nest distances in our northeast study area (mean 7.26 km) is similar to that among 48 nests in Arizona’s arid setting (mean 7.86 km; Figure 3). The distributions of nearest-nest distances in our main (mean 5.32 km) and midwestern field (mean 5.02 km) study areas are also similar (Figure 1).

Studies of raptors have concluded that within suitable habitat, densities of breeding birds are naturally limited by either food or nest sites, owing to competition for these critical resources (Martin 1987, Ratcliffe 1993, Hunt 1998, Newton 1998, 2017, Watson 2010). Analyses of nearest-nest distances have revealed that densities are related to food supply or a specific prey source available in a nesting area (Newton 2017). Fish as well as suitable nest substrates are in shorter supply in our Colorado study area than in habitats in wetter climates. This likely explains the wider spacing of nests in Colorado and Arizona. In Colorado, and likely at higher elevations in Arizona, the availability of fish becomes even further restricted during the winter. Although Bald Eagles reportedly prefer fish (Wright 1953, Stalmaster 1987, Gerrard and Bortolotti 1988, DeLong 1990, Knight et al. 1990, Newsome et al. 2010), their diet commonly reflects available prey at the local habitat level (Buehler 2000, Thompson et al. 2005, Elliott et al. 2006). This foraging strategy enables the Bald Eagle to exploit a diversity of other prey including birds, mammals, and reptiles (McEwan and Hirth 1980, Hunt et al. 1992, Markham and Watts 2008). While fish may be limited in Colorado, especially in winter, territorial Bald Eagles in our study area can rely on mammals, particularly prairie dogs. Waterfowl can be a seasonally important prey source during the winter at larger lakes and reservoirs (e.g., Table 2).
Although analyses of nearest-nest distances reveal critical information regarding nest density and resource availability for nesting populations, the differences among our three study areas emphasize the importance of comparing data from similar habitats. For example, in our main study area streams of all types are widely distributed along the mountain front. The network of drainages, floodplains, and irrigation ditches in the main study area is associated with a supply of suitable nest trees, water bodies, and associated wetlands. In contrast, the northeast study area, away from the mountain front, has only widely spaced Type 1 streams and a single Type 5 river. As a result, potential nest trees are fewer, as are other water-related resource habitats in this overall drier area. Most nests in the drier and less vegetated northeast study area are in the riverine habitat along the South Platte River (Figure 7). Nearest-nest distances in the northeast study tend to be greater than in the main study area, and some nests are very widely scattered, as in the drier Arizona nesting habitat where most nests are also along larger rivers.

Resource-Selection Analysis

The resource-selection analysis demonstrated that the coverage of buildings within a 0.4-km radius of Bald Eagle nests in our study area is significantly lower than within the same radius of random points. Around only 12% of nests in our main study area did building densities exceed one standard deviation of the average. Eagles nesting in areas where buildings are so dense may represent a reduced sensitivity to human disturbance. As we discuss below, these results may inform management around nests in more densely built-up areas.

Prey and Resource-Habitat Analysis

Our model-based classification of territories by habitat and dominant prey provides a contextual tool for understanding the relationships between these resources. For example, in the 10 territories classified as “prairie dog,” the eagles’ diet is likely to be dominated by prairie dogs, but three of these territories contained between 1 and 2.5% of a water source, implying that there the diet was likely augmented with fish. All 10 territories classified as “prairie dog” lie east of the region containing quarry ponds and streams of types 2 through 4 (Figure 7). We defined territories in which the nest is at least 1.9 km from a stream of Type 2 or greater as “upland” (Figure 7). These upland territories lie along low-discharge Type 1 tributaries or poorly defined drainages, which lack alluvial gravel, quarry ponds, and the wetlands that are commonly accompany them (Appendix 3). The abundance of the Black-tailed Prairie Dog in our study area and its prevalence in the diet are uncommon across the Bald Eagle’s range; compilations of diet studies have found that mammals are relatively minor or unimportant as prey in most Bald Eagle populations (Wright 1953, Stalmaster 1987, Gerrard and Bortolotti 1988, Jensen 1988, Mabie et al. 1995). A few exceptions, however, have been noted in the literature; examples include the Texas Panhandle in grasslands away from permanent water bodies, where the Black-tailed Prairie Dog is seasonally important (Boal et al. 2009), or San Juan Island, Washington, where rabbits are in unusual supply (Retfalvi 1970). Although consumption of fish
is predicted to dominate over consumption of prairie dogs in 51% of the 86 nest territories, the fish source mapped in nearly half of these territories is primarily bodies of still water and quarry ponds, which often freeze in the winter. Thus the Bald Eagles nesting in our study area derive a particular benefit from the abundance of prairie dogs, especially during the winter.

We predicted that in nesting territories grouped within the three fish-dominated categories, the eagles should feed overwhelmingly on fish, as average prairie-dog-to-fish ratios were extremely low. All 17 nest territories classified as “fish/water body” contain larger water bodies, and all but two of these are fed entirely by ditches or canals and are in what we defined as upland areas (see above; Figure 7). Six of these “fish/water body” territories contain prairie dog colonies, which likely augment the fish-dominated diet. Although most fish captured in the 21 territories classified as “fish/river” are likely from streams of types 3, 4, and 5, seven of the “fish/river” nest territories also are covered by 3 to 20% quarry ponds. Most of the “fish/river” nests are located along the South Platte River (Type 5), whereas the remaining six nests are located along Type 3 and 4 streams. Unlike water bodies and quarry ponds that can freeze during the winter, fish remain available along streams of types 3, 4, and 5. Of the 21 “fish/river” nests, 13 consisted of 2–15% prairie dog colonies (Appendix 2), further enriching these territories with this key mammalian prey source. Four of the six “fish/quarry pond” territories also contained prairie dog colonies. All six of the “fish/quarry pond” territories encompass Type 2 and Type 5 streams, although fishing is largely restricted to Type 5 in these territories.

The 18 nest territories categorized as “mixed” did not have a particularly dominant fish source but included enough combined prairie dog and fish sources to be considered more viable than the “resource-limited” nests. The “resource-limited” nests have fewer identified sources of fish and prairie dogs than do the other territories we studied. Data from five nests in the midwestern study area at which we studied post-fledging dependence intensively demonstrated that adults’ territorial attendance—the time at least one territorial adult was in the territory—varied from 50 to 95% year round. Limited data for adults’ territorial attendance at three “resource-limited” nests suggests this rate was lower at these nests than at the five other nests, where the classification confirmed that fish and prairie dogs were more abundant (Figure 10). From September through February—outside the nesting season when eggs or young are present—adults’ territorial attendance at three “resource-limited” territories averaged 50.4 ± 8.1%, whereas at the five nests in other categories it averaged 71.7 ± 11.4% (Figure 10). These preliminary findings are consistent with the inference that territorial Bald Eagles spend more time outside of their territories when prey resources are more limited.

We suggest that continuing studies of nesting Bald Eagles in northern Colorado’s Front Range be focused on expanding our knowledge of these “resource-limited” nests (1) to clarify the extent to which the eagles use resources outside of the nest territory, (2) to provide additional data on the adults’ territorial attendance and time outside the territory, and (3) to compile nest-inception dates to determine if the numbers of “resource-limited” nests have increased over time, as the carrying capacity of more favorable resource habitats is reached.
NESTING BALD EAGLE POPULATION IN NORTHERN COLORADO

CONSERVATION CONSIDERATIONS

State wildlife managers at Colorado Parks and Wildlife have expressed concerns about “densely [human] developed areas [in the Front Range corridor] that also contain a high concentration of Bald Eagles” (https://coloradooutdoorsmag.com/2021/07/14/studying-bald-eagles-along-colorados-densely-populated-front-range/). This appears to have led to a new definition applicable to management of Bald Eagle nests located in “highly developed areas” (CPW 2020b). Colorado Parks and Wildlife defines nests in “highly developed” areas as those situated “where the existing density [of buildings] exceeds 10 or more daily occupied facilities” within 400 m of the nest.” Instead of the previous recommendation of “no surface occupancy” aimed at protecting all Bald Eagle nests with a buffer of 400 m year round or 800 m seasonally (CPW 2008), a new buffer of 200 m now applies to nest territories deemed “highly developed” (CPW 2020b). This new buffer for nest territories considered urbanized or human tolerant is based on the U.S. Fish and Wildlife’s management guidelines, which have long-recommended a buffer of radius 200 m around Bald Eagle nests (USFWS 2007).

The recommendation for a 200-m buffer can be traced to studies of the effects of timber clearcutting around Bald Eagle nests in dense northern boreal forests (Manville 2018). The supporting basis for extending it to “highly developed areas” in Colorado Parks and Wildlife’s 2020 raptor guidelines is not explained. In the absence of these supporting references, we are led to several

![Figure 10. Adult Bald Eagles’ average rate of attendance in their territory from September through February at five nests with ample prey resources (fish or prairie dogs) compared with that at three “resource-limited” nests. All data from midwestern field study area along northern Colorado’s Front Range from 2016 through 2021. Sample sizes refer to number of years of study. Territories are categorized by a linear regression model associating predominant prey and source habitats (see Figure 7) QP, quarry pond; WB, water body.](image-url)
NESTING BALD EAGLE POPULATION IN NORTHERN COLORADO

questions pertinent to Bald Eagle management in the northern Colorado's Front Range: (1) Is the 200-m criterion from dense boreal forests applicable to the open habitat and behavioral attributes of Bald Eagles in northern Colorado's Front Range? (2) If any reduction in Colorado Parks and Wildlife's 0.4-km perennial or 0.8-km seasonal radius of “no surface occupancy” is warranted for urban-nesting Bald Eagles, how should “highly developed area” be defined? (3) Do buffers of 200 or 400 m protect critical resources including prey sources that sustain nesting territories? (4) Are these buffers aimed only at protection against disturbances of the nest, primarily during productive periods of the season? (5) How can critical foraging and habitat areas outside the 800-m buffer—which can be of particular importance to resource-limited territorial pairs—be protected?

With respect to the first question: our data demonstrate that the ecology of the Bald Eagle population in the dry, open terrain of northern Colorado's Front Range differs considerably from that of populations in wetter, densely forested regions. Yet, a 200-m buffer based on studies in such forests is currently being applied to nests in Colorado's drier open terrain. We recommend that the current definition and threshold for nests in “highly developed areas” be reevaluated, and if any reduction of the buffers from the previous 800-m seasonal or 400-m perennial standards is applied, that it be based on studies that quantify the density of buildings or human population with respect to the Bald Eagle population. We found no evidence for a statistically “high concentration of Bald Eagle nests” in densely developed areas in northern Colorado's Front Range. We further recommend that a coverage of buildings within 400 m of the nest being >1 standard deviation of the regional mean or another statistical threshold be applied if a Bald Eagle territory is to be defined as “urban.”

CONCLUSIONS

In this study, we compared nest numbers, nearest-nest distances, productivity, and success rates of the Bald Eagle population in northern Colorado's semiarid Front Range to those in more verdant and resource-rich areas, as well as to one in the desert Southwest. We found that in Colorado nests are more widely spaced than in wetter climatic regions, at a density more like that in Arizona.

We found no indication of a high concentration of nesting territories in areas with dense human development, as often reported in the Colorado media (https://www.rmpbs.org/blogs/news/colorados-bald-eagle-population-is-booming-in-urban-areas-the-state-is-trying-to-figure-out-why/; https://coloradooutdoorsmag.com/2021/07/14/studying-bald-eagles-along-colorados-densely-populated-front-range/).

Finally, we developed a baseline for understanding territorial Bald Eagles’ resource use based on prey sources in nesting territories. Unsurprisingly, over half of the nesting territories studied are dominated by fish predation. However, the abundance of the Black-tailed Prairie Dog and its prevalence in the diet of many of its territorial Bald Eagles are uncommon elsewhere. We inferred that the eagles’ consumption of prairie dogs exceeded that of fish in nearly one-third of the 86 territories we studied. In these same territories, the
average areal coverage of prairie dog colonies was 15%. In nearly half of the territories where fish are the principal prey, the primary source habitat often freezes over the winter. Thus the abundance of prairie dogs in our study area benefits the Bald Eagle population especially during the winter.

As the spacing of Bald Eagle nests likely corresponds with the abundance of prey and other resources, so does territory size reflect the abundance of these resources and the extent to which territorial eagles need to defend them. Few avian species in northern Colorado’s Front Range require a territory as large as do nesting Bald Eagles. Yet, the region is experiencing some of the fastest human population growth in the U.S. While land-management policies and guidelines typically focus on minimizing disturbance of nests, the loss of habitat and critical prey resources—particularly prairie dogs—as a result of development must be more seriously considered. Although the prairie dog is valued by some for its ecological role as a keystone species (Kotliar et al. 2006), human activities conflict with it frequently. Human land use and the rapid pace of development in northern Colorado’s Front Range continues to destroy prairie dog colonies and associated raptor habitat. In addition, plague and poisoning periodically eradicate entire colonies or portions of colonies, followed by varying degrees of recovery over a period of years (Sidle et al. 2012).

Open-space programs and land conservation can help to protect critical habitat required to sustain key resources such as the Black-tailed Prairie Dog, fish, and the dwindling number of mature cottonwoods suitable for nesting (Bove 2022). However, the distinctive aspects of the Bald Eagle population nesting in northern Colorado’s Front Range need to be understood. Not only is the supply of resources there more limited than in more verdant regions, but the competition for these resources in this rapidly developing environment could impair these Bald Eagles’ reproduction and undermine their large territories.

ACKNOWLEDGMENTS

We thank the many volunteers who so graciously assisted us with our field surveys for this study, including Diane Kristoff, Anita Langdon, Donna Busching, Donna Sichko, Al Backland, Liz Berube, and David Bailey. A special thanks goes out to Michael Seymour and Ken Jacobson for your knowledge and contribution of information on nests away from northern Colorado’s Front Range. We thank Noah Campbell for his statistical expertise and Bruce Snyder for his generous volunteer contribution to the Bald Eagle Watch program. We express our deepest gratitude for the hard work and insightful comments by editorial reviewers Reesa Conrey and Andrew Lifer-Birch. Finally, a special thanks to Ecopia for its generous donation of the digital building-footprint data.

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NESTING BALD EAGLE POPULATION IN NORTHERN COLORADO


Watts, B. D., and Paxton, B. J. 2019. Eagle nest and roost monitoring within...


Accepted 19 July 2023

Associate editor: Daniel D. Gibson
DAVID F. DE SANTE’S BIRDS OF CABO SAN LUCAS, FALL 1968: A HISTORIC ACCOUNT

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ABSTRACT: In preparation for his doctoral studies at Stanford University, the late David F. DeSante spent the fall of 1968 studying migratory landbirds at Cabo San Lucas. Although his hopes to capture numerous vagrant warblers were not met, he amassed an impressive list of distributional records for the Baja California Peninsula at a time when few ornithologists were working there. Among these were peninsular firsts for the Ring-necked Duck (*Aythya collaris*), Broad-billed Hummingbird (*Cynanthus latirostris*), Broad-winged Hawk (*Buteo platypterus*), Bobolink (*Dolichonyx oryzivorus*), and Painted Bunting (*Passerina ciris*). Another six species, and one subspecies, were found for the first time in Baja California Sur. Venturing away from the immediate confines of Cabo San Lucas, DeSante established the first peninsular record of the Gray-headed Junco (*Junco hyemalis caniceps*) and first state records for another five species and one subspecies. Although many of these records have been reported previously, the junior authors believe it is appropriate to synthesize them more completely with current context, in Dave’s honor.

Those familiar with the work of David F. DeSante (1942–2022) are aware of his visit to Cabo San Lucas in search of vagrant landbirds in the fall of 1968, early in his doctoral studies at Stanford University. The most notable observations from that season were reported by Wilbur (1987), Howell and Webb (1995), and Erickson and Howell (2001). DeSante had planned a more thorough account of his own—mentioned in passing in his dissertation (DeSante 1973) as “The fall migration of birds at the southern tip of Baja California.” He discussed it briefly with Erickson, Pyle, and others, but his plans ended with his untimely death in pursuit of California’s first Willow Warbler (*Phylloscopus trochilus*) in Marin County on 18 October 2022.

After 1968, DeSante went on to complete the field work for his dissertation on Southeast Farallon Island, California, after which he managed the landbird-monitoring program there while working for the Point Reyes Bird Observatory (DeSante and Ainley 1980, DeSante 1983). At the same time he was also studying the effects of annual variation in the snowpack on bird dynamics in the high Sierra Nevada (DeSante and Saracco 2021). He then went on to found the Institute for Bird Populations and to establish the acclaimed programs Monitoring Avian Productivity and Survival (MAPS) and

*Deceased*
DESANTE'S BIRDS OF CABO SAN LUCAS

Monitoring Neotropical Migrants in Winter (MoSI), which organize banders across North America to record standardized data from which birds’ vital rates can be calculated (Siegel 2023). With all of these and other activities (for a full list of his publications see David DeSante at https://www.birdpop.org/pages/pubsDatabase.php), along with extensive climate-change activism over the past decade, DeSante never found time to return to this unfinished manuscript.

Here we attempt to present something akin to what DeSante originally envisioned, with his original field observations supplemented with annotations and analyses by the junior authors. Although some of this information has been published previously, second-hand, we believe it is useful to synthesize these observations and analysis based on >50 more years of context.

STUDY AREA AND METHODS

According to a preliminary unpublished report that DeSante wrote in 1969 (excerpts shown in quotations here), the primary study area was “just outside the town of Cabo San Lucas [Baja California Sur] on an approximately [20-hectare] plot…. A more ideal location for this project could not have been imagined. Lying at the very southern tip of the Baja California Peninsula, the study area faced across the tiny bay of San Lucas to the grotesque rocks of the cape itself. The eastern half of the study area was composed of a fairly dense mesquite woodland surrounding an underground spring that surfaced just behind the beach, forming a small pond—the only surface fresh water for a radius of over [30 km] (except for a similar but polluted pond behind the cannery in the town of Cabo San Lucas). The western half of the study area was composed primarily of cultivated land, rows of orange trees and some grazed, cleared scrubland. The area was bordered to the north by the typical Arid Tropical Scrub of the Cape Region and to the south, of course, by the sea and the rocks of the cape.”

Regarding forays outside the study area, DeSante wrote, “In order to understand the fall migration in the Cape Region more fully, frequent trips were made to other areas. Most prominent among these were San José del Cabo and Todos Santos—both places where an abundance of fresh water could be found—and La Paz Bay. Three days were spent in early November at La Laguna, [1675 m] elevation, in the Cape Region mountains. Finally, in order to get a feel for pelagic birds, [DeSante sailed] to the Tres Marias Islands from Cabo San Lucas in late October.”

The spring and pond DeSante described in his primary study area may correspond to the (seasonal?) wetland at the mouth of the Arroyo Salto Seco, 22.892° N, 109.900° W (referred to as Estero Playa Cascada at eBird.org), but urban/tourist development at Cabo San Lucas has been extensive since 1968 and we are unable to identify with certainty the exact bounds of the study area. As of this writing, some land in the area remains undeveloped, but we are aware of no remaining agriculture.

DeSante was at Cabo San Lucas from 26 September 1968 to 5 January 1969. During this time, he “tended up to six mist net lanes in the study area and banded” birds. Many of those birds “were subjected to nocturnal orientation tests for at least one, and sometimes up to seven, nights.” A full explanation
of these procedures was provided by DeSante (1973). “In addition to banding and orientation work, a daily census was taken in the study area, giving a complete record of the fall migration at the cape.”

RESULTS

Notes concerning the fall of 1968 found among DeSante’s possessions included a two-page unpublished preliminary summary; cumulative lists of species observed at Cabo San Lucas; numerous details of individual birds seen, banded, or collected; and summaries of relevant literature. The notes contain nothing regarding his trips to La Paz, and those addressing San José del Cabo and Todos Santos are only cursory. Even at the Cabo San Lucas study area, complete census data (e.g., numbers of each species seen each day, or even presence/absence every day) have apparently been lost, and were not available to us. Some information supplemental to ours had been given to Wilbur (1987) and Erickson and Howell (2001). When specific information allowed, we entered DeSante’s records into eBird.org. All of DeSante’s notes on research from Baja California Sur and elsewhere during his career will be archived at a California museum.

Study Area, Banding, and Censusing

Table 1 is a complete list of the 178 species observed by DeSante at the Cabo San Lucas study area. Our few annotations in it primarily concern banding and specimen records. More detailed accounts of selected species follow.

DeSante banded some 400 birds of 39 species and collected at least 25 specimens representing 19 species; these are located at the California Academy of Sciences, San Francisco (CAS; 17 specimens), or the Colección Nacional de Aves, Departamento de Zoología, Instituto de Biología, Universidad Nacional Autónoma de México, Mexico City (CNAV; 8 specimens). Pyle re-examined all of the specimens at CAS (including those obtained away from Cabo San Lucas and discussed below) and, with one exception, agreed with age and sex designations he applied to specimen labels. Museums housing specimens collected by others and referred to in the text: LACM (Natural History Museum of Los Angeles County), MCZ (Museum of Comparative Zoology, Harvard University), MVZ (Museum of Vertebrate Zoology, University of California, Berkeley), UBC (University of British Columbia), and USNM (United States National Museum of Natural History, Smithsonian Institution).

Species Accounts

Ring-necked Duck. One seen on 29 Oct 1968 (Wilbur 1987) established the first record of the Ring-necked Duck for the Baja California Peninsula. Surprisingly, Grinnell (1928) had listed no records. The species is now an annual winter visitor locally the length of the peninsula (Erickson et al. 2023).

Surf Scoter. One seen 28 Nov 1968 (Wilbur 1987) was the first found south of La Paz in Baja California Sur, where the species is now a rare winter visitor (Erickson et al. 2023).

Vaux’s Swift. DeSante made 53 total observations on 13 days, 30 Sep–22 Nov 1968 (actual number of individuals unknown). Wilbur (1987) was unaware of these and listed no records for Baja California Sur, as Grinnell (1928) had questioned the only
# Table 1
Species Observed at the Cabo San Lucas Study Area 26 September 1968–5 January 1969

<table>
<thead>
<tr>
<th>Species Observed</th>
<th>Scientific Name</th>
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<tbody>
<tr>
<td>Cinnamon Teal</td>
<td>Spatula cyanoptera</td>
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<tr>
<td>Northern Shoveler</td>
<td>Spatula clypeata</td>
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<tr>
<td>Northern Pintail</td>
<td>Anas acuta</td>
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<tr>
<td>Green-winged Teal</td>
<td>Anas crecca</td>
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<tr>
<td>Ring-necked Duck</td>
<td>Aythya collarisa</td>
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<tr>
<td>scaup</td>
<td>Aythya sp.</td>
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<tr>
<td>Surf Scoter</td>
<td>Melanitta perspicillata</td>
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<tr>
<td>California Quail</td>
<td>Callipepla californica</td>
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<td>Common Ground Dove</td>
<td>Columbina passerina</td>
</tr>
<tr>
<td>White-winged Dove</td>
<td>Zenaida macroura</td>
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<tr>
<td>Mourning Dove</td>
<td>Zenaida macroura</td>
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<tr>
<td>Greater Roadrunner</td>
<td>Geococcyx californianus</td>
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<td>Lesser Nighthawk</td>
<td>Chordeiles acutipennis</td>
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<td>Common Poorwill</td>
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<td>Vaux's Swift</td>
<td>Chaetura vauxi</td>
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<td>White-throated Swift</td>
<td>Aeronautes saxatalis</td>
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<td>Costa's Hummingbird</td>
<td>Calypte costae</td>
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<tr>
<td>Common Ground Dove</td>
<td>Columbina passerina</td>
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<td>Fulica americana</td>
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<td>Recurvirostra americana</td>
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<td>Black-bellied Plover</td>
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<td>Killdeer</td>
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<td>Semipalmated Plover</td>
<td>Charadrius semipalmatus</td>
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<td>Snowy Plover</td>
<td>Charadrius nivosus</td>
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<td>Whimbrel</td>
<td>Numenius phaeopus</td>
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<td>Numenius americanus</td>
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<td>Marbled Godwit</td>
<td>Limosa fedoa</td>
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<td>Ruddy Turnstone</td>
<td>Arenaria interpres</td>
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<td>Black Turnstone</td>
<td>Arenaria melanocephala</td>
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<td>Sanderling</td>
<td>Calidris alba</td>
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<td>Dunlin</td>
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<td>Baird's Sandpiper</td>
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<td>Long-billed Dowitcher</td>
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<td>Wilson's Snipe</td>
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<td>Solitary Sandpiper</td>
<td>Tringa solitaria</td>
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<tr>
<td>Wandering Tattler</td>
<td>Tringa incana</td>
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<tr>
<td>Greater Yellowlegs</td>
<td>Tringa melanoleuca</td>
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(continued)


TABLE 1 (continued)

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<tr>
<th>Species</th>
<th>Date(s)</th>
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<td>Red-necked Phalarope <em>Phalaropus lobatus</em></td>
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<tr>
<td>Red Phalarope <em>Phalaropus fulicarius</em> (seen 15 Nov 1968)</td>
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<tr>
<td>Black-legged Kittiwake <em>Rissa tridactyla</em></td>
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<tr>
<td>Bonaparte’s Gull <em>Chroicocephalus philadelphia</em> (1 collected: CNAV 000903, 13 Nov 1968)</td>
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<td>Franklin’s Gull <em>Leucophaeus pipixcan</em></td>
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<td>Ring-billed Gull <em>Larus delawarensis</em></td>
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<tr>
<td>Western Gull <em>Laruss occidentalis</em></td>
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<tr>
<td>California Gull <em>Larus californicus</em></td>
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<td>Herring Gull <em>Larus argentatus</em></td>
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<td>Glaucoos-winged Gull <em>Larus glaucescens</em> (seen 15 Nov 1968)</td>
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<td>Common Tern <em>Sterna hirundo</em> (seen 9 Oct 1968)</td>
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<td>Forster’s Tern <em>Sterna forsteri</em></td>
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<td>Royal Tern <em>Thalasseus maximus</em></td>
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<td>Elegant Tern <em>Thalasseus elegans</em></td>
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<td>Pacific Loon <em>Gavia pacifica</em> (seen 27 Dec 1968)</td>
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<td>Black Storm-Petrel <em>Hydrobates melania</em></td>
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<td>Least Storm-Petrel <em>Hydrobates microsoma</em></td>
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<td>Magnificent Frigatebird <em>Fregata magnificens</em></td>
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<td>Masked/Nazca Booby <em>Sula dactylatrgra</em> (seen 18 Dec 1968; Wilbur 1987)</td>
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<td>Brown Booby <em>Sula leucogaster</em></td>
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<td>Brandt’s Cormorant <em>Urile penicillatus</em></td>
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<td>Double-crested Cormorant <em>Nannopterum auritum</em></td>
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<td>Brown Pelican <em>Pelecanus occidentalis</em></td>
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<td>Great Blue Heron <em>Ardea herodias</em></td>
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<td>Snowy Egret <em>Egretta thula</em></td>
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<td>Cattle Egret <em>Bubulcus ibis</em></td>
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<td>Black-crowned Night-Heron <em>Nycticorax nycticorax</em></td>
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<td>White-faced Ibis <em>Plegadis chihi</em></td>
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<td>Turkey Vulture <em>Cathartes aura</em></td>
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<td>Golden Eagle <em>Aquila chrysaetos</em></td>
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<td>Sharp-shinned Hawk <em>Accipiter striatus</em> (first seen 28 Sep 1968)</td>
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<td>Cooper’s Hawk <em>Accipiter cooperii</em></td>
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<td>Broad-winged Hawk <em>Buteo platypterus</em></td>
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<td>Swainson’s Hawk <em>Buteo swainsoni</em></td>
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<td>Zone-tailed Hawk <em>Buteo albonotatus</em></td>
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<td>Red-tailed Hawk <em>Buteo jamaicensis</em></td>
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<tr>
<td>Barn Owl <em>Tyto alba</em></td>
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<td>Western Screech-Owl <em>Megascops kenniscttii</em> (observed 28 Sep 1968)</td>
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<td>Great Horned Owl <em>Bubo virginianus</em></td>
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<tr>
<td>Elf Owl <em>Micrathene whitneyi</em> (observed 20 Nov 1968)</td>
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<tr>
<td>Belted Kingfisher <em>Megaceryle alcyon</em></td>
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<tr>
<td>Gila Woodpecker <em>Melanerpes uropygialis</em> (11 banded 30 Sep–29 Oct 1968)</td>
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<tr>
<td>Ladder-backed Woodpecker <em>Dryobates scalaris</em></td>
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<tr>
<td>Gilded Flicker <em>Colaptes chrysoideos</em></td>
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<tr>
<td>Crested Caracara <em>Caracara plancus</em></td>
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<tr>
<td>American Kestrel <em>Falco sparverius</em></td>
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<tr>
<td>Merlin <em>Falco columbarius</em> (seen 31 Oct 1968)</td>
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<tr>
<td>Peregrine Falcon <em>Falco peregrinus</em></td>
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</table>

(continued)
Prairie Falcon *Falco mexicanus* (seen 20 Dec 1968)
Tropical Kingbird *Tyrannus melancholica*
Cassin's Kingbird *Tyrannus vociferans* (1 banded 9 Dec 1968)
Western Kingbird *Tyrannus verticalis*
Eastern Kingbird *Tyrannus tyrannus*
Scissor-tailed Flycatcher *Tyrannus forficata*
Western Wood-Pewee *Contopus sordidulus*
Western Flycatcher *Empidonax difficilis* (6 banded 3 Oct–11 Dec 1968)
Black Phoebe *Sayornis nigricans*
Say's Phoebe *Sayornis saya*
Vermilion Flycatcher *Pyrocephalus rubinus* (2 banded 4, 17 Oct 1968)
Bell's Vireo *Vireo bellii* (2 banded 18 Oct, 24 Dec 1968)
Cassinis/Plumbeous Vireo *Vireo cassini/plumbeus* (seen 25 Nov 1968)
Loggerhead Shrike *Lanius ludovicianus*
California Scrub-Jay *Aphelocoma californica*
Common Raven *Corvus corax* (first seen 11 Oct 1968)
Verdin *Auriparus flaviceps*
Bank Swallow *Riparia riparia*
Tree Swallow *Tachycineta bicolor*
Violet-green Swallow *Tachycineta thalassina*
Northern Rough-winged Swallow *Stelgidopteryx serripennis*
Purple Martin *Progne subis*
Barn Swallow *Hirundo rustica*
Cliff Swallow *Petrochelidon pyrrhonota*
Cedar Waxwing *Bombycilla cedrorum*
Phainopepla *Phainopepla nitens*
Blue-gray Gnatcatcher *Polioptila caerulea* (1 banded 9 Oct 1968)
California Gnatcatcher *Polioptila californica*
Cactus Wren *Campylorhynchus brunneicapillus* (1 banded 3 Oct 1968)
House Wren *Troglodytes aedon* (2 banded 17 Oct, 24 Nov 1968)
Marsh Wren *Cistothorus palustris*
Gray Thrasher *Toxostoma cinereum*
Northern Mockingbird *Mimus polyglottos* (1 banded 3 Oct 1968)
Swainson's Thrush *Catharus ustulatus*
Hermit Thrush *Catharus guttatus* (seen 11 Oct 1968, 1 banded 29 Oct 1968)
American Pipit *Anthus rubescens*
House Finch *Haemorhous mexicanus* (2 banded 8 Oct 1968)
Lesser Goldfinch *Spinus psaltria* (1 banded 24 Dec 1968)
Lawrence's Goldfinch *Spinus lawrencei*
Chestnut-collared Longspur *Calcarius ornatus*
Grasshopper Sparrow *Ammodramus savannarum* (seen 17 Oct 1968)
Lark Sparrow *Chondestes grammacu* (10 banded 8–17 Oct 1968)
Lark Buntings *Calamospiza melanocorys*
Chipping Sparrow *Spizella passerina*
Clay-colored Sparrow *Spizella pallida* (1 collected: CAS 68595, 28 Oct 1968, male in formative plumage [also probably CNAV 011255, although the database date entered is 15 Oct 1978]; 1 banded 21 Nov 1968)

(continued)
previous reports, of single birds seen by M. A. Frazar at San José del Cabo 24 Sep and 2 Nov 1887 (Brewster 1902). Vaux’s Swift is currently considered a very rare fall migrant and winter visitor in the Cape Region (Erickson et al. 2023).

**Broad-billed Hummingbird.** A female in formative plumage collected 24 Nov 1968 (C. l. magicus, CAS 68577) had been seen the day before and represented the first record for the Baja California Peninsula. Wilbur (1987) listed this one among “several” that DeSante saw in 1968.

**Black-legged Kittiwake.** Several seen during “winter 1968” (Wilbur 1987) were the first reported from Baja California Sur. The first report was on 30 Nov 1968, and one undated photograph has been archived (Hamilton and Howell 2001).

### Table 1 (continued)

<table>
<thead>
<tr>
<th>Species</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>Brewer’s Sparrow <em>Spizella breweri</em></td>
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<tr>
<td>Vesper Sparrow <em>Poecetes gramineus</em> (seen 17 Oct 1968)</td>
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<tr>
<td>Savannah Sparrow <em>Passerculus sandwichensis</em></td>
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<tr>
<td>California Towhee <em>Melospiza crissalis</em></td>
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<td>Green-tailed Towhee <em>Pipilo chlorurus</em> (8 banded 9 Oct–4 Dec 1968)</td>
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<tr>
<td>Yellow-breasted Chat <em>Icteria virens</em></td>
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<tr>
<td>Yellow-headed Blackbird <em>Xanthocephalus xanthocephalus</em> (seen 20 Nov 1968)</td>
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<td>Bobolink <em>Dolichonyx oryzivorus</em></td>
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<tr>
<td>Hooded Oriole <em>Icterus cucullatus</em> (13 banded 30 Sep–9 Oct 1968)</td>
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<td>Bullock’s Oriole <em>Icterus bullockii</em></td>
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<tr>
<td>Scott’s Oriole <em>Icterus parisorum</em> (7 banded 3 Oct–9 Dec 1968)</td>
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<tr>
<td>Brown-headed Cowbird <em>Molothrus ater</em></td>
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<tr>
<td>Brewer’s Blackbird <em>Euphagus cyanocephalus</em></td>
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<td>Northern Waterthrush <em>Parkesia noveboracensis</em> (1 banded 7 Oct 1968)</td>
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<tr>
<td>Orange-crowned Warbler <em>Leiothlypis celata</em> (109 banded 29 Sep–31 Dec 1968)</td>
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<td>Lucy’s Warbler <em>Leiothlypis luciae</em></td>
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<td>Nashville Warbler <em>Leiothlypis ruficapilla</em></td>
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<td>MacGillivray’s Warbler <em>Geothlypis tolmiei</em> (1 banded 3 Oct 1968)</td>
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<td>Belding’s Yellowthroat <em>Geothlypis beldingi</em> (seen 1 Nov 1968)</td>
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<tr>
<td>Common Yellowthroat <em>Geothlypis trichas</em></td>
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<tr>
<td>Yellow Warbler <em>Setophaga petechia</em> (5 banded 1–16 Oct 1968)</td>
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<tr>
<td>Palm Warbler <em>Setophaga palmarum</em> (several observed beginning 15 Oct 1968; 1 collected CNAV 014163, 28 Oct 1968; 1 banded 28 Oct 1968)</td>
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<tr>
<td>Yellow-rumped Warbler <em>Setophaga coronata</em></td>
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<td>Audubon’s Warbler S. c. auduboni (69 banded 11 Oct–28 Dec 1968)</td>
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<td>Myrtle Warbler S. c. coronata/hooveri</td>
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<td>Townsend’s Warbler <em>Setophaga townsendi</em> (seen 1 Dec 1968)</td>
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<td>Wilson’s Warbler <em>Cardellina pusilla</em> (4 banded 17 Nov–9 Dec 1968)</td>
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<td>Western Tanager <em>Piranga ludoviciana</em> (2 banded 3, 19 Oct 1968)</td>
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<td>Northern Cardinal <em>Cardinalis cardinalis</em> (3 banded 3 Oct–9 Dec 1968)</td>
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<td>Pyrrhuloxia <em>Cardinalis sinuatus</em> (2 banded 1 Nov, 11 Dec 1968)</td>
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<td>Blue Grosbeak <em>Passerina caerulea</em></td>
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<td>Lazuli Bunting <em>Passerina amoena</em></td>
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<td>Varied Bunting <em>Passerina versicolor</em></td>
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<td>Painted Bunting <em>Passerina ciris</em></td>
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aSee species accounts for additional data.
Franklin’s Gull. One seen 17 Dec 1968 (Wilbur 1987) was the first found in Baja California Sur, where the species is currently considered a very rare transient and winter visitor (Erickson et al. 2023).

Black Tern. An unknown number was seen 1 Dec 1968. Grinnell (1928) listed several records for the Cape Region, but Wilbur (1987) mentioned only one “recent record” for the peninsula, from Baja California in 1976. More recently, the Black Tern has been a rare transient in the Cape Region, and an extremely rare winter visitor (eBird.org; Erickson et al. 2023).

Cattle Egret. A female in formative plumage collected 16 Oct 1968 (B. i. ibis; CAS 68573) established the first specimen record for the Baja California Peninsula, and few specimens have been collected there subsequently (Howell et al. 2001, Ruiz-Campos et al. 2001, VertNet.org). Dickerman (1964) summarized the earliest records for Mexico, Hubbs (1968) reported the first records for the Baja California Peninsula (including the first for Baja California Sur at Isla San José 24 Apr 1964), and Wilbur (1987) reported “many sightings” by DeSante between La Paz and Cabo San Lucas in 1968/1969. The Cattle Egret is now a fairly common resident in the Cape Region.

White-faced Ibis. An unknown number was seen 7 Oct 1968. Grinnell (1928) summarized five early records from the Cape Region, but Wilbur (1987) reported only a few on the peninsula in “recent years,” none south of La Paz. This was in keeping with a low point in the population in western North America in the 1960s and 1970s (Shuford et al. 1996, Ryder and Manry 2020). Erickson et al. (2001) summarized additional records from the 1980s and 1990s, and Marrón et al. (2022) updated the species’ status in Baja California Sur and documented the first nesting in the state, in 2021.


Broad-winged Hawk. “Several” observed in 1968, “earliest date 31 Oct” (Wilbur 1987). These represented the first records for the Baja California Peninsula. The Broad-winged Hawk is now of annual occurrence in the Cape Region in fall and winter, 30 Sep–17 Apr, with maximum counts up to 20 per observation (eBird.org).

Swainson’s Hawk. One seen 31 Oct 1968 (Wilbur 1987) represented the first record for Baja California Sur. Following population lows in the mid 20th century, Swainson’s Hawk numbers have increased, at least in California (Furnas et al. 2022), and the species has been seen almost annually in the Cape Region this century, sometimes in the hundreds (eBird.org).

Tropical Kingbird. One collected (29 Sep 1968; T. m. satrapa; CAS 68579) and four others seen 28 Sep–22 Nov 1968 Wilbur (1987) believed to be the first recorded on the Baja California Peninsula, but that honor goes to one collected by the eminent fisheries biologist Peter A. Larkin at Cabo San Lucas 22 Mar 1957 (UBC B008415). The species has since become established as a breeding resident in coastal lowlands from La Paz southward, with nesting first confirmed in 2007 (N. Am. Birds 61:645, Erickson et al. 2023).

Western Kingbird. Wilbur (1987) listed no records for Baja California Sur, so Rodriguez-Estrella et al. (1990) reported two south of La Paz, 29 Sep 1990, as the first for the state. Erickson et al. (2001), Hamilton and Erickson (2001), and Wurster et al. (2001) then reported numerous additional records from 1988 to 1999. None of those authors was aware of DeSante’s 78 total observations (actual number of birds unknown) on 12 days 28 Sep–22 Nov 1968, with one banded 3 Oct. The date of a Western Kingbird from the Henry Bryant collection taken at Cabo San Lucas in the mid-1800s (MCZ 363213) cannot now be verified (J. Trimble pers. comm.). In the current century, the Western Kingbird has been recorded in small numbers in
the Cape Region every “winter,” with extreme dates of 7 Jul (N. Am. Birds 61: 645) and 25 May (eBird.org).

Eastern Kingbird. An adult male collected 28 Sep 1968 (Howell and Webb 1995; CAS 68578) represented the first record for the Baja California Peninsula since one seen at Todos Santos 3 Aug 1924 (Lamb 1925). There have been several subsequent records for Baja California Sur (and Baja California), but no more from the Cape Region (Erickson et al. 2023).

Scissor-tailed Flycatcher. One seen 2–5 Nov 1968 was photographed. Wilbur (1987) believed it to be the first for the Baja California Peninsula, but one had been collected at Cabo San Lucas 2 Mar 1959 (Erickson et al. 2001; UBC 8976). The species is currently very rare in winter in the Cape Region, having been recorded at least 18 times 29 Oct–14 Apr, 1989–2023 (eBird.org, Erickson unpubl. data).

Western Wood-Pewee. Two: one captured 8 Oct 1968 and one in formative plumage captured 11 Oct 1968 that died in captivity 13 Oct 1968 (CAS 68583). Our current understanding of the species’ status in Baja California Sur is as an uncommon summer resident in the mountains of the Cape Region (the endemic subspecies peninsulae) and as a rare transient south to Punta Abreojos (26.705° N, Erickson et al. 2023). Farther south, away from the Sierra de La Laguna, no confirmed reports have been submitted to N. Am. Birds (Erickson et al. 2008), or to eBird, although Erickson and Marrón have been presented with some unconvincing claims.

And yet, several pewees had been collected in the lowlands of the Cape Region prior to 1968 (VertNet.org): San José del Cabo 2 Apr 1895 (C. s. peninsulae; USNM 140040) and 17 Jun 1923 (C. s. peninsulae; LACM 14165); Todos Santos 17 Nov 1923 (C. s. peninsulae; MVZ 44310; reported as 13 Nov by Grinnell 1928); and Isla Cerralvo 8 Nov 1961 (C. s. peninsulae; CAS 62650; “assumed to have been a wanderer from the peninsula” Banks 1963). We acknowledge that locality data for old specimens may be imprecise, such that named coastal sites may actually refer to mountain localities nearby.

The subspecies of the Western Wood-Pewee are differentiated only weakly in bill shape and plumage color, and Pyle (2022) considered the species monotypic. In regards to the origins of the birds discussed above, we recall a memorable conversation long ago, when DeSante firmly corrected Erickson’s initial thinking that Nashville Warblers wintering in coastal Humboldt County, California, may have come from the local breeding populations. They might have come from anywhere, but not from local populations—long-distance migration matters, and is mandatory in species such as the Western Wood-Pewee. It may not be possible to confirm, but in the spirit of DeSante himself (who did not identify the two wood-pewees he observed to subspecies), we doubt the identifications of these specimens as peninsulae, and suggest that the lowland pewees found in the Cape Region (including Cerralvo) are more likely to have come from populations far removed, rather than from the Sierra de La Laguna. Pyle examined the two CAS specimens (62650 and 68583) and could not distinguish them definitively from any other fall-collected Western Wood-Pewees in the collection.

Bank Swallow. An unknown number seen 17 Oct 1968. The only previous published record for the Baja California Peninsula was for San José del Cabo, Sep 1890 (Bryant 1891), as reported by Grinnell (1928): “thousands of swallows; in which this species was chiefly represented.” The Bank Swallow has been reported in the Cape District many times subsequently, and in the 21st century has been found annually at localities scattered throughout the peninsula, usually in low numbers (eBird.org).

Swainson’s Thrush. One banded 1 Oct 1968. Swainson’s Thrush is one of several neotropical migrant species whose migration circumvents the more distal portions of the Baja California Peninsula. Besides DeSante’s, there are no other records from the coastal lowlands in the Cape Region, and very few from the foothills (one 13 Jun
DESANTE'S BIRDS OF CABO SAN LUCAS

1887, Brewster 1902; four 1 Oct–7 Nov 2005–2012, eBird.org) and mountains (three 4–16 May 1887, Brewster 1902). Only the ustulatus group of subspecies (Russet-backed Thrush) has been confirmed on the Baja California Peninsula (Ramos 1991, Erickson et al. 2020).

Lawrence's Goldfinch. First observed 29 Oct 1968; adult male collected 5 Nov 1968 (CAS 68592; Wilbur 1987). This established the first record for Baja California Sur, and there has been only one subsequent record for the Cape Region (10 Nov 2014; N. Am. Birds 69: 160).

Chestnut-collared Longspur. One seen 28 Oct 1968 (Wilbur 1987, Hamilton and Howell 2001) was the first for Baja California Sur, and still one of only five recorded for the state.

Bobolink. One male collected 20 Nov 1968 (Wilbur 1987; CAS 68590, in formative plumage though DeSante labeled it as an adult) established the first record of the Bobolink for the Baja California Peninsula. At least 30 have since been recorded in northwestern Baja California Sur (1996–2019; eBird.org, Erickson unpubl. data), but the only subsequent record for the Cape Region is of up to three at Estero San José 1–3 Oct 2005 (N. Am. Birds 60: 146).

Bullock's Oriole. One banded 3 Oct 1968. The only prior records for Baja California Sur are from San Ignacio (Bancroft 1930) and Agua Caliente (23.442° N, 109.774° W), where two specimens were collected on 16 and 19 Apr 1910 (MCZ 318642 and 318643). Bullock's Oriole is another species whose migration typically circumvents Baja California Sur, and it remains a rare visitor to the state (Erickson et al. 2023).

Lucy's Warbler. Several seen, beginning 12 Oct 1968; two collected (31 Oct 1968, CAS 68586, male in formative plumage; 15 Nov 1968, CAS 68585, adult male). These represent the first records of Lucy's Warbler for Baja California Sur, where the species is now a rare fall and winter visitor (Erickson et al. 2023).

Nashville Warbler. One seen 22 Nov 1968 was the first reported for the Cape Region, where the Nashville Warbler is now a rare fall and winter visitor (Erickson et al. 2023).

Myrtle Warbler. One collected 31 Oct 1968 (CAS 68588, female in formative plumage) was the first reported for Baja California Sur, where the subspecies is now considered a regular winter visitor (Erickson et al. 2013).

Painted Bunting. A male in formative plumage captured 15 Nov 1968 died in captivity 26 Nov 1968 (Wilbur 1987; CAS 68591, labeled P. c. pallidior, though Thompson [1991] and Pyle [2022] considered the species monotypic). This was the first record for the Baja California Peninsula, where the species remains a rare vagrant (Erickson et al. 2023), although its true status may be somewhat obscured by escaped cagebirds (Mlodinow and Hamilton 2005).

Orientation Tests

DeSante tested the orientation of 86 individuals of 22 species. “A total of 136 orientation traces were obtained. The results of these tests indicate that:

Freshly captured wild birds will show a strong nocturnal orientation or Zugunruhe only if they are migrating that night. Birds captured while entering a night roost did not show Zugunruhe even though they had heavy fat deposits and apparently migrated a few nights after being released.

These wild birds generally maintained a fixed orientation during successive nights of testing. A captive bird often developed an orientation even if it was inactive the first night.

Of the 22 species tested, five were vagrants. Three of these, a Painted Bunting, a Lucy’s Warbler, and a Palm Warbler had consistent west or south-
west—out into the ocean—orientations. Two October Black-and-white Warblers, however, oriented east or southeast—toward the mainland. A Northern Waterthrush and three November-caught Black-and-white Warblers were unoriented. One of these Black-and-white Warblers was later found wintering in San José del Cabo, only [40 km] away. [The Black-and-white Warbler and Northern Waterthrush are now known to winter regularly in the Cape Region and are no longer considered vagrants there.]

The general direction of regular migrants [e.g., Orange-crowned Warbler] was found to be southeast, roughly parallel to the lie of the peninsula.”

Observations away from the Cabo San Lucas Study Area

Tundra Swan Cygnus columbianus. Three at Estero San José 8 Dec 1968 were the first found south of La Paz (Wilbur 1987). The species is a very rare winter visitor on the Baja California Peninsula (Erickson et al. 2023).

Yellow-billed Cuckoo Coccyzus americanus. One found dead, “badly shot up,” 14 Oct 1968 was incorrectly attributed to the state of Baja California by Wilbur (1987). Although we do not know the actual location of “El Saucito,” we do know that DeSante did not travel north of 28° N in October 1968. The Yellow-billed Cuckoo is an uncommon summer resident in the Cape Region.

South Polar Skua Stercorarius maccormicki. DeSante noted one approximately 26 km southeast of Cabo San Lucas 19 Oct 1968 (not 1971, as reported by Wilbur 1987). Another approximately 200 km southeast of Cabo San Lucas 21 Oct 1968 was apparently closer to the Tres Marias Islands, and therefore in the waters of Nayarit. The only prior Mexican report of this now regularly occurring species appears to be that of one 60 nautical miles west-southwest of Islas Coronado, Baja California, 10 May 1961 (Audubon Field Notes 15: 438).

Cooper's Hawk Accipiter cooperii. One was seen flying north, approximately 7 km southeast of Cabo San Lucas, 19 Oct 1968. Cooper's Hawks are rarely observed at sea.

American Kestrel Falco sparverius. One was approximately 40 km southeast of Cabo San Lucas, 19 Oct 1968. Similarly, kestrels are rarely observed at sea.

House Sparrow Passer domesticus. Seen at the town of Cabo San Lucas 26 Sep 1968. Bancroft (1930) first reported the species in Baja California Sur at Santa Rosalia, but there appear to be no other records prior to 1968. The species is now common and widespread at human settlements throughout the state (eBird.org).

Gray-headed Junco Junco hyemalis caniceps. Four at La Laguna 10–11 Nov 1968 (Wilbur 1987; 2 collected: CAS 68594, male in formative plumage; CNAV 011693) established the first records of J. h. caniceps for the Baja California Peninsula. Remarkably, the subspecies has not been confirmed in southern Baja California Sur since. The eight recorded elsewhere in the state were in the Vizcaíno Peninsula region (7) or on Isla Carmen (1; eBird.org; Erickson unpubl. data).

Oregon Junco Junco hyemalis thurberi/shufeldti. One collected at La Laguna 10 Nov 1968 (Erickson et al. 2001; CAS 68593, male in formative plumage) established the first record for Baja California Sur. Pyle examined the specimen, and its plumage color appears well saturated as in a first-fall male of the population breeding in western Washington and western Oregon—shufeldti according to Miller (1941) but named similimus by Phillips (1962). The Oregon Junco has proved to be of casual occurrence in northern Baja California Sur south to Bahía Asunción (27.13° N, eBird.org) and San Francisco de la Sierra (27.60° N, three on 8 Apr 2022, Marrón). But since 1968 it has been reported only once from the Cape Region (Sierra Las Pirras, 8 Jan 2022, N. Block, https://ebird.org/checklist/S100475591).

Louisiana Waterthrush Parkesia motacilla. Two at La Laguna 11 Nov 1968 (Wil-
bur 1987, Hamilton and Howell 2001) were the first found in Baja California Sur. The Louisiana Waterthrush was unrecorded thereafter until 2011, but since then has been found with some regularity in winter in the Sierra de La Laguna (eBird.org).

Black-throated Blue Warbler *Setophaga caerulescens*. A male in formative plumage at La Laguna 12 Nov 1968 (Wilbur 1987; *S. c. caerulescens*; CAS 68587) was the first found in Baja California Sur. The Black-throated Blue Warbler has been recorded only twice in the Cape Region since 1968, at Caduano 25–27 Jan 2003 and Sierra de La Laguna 10 Nov 2019 (eBird.org). Elsewhere in Baja California Sur, two have been found in winter (one for three consecutive years) and at least 25 in fall (eBird.org, Erickson unpubl. data).

Palm Warbler *Setophaga palmarum*. A female in formative plumage collected at Migriño 6 Oct 1968 (Wilbur 1987; *S. p. palmarum*, CAS 68589) was the first recorded in Baja California Sur. In the Cape Region, the Palm Warbler is now found annually in winter in very small numbers (eBird.org).

Hermit Warbler *Setophaga occidentalis*. One at La Laguna 10 Nov 1968 (presumably representing the “one fall record in the Cape district” [Wilbur 1987]) was the first reported from Baja California Sur. It is currently considered a rare winter visitor in the mountains of the Cape Region (Erickson et al. 2023).

**DISCUSSION**

DeSante visited Cabo San Lucas hoping to encounter a good showing of vagrant passerines, especially wood warblers. His subsequent field work at Southeast Farallon Island (DeSante 1973), was aimed at documenting “mirror-image vagrancy,” now widely viewed as one of the causal mechanisms for bird vagrancy around the world (Howell et al. 2014, Lees and Gilroy 2021). He was disappointed that the Blackpoll Warbler (*Setophaga striata*)—the primary focus of his dissertation due to the strong southeastern directional component to its normal migration—went unrecorded altogether. That species remains unrecorded as a fall vagrant in the Cape Region, or anywhere in southern Baja California Sur; the only observations from that area are at San José del Cabo on 23 May 2006 (N. Am. Birds 60:442) and 8 Jan 2009 (N. Am. Birds 63:328). Among DeSante’s other somewhat surprising misses of this sort were the American Redstart (*Setophaga ruticilla*) and especially the Orchard Oriole (*Icterus spurius*), given their regularity in the Cape Region now. The American Redstart has been known as a winter visitor to the Cape Region since 1883 (Grinnell 1928). These issues were noted briefly by Erickson et al. (2001), as part of a larger discussion of vagrancy on the entire Baja California Peninsula.

Among western migrants, DeSante’s findings of the Western Wood-Pewee and Swainson’s Thrush would be considered exceptional today. Somewhat surprising misses of western migrants included the Warbling Vireo (*Vireo gilvus*), Lincoln’s Sparrow (*Melospiza lincolni*), and Black-throated Gray Warbler (*Setophaga nigriceps*).

The presence or absence of certain species in the study area in 1968 reflects actual changes in distribution. The Eurasian Collared-Dove (*Streptopelia decaocto*) and European Starling (*Sturnus vulgaris*) are non-native species that in 1968 had not yet reached Cabo San Lucas. Neither did DeSante note the Rock Pigeon (Feral Pigeon; *Columba livia*), but Grinnell (1928) and Wilbur (1987) did not address this species at all (Howell et al. 2001), so comparisons
with earlier times are not possible. The earliest reports for Baja California Sur in eBird are from 1976. As noted above, another non-native species, the House Sparrow, was first recorded by DeSante in 1968. Native species regular today at Cabo San Lucas that were not present in 1968 include the Ruddy Ground Dove (*Columbina talpacoti*; first recorded on the peninsula in 1990), Anna’s Hummingbird (*Calypte anna*), and apparently Great Egret (*Ardea alba*). The Common Raven was not recorded during the first two weeks of DeSante’s visit, a feat that would seem to be impossible today given this species’ close association with human development.

We are surprised by several other species unrecorded at DeSante’s study area in 1968, and we are unable to speculate on why. These include the Willet (*Tringa semipalmata*), Caspian Tern (*Hydroprogne caspia*), Northern Harrier (*Circus hudsonius*), and Black-throated Sparrow (*Amphispiza bilineata*). The Yellow-footed Gull (*Larus livens*) had not been split from Western Gull at that time, so its absence from DeSante’s lists is not surprising. Both gull species are regular in the Cape Region now. Knowledge of bird identification was more primitive in 1968, as were opportunities for photography. DeSante’s notes make clear that he grappled with several bird identifications, and it is likely that had he had access to today’s tools and knowledge, he would have recorded even more than he did.

In closing, we wish to emphasize the opportunities for study that remain at the tip of the Baja California Peninsula. To our knowledge, there still has never been a systematic census of raptor movement at the cape, or diurnal movement of landbirds either. The searching for vagrants that has been intensive farther north on the peninsula (e.g., Erickson et al. 2001) has been less so in the Cape Region. However, we do note the establishment of a new satellite campus of the Universidad Autónoma de Baja California Sur in Cabo San Lucas, and an associated avian study group led by Emer García. We look forward to their findings.

ACKNOWLEDGMENTS

Forest DeSante and Rodney B. Siegel helped us gain access to DeSante’s notes for 1968. Danny Bystrak of the U.S. Geological Survey’s Bird Banding Lab sent us DeSante’s banding records for that year. Online databases at eBird.org and VertNet.org were essential in our study. Thank you to Moe Flannery for providing Pyle access to DeSante’s specimens at the California Academy of Sciences. Jeremiah Tremble (MCZ) and Ildiko Szabo (UBC) helped with analysis of specimens in their care. Peter Alsing, Janet K. Farness, John S. Luther, Susanne A. Methvin, C. J. Ralph, J. V. Remsen, Jr., Thomas S. Schulenberg, Scott B. Terrill, and Art Wang—old friends of DeSante’s—assisted in our ultimately unsuccessful search for further details of his travels in 1968. Joseph Morlan scanned DeSante’s dissertation for posting at the Institute for Bird Populations website. Steve N. G. Howell and Rodney Siegel made many helpful comments on a late draft of the paper, as did Kimball L. Garrett, Steven G. Mlodinow, and Philip Unitt in their formal review for *Western Birds*. Finally, we acknowledge Rich Stallcup (1944–2012), who inspired a multitude of California birders during his lifetime (Winter 2013), Erickson and Pyle most certainly included. DeSante dedicated his 1973 dissertation as follows: “to Rich Stallcup, who, more than any man alive, knows the beauty and the magic that is the wood warbler.” This is contribution number 831 of The Institute for Bird Populations.
LITERATURE CITED


Accepted 20 November 2023

Associate editor: Kimball L. Garrett
FIRST RECORD OF TRICOLORED BLACKBIRDS IN IDAHO

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ABSTRACT: Over 99% of Tricolored Blackbirds (Agelaius tricolor) occur in California. However, small populations persist in Oregon, Washington, Nevada, and Baja California. Loss of wetlands that historically served as foraging and breeding habitat has led to their increasing use of agricultural landscapes including silage fields and cattle feedlots. Here we provide the first documentation of the Tricolored Blackbird in Idaho (26 March–13 May and 3 November–16 December 2023), of up to 30 birds observed at five different locations associated with cattle feedlots, each 10–15 km apart, in Payette and Gem counties. Seven observations included recordings of vocalizations (3-23 April and 14 December 2023), largely coinciding with the final observations at each location, presumably before dispersal to breeding grounds. We consider three hypotheses to explain the apparently sudden occurrence of these birds, including their return to some of the same sites in November 2023: (1) a continued pattern of range expansion due to climate change; (2) an undetected long-term population due to low survey effort; or (3) a large-scale movement in response to flooding and extreme weather in the traditional range. We encourage continued monitoring and surveying of these locations in the coming years and surveying for both new wintering locations and for evidence of the Tricolored Blackbird breeding in Idaho.

OBSERVATION AND IDENTIFICATION

On 26 March 2023 we were exploring sites in southwest Idaho underrepresented in reports to https://eBird.org. Driving along Big Willow Road, 18 km southeast of the town of Payette, we stopped to sort through a mixed blackbird flock across from a cattle feedlot. The flock consisted of Brewer’s Blackbirds (Euphagus cyanocephalus), Red-winged Blackbirds (Agelaius phoeniceus), Brown-headed Cowbirds (Molothrus ater), and European Starlings (Sturnus vulgaris). Within about 10 min the birds flushed, and we immediately noticed a blackbird with bright white median coverts and crimson red lesser wing coverts (Figure 1). Over the next 30 min, we noted additional field marks including glossy black feathers, a rounded head, pointed wings in flight, and a bill longer and tail more squared than in a Red-winged Blackbird. Our photos confirm the bird was a Tricolored Blackbird (Figure 1).

After we alerted other observers, additional reports documented the Tricolor at the first cattle feedlot, and more Tricolors were noted near two other cattle feedlots, 10 km apart (Figure 2, Table 1). C. Strope noted copulation between Tricolored Blackbirds on 31 March 2023 when a minimum of 12 was that spring’s highest count in Payette Co., and groups of both sexes were documented by multiple observers (Figures 3, 4, Table 1).

On 5 April 2023, E. Medes discovered a group of 13 Tricolored Blackbirds, a new high count for Idaho, in neighboring Gem County along Van Deusen Road near another cattle feedlot, 10 km east of the nearest previously recorded location. Medes and D. Hughes obtained audio recordings at a potential roost.
site. Seven other reports also noted or recorded vocalizations (Table 1). On 23 and 25 April 2023, Medes observed a single male Tricolor at a fifth feedlot near Little Rock, Gem County, ~15 km southwest of the Van Deusen feedlot (Figure 5). Sightings decreased after mid-April, in spite of some attempts to survey the area into the breeding season. The only sighting in May was of

**Figure 1.** First documented Tricolored Blackbird in Idaho, a male in a mixed blackbird flock at the Big Willow Lower cattle feedlot 18 km southeast of Payette on 26 March 2023. *Photos by Katie Sorenson*

**Figure 2.** Locations of cattle feedlots where Tricolored Blackbirds were encountered in March and April 2023. Circled numbers indicate the observations’ sequence. Inset map shows Payette and Gem counties, Idaho.
four males at the Big Willow Upper feedlot in Payette Co. on the 13th. Because of lack of public access to potential breeding sites on privately owned land, we were unable to survey except from roads. Although multiple observers noted courtship behavior and copulation, no one found conclusive evidence of breeding or nests in Idaho in 2023.

Tricolors returned the following fall to both Payette and Gem counties. The first report, by L. Evers and L. Wentz, was of at least two at the Upper Big Willow feedlot on 3 November (Table 1). Medes reported 12 males and an uncertain number of females at the Van Deusen cattle feedlot on 9 November. We revisited both sites on 11 November 2023 and found at least 15 Tricolored Blackbirds at Van Deusen and at least 20 at the Upper Big Willow feedlot, a new high count for Payette Co. Medes (pers. comm.) and L. Downer reported ~30 at the Van Deusen feedlot on 10 November 2023, a new high count of the species for Idaho.

**Table 1** Notable Sightings and Behaviors of the Tricolored Blackbird in Idaho

<table>
<thead>
<tr>
<th>Observers</th>
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<td>26 Mar 2023</td>
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aWeb link to eBird checklist or Macaulay Library record.
DISCUSSION

The reason for the unexpected discovery of dozens of Tricolored Blackbirds in Idaho, representing a first state record (pending acceptance, Idaho Bird Records Committee 1-A-2023 and 2-A-2023 Tricolored Blackbird), is unknown. One hypothesis is that the birds arrived in Idaho as part of a...
pattern of range expansion throughout the Pacific Northwest, likely due to climate change (McCormick 2022). The nearest known source populations are in central Oregon and southeast Washington. Another hypothesis is that a small population has existed in Idaho for longer but until now has remained undetected because of low survey effort. The area is one birders seldom investigate: Payette and Gem counties account for only 3% of Idaho eBird checklists. The return of Tricolored Blackbirds to at least two sites in November 2023 provides additional examples of their use of cattle feedlots in this area as a longer-term wintering site. Complicating matters is a photo of a male blackbird taken on 1 January 2014. It was posted to the Idaho Birding Facebook group from Little Willow Road in Payette Co., near one of the 2023 sites, but identification of the bird was inconclusive. However, this photo from nine years prior provides some evidence suggesting longer-term wintering in southwest Idaho. Two other reports of the Tricolored Blackbird have been submitted to the Idaho Bird Records Committee, one from Pearl, Gem Co., in 2007 (IBRC 1-A-07), the other from northern Idaho (IBRC 28-A-11), but both were rejected. Finally, during the winter and spring preceding this discovery exceptionally heavy precipitation flooded much of the blackbird’s core range in the Central Valley of California. This flooding might have caused large-scale movements, as the Tricolored Blackbird is prone to frequent movements throughout its life cycle (Beedy et al. 2018) and may breed itinerantly (Hamilton 1998).

Surveys of the species’ core range in California have documented population decreases of almost 90% from historic levels (Meese 2022). As popula-
tions have declined, sites of nesting and foraging have shifted from wetlands to agricultural landscapes (Beedy et al. 2018, Castañeda et al. 2023). Tricolors use dairies and feedlots because they provide a concentrated source of foods such as house flies and drone fly larvae, more concentrated than in many grasslands and wetlands (Goodward and Diaz 2023). Outside of California, there are isolated populations in Oregon (Neff 1937, Marshall et al. 2003, Denny and Denny 2007), Washington (McCormick 2022), and near Reno, Nevada (Ammon and Woods 2008). Few vagrants have been recorded outside of the main range, with single individuals seen in eastern Oregon near Burns in 2020 (https://ebird.org/pnw/checklist/S66144207) and at Malheur National Wildlife Refuge in 2022 and 2023 (https://ebird.org/checklist/S111334457, https://ebird.org/checklist/S134679976). Interestingly, the record closest to Idaho before the year 2023 was of four Tricolors on 25 April 2021 in Jordan Valley, Oregon, 15 km from the Idaho border and about 100 km from the 2023 Idaho sightings (https://ebird.org/checklist/S86394188). Like Payette Co., Malheur Co., Oregon, is sparsely populated and could have yet undiscovered populations of Tricolors.

Another unknown is whether the Idaho birds represent a wintering population that breeds beyond Idaho, possibly the well-documented breeding populations in Oregon or Washington (Marshall et al. 2003, Wahl et al. 2005, Denny and Denny 2007, McCormick 2022). The initial observations in Idaho did not note vocalizations, and most vocalizing occurred shortly before observations ceased for the season. This suggests that the Tricolors may have left their wintering sites to breed elsewhere, consistent with the phenology of other populations (Collier 1968, DeHaven et al. 1975). The distance from wintering to breeding grounds could be hundreds of kilometers (Beedy et al. 2018). Known breeding in Washington is confined to six locations and always in emergent vegetation (McCormick 2022). Few ponds or wetlands exist near the recent Idaho sightings, but the Snake River Plain resembles Washington’s Columbia Basin, where irrigation could raise the water table in some areas and generate sites suitable for Tricolored Blackbird breeding colonies. Many such sites exist in Payette and Gem counties, as well as in more populated areas in Canyon and Ada counties. The non-native Himalayan blackberry (Rubus armeniacus) is another potential nesting substrate that is available throughout southern Idaho, including in riparian areas near each feedlot, and would provide protection from common predators in the area such as the coyote (Canis latrans) and raccoon (Procyon lotor), nest predators such the Common Raven (Corvus corax), disturbance by livestock, and adverse weather (Beedy et al. 2018, Airola 2021). If the Idaho birds follow a pattern similar to that in Washington, grain stores could be another source of wintering Tricolored Blackbirds (see McCormick 2022).

With California expected to be warmer and more prone to drought in the future (Thorne et al. 2018), and documented range shifts northward (Erickson et al. 2021), Tricolors may travel farther north and east to seek new wintering and breeding grounds (Beedy et al. 2018, McCormick 2022). Thus Idaho is likely to see continued incursions. Detection of breeding in Idaho will require a more concerted and systematic effort, similar to California’s model (Meese 2017) or as proposed by McCormick (2022) for Washington State, rather than the opportunistic sampling occurring in Idaho now. Band-
ing or tagging Tricolored Blackbirds wintering in Payette or Gem counties could help clarify the Idaho birds’ movements and reveal where these birds go to breed in May.

ACKNOWLEDGMENTS

We thank Elizabeth Medes for extensive surveys throughout Gem County, discovering two new locations and a significant roost site; Louisa Evers and Linda Wentz for finding the first large group in Payette County, and for their efforts to survey roads in Payette County; Denise Hughes for efforts in recording Tricolor vocalizations and assisting Elizabeth Medes in Gem County; and Jay Carlisle and Heidi Ware Carlisle for encouraging us to write this paper. We thank Jay Carlisle and Cameron Duquette for helpful comments on a draft of this article, and Andrew McCormick and Daniel D. Gibson for peer-reviewing and greatly improving the final manuscript. Thanks to Elizabeth Medes, Kent Kleman, and Scott Urban for permission to use their photos. United States Department of Agriculture is an equal opportunity provider and employer.

LITERATURE CITED


FIRST RECORD OF TRICOLORED BLACKBIRDS IN IDAHO


Accepted 24 January 2024
Associate editor: Daniel D. Gibson
FACTORS INFLUENCING SURVIVAL OF BLACK-CHINNED HUMMINGBIRD NESTS IN SOUTHWEST COLORADO

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ABSTRACT: We estimated survival of Black-chinned Hummingbird (Archilochus alexandri) nests in southwest Colorado in 1998, 2001, and 2004 by means of models generated in program Mark. The best supported, and parsimonious, model suggested nest age (i.e., time since the nest was initiated) as the most important variable in indicating nest survival; daily survival rates of nests with eggs were lower than those of nests with nestlings. Substrate type was a second covariate that had some support in describing nest survival. Nests in Gambel oak (Quercus gambelii) or narrow-leaf cottonwood (Populus angustifolia) had greater daily survival rates than did those built in other substrates. No other ecological covariates were strongly supported in explaining nest survival. Of the 24 nests studied, 10 were successful, fledging an average of 1.7 (standard error 0.14) chicks.

Among the hummingbird species that regularly breed in the western and southwestern United States, the Black-chinned Hummingbird (Archilochus alexandri) has the widest breeding range. The largest breeding populations are in riparian habitats of southern New Mexico and Arizona (Baltosser and Russell 2020). According to the Breeding Bird Survey, the population trends in Colorado were negative from both 1966 to 2019 (−0.88 %/year, 95% confidence interval −2.57 to 0.66) and from 1993 to 2019 (−1.69 %/year, 95% confidence interval −3.59 to 0.23, Sauer et al. 2020). Because of the weakness of the supporting data (Sauer et al. 2020) and because the 95% confidence intervals straddle zero, however, these apparent trends might not be significant (Arnold 2010). In contrast, results of the two Colorado breeding bird atlases imply that the Black-chinned Hummingbird’s breeding distribution in Colorado spread from 1987–1995 to 2007–2012 (Lyon 2016).

Stiles (1973), on the basis of 55 nests in southern California, and Baltosser (1978, 1983, 1986), on the basis of 157 nests in southwestern New Mexico and southeastern Arizona, were the first to report on the Black-chinned Hummingbird’s apparent nest success. Using the logistic exposure method (Shaffer 2004), Smith et al. (2009) greatly increased knowledge of the Black-chinned Hummingbird’s nest survival (not the same as apparent nest success) in a study of the effects of fire fuel reduction along the middle Rio Grande (n = 635 nests) in central New Mexico. Smith et al. (2014) also reported (n = 434 nests) on the effects of nonnative tamarix (Tamarix ramosissima) and Russian olive (Elaeagnus angustifolia) on nest survival along the Rio Grande in central New Mexico, comparing it to that along the Gila River (n = 137 nests) in southwest New Mexico, where native boxelder (Acer negundo) was the most common nest substrate. In southeast Arizona, Greeney et al. (2015) used the Mayfield method (Mayfield 1961, 1975, Johnson 1979) to determine the daily survival rate of 342 Black-chinned Hummingbird nests near Northern Goshawk (Accipiter gentilis) and Cooper’s Hawk (A. cooperii) nests.
Previous research on the apparent success, daily survival rate, and survival of Black-chinned Hummingbird nests has taken place where the population density is high (Greeney and Wethington 2009, Smith et al. 2009, 2014, Greeney et al. 2015). In our study, we evaluated the Black-chinned Hummingbird’s nest survival in southwestern Colorado where its population density is lower than described in previous studies. We examined various ecological factors (including nest substrate, substrate height, nest height, and nest age) that have been considered previously (see Baltosser 1986, Smith et al. 2009, 2014, Greeney et al. 2015) as well as other variables that could affect nest survival.

METHODS

Study Area

In 1998, 2001, and 2004, we studied the nesting of the Black-chinned Hummingbird at the San Juan Basin Research Center (then administered by Colorado State University). The site is located at 37° 14′ N, 108° 3′ W in La Plata County, southwest Colorado. It covers 2541 ha at elevations ranging from 2312 to 2365 m (Ortega and Ortega 2003a, b, 2016). Along the La Plata River, riparian habitat extends from 5 to 200 m from the river and is dominated by narrow-leaf cottonwood (Populus angustifolia). River birch (Betula fontinalis) and thinleaf alder (Alnus tenuifolia) are also present. The upland habitat is dominated by Gambel oak (Quercus gambelii) with scattered ponderosa pines (Pinus ponderosa), junipers (Juniperus spp.), and quaking aspens (Populus tremuloides). Because of grazing by up to 3.3 head of cattle per hectare, the understory is low, but various forage grasses are present (Ortega and Ortega 2003a, 2016).

Data Collection

We followed nests of Black-chinned Hummingbirds to assess their outcomes. We typically visited nests every 2 or 3 days, viewing them directly or by use of an adjustable mirror attached to an extendable pole (Ortega and Ortega 2016) and noting whether they contained eggs or chicks. We considered a nest successful if we observed fledging or fledglings nearby, or, if the nest was empty at the time we expected fledging (the species’ nestling period is about 21 days [Baltosser and Russell 2020]), it did not show any obvious signs of predation (the nest was not pulled over, destroyed, or disheveled). In addition, if a nest was stretched and soiled with fecal material, we inferred the chicks had fledged successfully (Smith et al. 2009, Ortega and Ortega 2016). We estimated the height of the nest and its substrate by using a 2-m pole as a guide (Ortega and Ortega 2003a).

Statistical Analyses

Commonly, nest success has been quantified as apparent nest success or by the Mayfield method (Mayfield 1961, 1975, Dinsmore et al. 2002, Dinsmore and Dinsmore 2007, Rotella 2023). Apparent nest success is calculated by taking the total number of nests from which a chick successfully fledged and dividing this number by the total number of nests found. However, this method usually overestimates the percentage of successful nests since it does
not account for those nests that had already failed prior to being discovered (Mayfield 1961, 1975, Dinsmore et al. 2002, Dinsmore and Dinsmore 2007, Rotella 2023), and unsuccessful and successful nests may not be found at the same rate (Rotella 2023). Understanding this problem, Mayfield (1961, 1975) suggested the use of both the number of nests that failed while they were being followed and the number of exposure days—the number of days that a nest was exposed (and followed) to possible predation—allowing for the calculation of both the daily mortality rate and hence the daily probability of survival (Mayfield 1961, 1975, Dinsmore et al. 2002, Dinsmore and Dinsmore 2007, Rotella 2023). The Mayfield method, however, implies that daily survival rate is constant through the nesting cycle, and it does not allow for the easy analysis of covariates that could be important in potentially explaining nest survival and nest success (Dinsmore et al. 2002, Dinsmore and Dinsmore 2007, Rotella 2023). Therefore, several other methods for analyzing nest survival and success have been developed (Dinsmore et al. 2002, Shaffer 2004, Dinsmore and Dinsmore 2007, Johnson 2007, Rotella 2023), and one of these methods is the program Mark, which allows one to assess the importance of multiple covariates on nest survival and how a nest’s daily survival rate might vary through time (Dinsmore et al. 2002, Dinsmore and Dinsmore 2007, Rotella 2023).

Therefore, we estimated nest survival with this program. We initially evaluated 10 a priori candidate models (Table 1), nine of which combined a constant daily survival rate with a potentially important ecological variable. The other was based on a constant daily survival rate only, and this model is the same as the maximum-likelihood method for calculating nest success by

**Table 1** Summary Statistics for 12 a Priori Candidate Models and One Exploratory Model Generated in Program Mark to Describe Survival of 24 Nests of the Black-chinned Hummingbird at the San Juan Basin Research Center, Hesperus, Colorado, in 1998, 2001, and 2004

<table>
<thead>
<tr>
<th>Model</th>
<th>$\Delta$AIC$_c$</th>
<th>AIC$_c$ weight</th>
<th>$K^b$</th>
<th>Deviance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nest age</td>
<td>0.000</td>
<td>0.220</td>
<td>2</td>
<td>96.074</td>
</tr>
<tr>
<td>Nest age + substrate</td>
<td>0.041</td>
<td>0.215</td>
<td>4</td>
<td>92.047</td>
</tr>
<tr>
<td>Constant DSR + substrate</td>
<td>1.003</td>
<td>0.133</td>
<td>3</td>
<td>95.048</td>
</tr>
<tr>
<td>Constant DSR + nest height</td>
<td>2.235</td>
<td>0.072</td>
<td>2</td>
<td>98.309</td>
</tr>
<tr>
<td>Constant DSR + precipitation</td>
<td>2.383</td>
<td>0.067</td>
<td>2</td>
<td>98.456</td>
</tr>
<tr>
<td>Constant DSR + year</td>
<td>2.622</td>
<td>0.059</td>
<td>2</td>
<td>98.696</td>
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<tr>
<td>Constant DSR + snowfall</td>
<td>2.799</td>
<td>0.054</td>
<td>2</td>
<td>98.873</td>
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<tr>
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<td>3.220</td>
<td>0.044</td>
<td>1</td>
<td>101.313</td>
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<tr>
<td>Constant DSR + grazing intensity</td>
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<td>0.040</td>
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<td>97.471</td>
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<tr>
<td>Constant DSR + substrate height</td>
<td>3.997</td>
<td>0.030</td>
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<td>100.070</td>
</tr>
<tr>
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<td>0.025</td>
<td>2</td>
<td>100.413</td>
</tr>
<tr>
<td>Varying DSR</td>
<td>4.416</td>
<td>0.024</td>
<td>2</td>
<td>100.489</td>
</tr>
<tr>
<td>Constant DSR + ratio of nest height to substrate height</td>
<td>5.008</td>
<td>0.018</td>
<td>2</td>
<td>101.081</td>
</tr>
</tbody>
</table>

$^a$Difference from 100.102, the value of AIC$_c$ (Akaike's information criterion corrected for small sample sizes) for the most strongly supported model.

$^b$Number of parameters.

$^c$DSR, daily survival rate.
the Mayfield method (Mayfield 1961, 1975, Rotella 2023). We then considered two additional models, one that allowed the daily survival rate to vary over the breeding season and one that examined whether a nest’s age affected its daily survival rate. Specifically, evaluation of a model with nest age can suggest whether a nest’s daily survival rate varies through time (for example, if it differs at the incubation or nestling stages). To evaluate the covariate of nest age, we needed to know the date that the first egg was laid. We did this by identifying when an egg was newly laid, by using the median of a range of dates within which laying of the first egg was contained, or by back-dating to when the first egg was laid based on when eggs hatched and/or when chicks fledged. For back-dating, we estimated on the basis of a 2-day egg-laying period, a 13-day incubation period starting with laying of the second egg (incubation takes 12–14 days), and a 21-day nestling period (Baltosser and Russell 2020). Therefore, the entire nesting attempt could last about 35 days.

The environmental covariates that we initially considered were habitat (riparian versus Gambel oak-dominated upland), substrate (Gambel oak, narrow-leaf cottonwood, or other), and grazing intensity (none, low, or moderate to high; Ortega and Ortega 2016). We also evaluated the potential importance of nest height (m), substrate height (m), and ratio of nest height to substrate height. Because soil moisture might affect production of flowers and of insects that forage on newly growing vegetation, we included the covariates of winter snowfall (cm) during the preceding October through April and precipitation (cm) from May through August in a breeding season. We obtained data for winter snowfall prior to a breeding season and total precipitation during a breeding season from Colorado State University’s Colorado Climate Center at Fort Lewis (http://www.climate.colostate.edu/data_access_new.html). We also included the possible effect of year as a covariate.

Using an information-theoretic approach, we compared the candidate models by means of Akaike’s information criterion corrected for small sample sizes (AICc; Burnham and Anderson 2002). Under this method, the model with the smallest AICc value is the most parsimonious, or best supported, model at explaining nest survival according to the inclusion, or not, of various possible covariates (Burnham and Anderson 2002). It is to this best-supported model that all other models are compared, the difference being ΔAICc. Models with ΔAICc ≤ 2 are also considered to have some support (Burnham and Anderson 2002). In addition, the AICc weight, compared to that of other models (Table 1), can also be used to gauge a model’s support (Rotella 2023): if one takes the value of a model with a larger weight and divides by the value of a model with a smaller weight, one obtains another estimate of the two models’ relative support.

RESULTS

We followed the outcome of 24 Black-chinned Hummingbird nests. The first Black-chinned Hummingbird egg appeared in a nest on 18 May (2004), and the latest nest was initiated on 29 June (2001). Fourteen of 24 (58%) nests failed, all because of depredation; therefore, apparent nest success was 42%. We found nine nests (37.5%) in Gambel oak-dominated uplands and 15 (62.5%) in riparian habitat. Black-chinned Hummingbirds placed ten (42%)
nests in Gambel oaks, 11 (46%) nests in narrow-leaf cottonwoods, and three (12.5%) nests in another substrate. The 17 chicks observed or determined to have fledged had an average age when last observed in the nest of 20.3 ± 0.39 days (± 1 standard error). An average of 1.7 ± 0.14 chicks fledged from successful nests.

Of our 12 a priori candidate models, one with daily survival rate allowed to vary with nest age was the best supported (Table 1). According to this model, within any nesting attempt, the daily survival rate increased from the beginning of incubation through the end of the nestling period. This model suggested that, for example, the daily survival rate of a nest initiated on 11 June (the mean date of nest initiation in our study), was 0.952 (standard error 0.014) on the seventh day of incubation (midway through the 13-day incubation period). But by the eleventh day of the nestling period (midway through the 21-day nestling period), the rate had increased to 0.983 (± 0.008). These values imply a nest’s overall chance of survival as 0.179 (0.95235) on the seventh day of incubation but of 0.549 (0.98335) on the eleventh day of the nestling period.

The only other model in the initial set with some support (ΔAICc ≤ 2) was one with a constant daily survival rate plus the covariate of substrate. In this model, the daily survival rates of nests in Gambel oak (0.971 ± 0.012) or narrow-leaf cottonwood (0.976 ± 0.011) were the same but survival of those few nests on other substrates was lower (0.820 ± 0.096). Because of the potential importance of substrate, we devised one exploratory model combining substrate with nest age (Table 1). This model had almost the same support as our best-supported model (Table 1). The fourth best-supported model suggested that nest survival increased with nest height, but because the lower (–0.080) and upper (0.796) 95% confidence intervals included zero, this parameter was not likely useful in explaining nest survival (Arnold 2010).

Of the other models that we examined (Table 1), neither snowfall in the previous winter (from October through April) nor precipitation during the breeding season (from May through August) demonstrated strong support explaining nest survival. In addition, we found no support for the possibility that a nest’s daily survival rate varies through the breeding season.

DISCUSSION

We found nest age was important in determining the daily survival rate of a Black-chinned Hummingbird nest. Of 14 nests lost to predators, 12 were depredated during incubation whereas in only two were nestlings depredated. In the Santa Monica Mountains of southern California, Stiles (1973) found a low apparent nest success of 31.9% for Anna’s Hummingbird. Baltosser (1986: table 3) indicated that for the Black-chinned Hummingbird, “nesting success” during the incubation and nestling periods was complicated but that over three study areas in southwest New Mexico and southeast Arizona nesting success averaged only 34.0%. In their study of the effects of fire-fuel reduction along the middle Rio Grande, Smith et al. (2009) found several ecological variables affecting survival of Black-chinned Hummingbird nests, and that survival varied substantially from year to year, from 31% to 73%—their best model included an interaction between nest height and substrate along with a
year effect. In another study, Smith et al. (2014) estimated nest survival along the middle Rio Grande at 52% but that along the Gila River in southwest New Mexico at only 23%. Smith et al. (2009, 2014) estimated nest survival on the basis of a 38-day nesting period, which would lower the survival rates projected in our study. In the Chiricahua Mountains of southeast Arizona, Greeney et al. (2015) reported enhanced success of Black-chinned Hummingbirds nesting ≤300 m from Northern Goshawk or Cooper’s Hawk nests. Near an Accipiter nest, the predicted success of a Black-chinned Hummingbird nest was 31.2%, but away from an Accipiter nest, predicted success was only 6.2% (these authors also based their calculations on a 38-day nesting period).

Our second- and third-most supported models both implied some importance of substrate to nest survival (Table 1). Smith et al. (2009) found an interaction between substrate and nest height where the daily survival rate of nests in both Russian olives and Rio Grande cottonwoods (Populus deltoides) was lower than that of nests in Tamarix. Daily survival rate decreased with increasing nest height in both Russian olives and Rio Grande cottonwoods. Smith et al. (2014) also found daily survival rate decreasing with increasing nest height in Russian olives and in Rio Grande cottonwoods, as it did along the Gila River for nests in boxelder, the most common substrate in that area. Baltosser (1986) and Baltosser and Russell (2020) also reported that the chance of failure was greater for higher nests, and predation was the major cause of this failure. In all of these previous studies, birds were observed or implicated as predators of at least Black-chinned Hummingbird eggs. These observed or suggested avian predators included the Mexican Jay (Aphelocoma wollweberi), Summer Tanager (Piranga rubra), Hooded Oriole (Icterus cuculatus), and Bullock’s Oriole (I. bullockii). In addition, Greater Roadrunners (Geococcyx californianus) have been observed capturing Black-chinned Hummingbird nestlings in New Mexico (Elliston and Baltosser 1995, Baltosser and Russell 2020). At our study site, other potential avian predators include the Steller’s Jay (Cyanocitta stelleri), Woodhouse’s Scrub-Jay (A. woodhouseii), and Black-billed Magpie (Pica hudsonia)—which we have observed depredating nests of the American Robin (Turdus migratorius) (Ortega and Ortega 2003b, 2016). Bullock’s Orioles were also numerous. In addition, potential small-to-medium-sized mammalian predators include the western deer mouse (Peromyscus sonoriensis), chipmunks (Neotamias spp.), long-tailed weasel (Neogale frenata), and rock squirrel (Otospermophilus variegatus)—which we have observed depredating nests of the American Robin (Turdus migratorius) (Ortega and Ortega 2003b, 2016).

One means of understanding how nest success, or nest survival, affects a population is to consider the number of young a female successfully fledges within a breeding season (Ricklefs and Bloom 1977, Baltosser 1986): clutch size × breeding success × rate of nest initiation (Ricklefs and Bloom 1977:87, Baltosser 1986:356). While the complete clutch in the Black-chinned Hummingbird is invariably two eggs (Baltosser and Russell 2020), and our data allow an estimate of breeding success (i.e., nest survival), since the females we studied were not marked, we cannot estimate the rate of nest initiation, so we cannot estimate the number of young fledged by a female during a breeding season.

With nest success in some areas as low as 6.2% (Greeney et al. 2015) and
9.0% (Greeney and Wethington 2009), source populations must be feeding these sink populations. At least one population with high nest success has been identified in northwest New Mexico where apparent nest success was 86.5% ($n = 37$ nests with known outcomes, C. Ortega and C. Francis, unpubl. data). At that location, Black-chinned Hummingbirds nested close to noisy compressors for gas wells, and the high noise level appeared to deter predators (Francis et al. 2009). Other differences that might have had an effect on nest success include lower density of hummingbirds toward the northern side of their range and habitat. The dominant trees at the study site in northwest New Mexico were native piñon pine ($Pinus edulis$) and Utah juniper ($J. osteosperma$), whereas the study areas farther south were wooded with different native and non-native tree species. We recognize that with our comparatively small size of our Colorado sample ($n = 24$ nests), the results of our study should be considered tentative. However, to the best of our knowledge, no other studies have addressed survival of Black-chinned Hummingbird nests in southwest Colorado, in habitats dominated by Gambel oak and narrow-leaf cottonwood, and under different grazing regimes. To improve understanding of the Black-chinned Hummingbird’s population dynamics, the number of nests studied should be increased, and further studies should focus on latitudinal differences in the variables that most affect seasonal nest success, which requires determining the number of nests attempted per season by banded females.

ACKNOWLEDGMENTS

We appreciate the help of our field assistants including Susan Allerton, John Arnett, Florence Bliss, Jessica Cable, Samuel Henna, Heather Lyon, Ann Maurer, Peter Nylander, Arik Skromme, Carly Thornton, Joseph Vagneur, and Michael Vivalda. This research was funded by grants from the National Geographic Society, the National Fish and Wildlife Foundation, and the Colorado Wetlands Program to Catherine P. Ortega. Also, Catherine P. Ortega and John Arnett were supported by a Colorado Alliance for Minority Participation Grant (administered by the National Science Foundation). David Schafer and Douglas Zalesky allowed us access to the San Juan Basin Research Center (administered by Colorado State University at the time of this research). The manuscript also benefited from the review of Matthew Baumann and two anonymous reviewers.

LITERATURE CITED

Survival of Black-chinned Hummingbird nests in Colorado


Accepted 5 November 2023

Associate editor: Matthew J. Baumann
ABSTRACT: A second-cycle Black-headed Gull (Chroicocephalus ridibundus), a rare to casual visitor in western North America, remained at Anchorage, Alaska, from 16 July through 17 September 2023, providing a unique opportunity to track and document most stages of its second prebasic molt into definitive (adult) basic plumage. I estimated that the Anchorage bird required approximately 3 to 3.5 months (early/mid-June through late September) to complete the molt of its primaries. This is notably longer than the “average” 2.5 months stated for second-cycle Black-headed Gulls in several publications, but consistent with the duration and calendar limits reported by others for the entire species (mid-May/June through September). The start and duration of rectrix molt relative to the stage of primary molt closely matched that described for gulls in general, and specifically for predefinitive Bonaparte’s (C. philadephia) and Western (Larus occidentalis) gulls. When first observed in mid-July, the Anchorage bird had a white tail, as in definitive plumage, a trait infrequent in first-cycle Black-headed Gulls; then it molted the tail again through August. Although Black-headed Gulls occurring in western North America have been presumed to originate from eastern Asia, the timing of the Anchorage bird’s primary molt closely matched that published for second-cycle Black-headed Gulls in Europe, which has reported to be earlier—though molt schedules of Charadriiformes at the population level are highly variable.

In North America, the Black-headed Gull (Chroicocephalus ridibundus) breeds and winters annually along the Atlantic coast, from western Greenland to New York (AOU 1998), but along the Pacific coast this species is a rare migrant in the Bering Sea and casual from southeastern Alaska to California (California Bird Records Committee 2007, Gibson and Withrow 2015, Tobish 2015). Prior to 2023 the Black-headed Gull had been recorded at Anchorage, Alaska, on nine occasions, all between June and September.

On 16 July 2023 Ben Lagassé found a one-year-old Black-headed Gull on tidal mudflats of Knik Arm in west Anchorage. It lingered until at least 17 September, associating closely with post-breeding and migrant Bonaparte’s Gulls (C. philadephia) of various ages. When first observed the gull had already begun its second prebasic molt. The inner primaries had been shed, with several regrowing, and molt of the head and wing coverts was underway, but the remaining outer primaries, secondaries, and a few outer primary coverts were very worn, dull, and many had dark marks indicative of juvenile feathers (Malling Olsen and Larsson 2004, Howell and Dunn 2007, Pyle 2008). During the remainder of the gull’s stay it nearly completed its second prebasic molt into definitive plumage (Figures 1–5), replacing all its remiges and rectrices.

Black-headed Gulls molt according to the “complex alternate strategy” as defined by Howell et al. (2003) (Pyle 2008). Pyle (2008:640–642) stated that first-cycle Black-headed Gulls undergo a preformative molt between August and October and a partial first prealternate molt between February and May. Both of these molts involve the head, some to most of the body, and in some individuals some wing coverts, but no flight feathers (except occasionally the tertials). Second-cycle birds undergo a complete second prebasic molt
between July and November and a partial second prealternate molt from January to April (Pyle 2008:640–642). According to Pyle (2008:630), gulls in general replace the primaries slowly from the innermost, p1 (see Methods for feather-numbering scheme), to the outermost, p10. The secondaries are replaced inward from the outermost, s1, rapidly to s4, then more slowly inward from s5. Molt also proceeds outward from the tertials, with the last secondaries to be replaced usually several feathers outward from the tertials. The rectrices are replaced rapidly from the central pair, r1, to the outer pair, r6.

The only field studies I found investigating the sequence, rate, and duration of prebasic molt in the Black-headed Gull took place in Europe (Walters 1978, 1982, Cramp and Simmons 1983, Malling Olsen and Larsson 2004, Meissner 2007). Those studies also tracked molt in large numbers of birds, not individually. Thus the observations at Anchorage presented a unique opportunity to document all but the earliest stage of the second prebasic molt of a Black-headed Gull, albeit a singleton and vagrant, for two months in western North America.

METHODS

I interpreted the state of the Anchorage Black-headed Gull’s second prebasic molt through my field observations, made at roughly one to two week intervals after 2 August (Figures 1–5), and review of other photographs that showed one or both open wings (27 in total from 16 July to 17 September 2023). All photos are archived at the Cornell Lab of Ornithology’s Macaulay Library (ML; http://www.macaulaylibrary.org).

To quantify the progress of molt of the primaries, I used these photographs to estimate a range of single-wing primary-molt scores versus time. The score
can range from zero for a bird that has not yet started its primary molt (all primaries present and old), to a maximum of 50 at completion of primary molt (all primaries new and fully grown). I adopted the following rankings, somewhat modified from those defined by Ginn and Melville (1983): 0 for old feathers, 1 for an apparently missing or not visible feather, 2 for a visible feather less than about one-third grown, 3 for a feather between about one- and two-thirds grown, 4 for a feather more than about two-thirds but less than fully grown or a fully grown new primary adjacent to a missing or partially grown primary, and 5 for an apparently fully grown primary adjacent to fully regrown feathers. Ranges of the score on a specific date reflect cases where the length of the feather appeared to border two conditions, and/or considering that the persistence of a waxy sheath at the base of a feather cannot be discerned in a photograph.

Terms for molt and feather tracts are generally consistent with definitions in Pyle (2008) and Howell (2010). According to Ginn and Melville (1983) and Pyle (2008), the Black-headed Gull has 10 functional primaries numbered outward from p1 to p10, 20–21 secondaries, numbered inward from s1 to s17 or s18, plus three tertials numbered outward from t1 to t3, and 12 rectrices numbered symmetrically outward from the center pair, r1, to the outermost pair, r6.

For this study I attempted to differentiate only secondaries s1 to s15 in a photograph, and used “s16+” as a proxy for the innermost group (s16–17/18) because of the difficulty in distinguishing these in images. I also did not at-

Figure 2. Black-headed Gull undergoing the second prebasic molt at Anchorage, Alaska, on 3 August 2023. Note the new adult primaries (p1–5 regrown, p6–7 growing), secondary s1 (and possibly s5) emerging from beneath the greater coverts, and central rectrices (r1). Note the juvenile primaries (p9–10), some inner secondaries, and primary coverts (at p9–10). Apparently missing are p8, a large number of outer secondaries (s2–s8), which at least had not yet emerged from beneath the greater coverts, and several rectrices (possibly r2 and r3?).
SECOND PREBASIC MOLT OF A BLACK-HEADED GULL AT ANCHORAGE

RESULTS

The following subheadings describe the progress of the Anchorage Black-headed Gull’s second prebasic molt. Soft parts and plumage aspects that did not appear to change during the gull’s stay are not described but are visible in the figures.

Contour Feathers and Wing Coverts

When first observed on 16 July 2023 the gull’s head appeared white with dull smudge marks on the crown and face (as in first alternate plumage) and a rather distinct dark gray fore-eye crescent and ear spot (e.g., ML594800151, 16 July 2023, Enric Fernandez). For the most part the contour feathers of the upperparts and the wing coverts were gray (as in definitive plumage). Lagassé noted that the upperwing coverts lacked brown markings (ebird.org/ak/checklist/s144798045), which is also borne out in the photographs from that time, albeit all taken from a great distance, that show no sign of the darkish carpal/ulnar markings typical of juvenile plumage. On both the upper and underwing the outer greater coverts corresponding to s1 to about s8/10 were missing. By 2 and 3 August (Figures 1 and 2) the head was cleaner white, which accentuated the dark fore-eye crescent and ear spot; a pale gray-

Figure 3. Black-headed Gull undergoing the second prebasic molt at Anchorage, Alaska on 16 August 2023. The primaries out to p6 had been regrown, p7 was almost fully regrown, p8–9 were growing, and p10 was missing. The outer secondaries were regrown inward to about s9 (possibly s10), but the next inner secondaries in to about s15 or s16+ were missing. Additionally, one of the outer pairs of tail feathers (possibly r4 or 5?) appeared to be missing.

Photos by Robert L. Scher

tempt to differentiate tertials as on flying gulls those are usually covered by the scapulars (Grant 1986).
ish “ghost” hood-ring was very faint. The outer upperwing greater coverts appeared fully replaced, but now the inner greater coverts were missing. Additionally, Figure 2 shows dark-marked juvenile greater primary coverts corresponding to p9–10. By 16 August (Figure 3) all upperwing coverts appeared fully replaced.

**Primaries**

On 16 and 17 July, p1 appeared fully grown, p2 was at least two-thirds regrown, p3–4 were possibly one- to two-thirds regrown, p5–6 were missing or less than one-third grown, and p7–10 were old (juvenile), resulting in an estimated primary-molt score of 18–20 (ML594939661, 16 July 2023, Bill Carpenter; ML594915441, 17 July 2023, Emily Weiser). By 14 September (Figure 5), the last date I observed the bird, all primaries out to p9 appeared fully grown, with p10 nearly fully grown (score 49). Figures 2–5 illustrate the progress of primary molt for the period over which the bird was observed in Anchorage (see also my photos ML600108961, 2 August 2023; ML606995091 and ML606991671, 21 August 2023; ML608298927 and ML608298926, 29 August 2023, and ML608411233, 2 September 2023. Ages or apparent lengths of regrown feathers and molt scores are detailed in Table 1, and the scores are plotted versus time in Figure 6.

**Secondaries**

Observers’ details (ebird.org/ak/) and photographs from 16 and 17 July (ML594939661, 16 July 2023, Bill Carpenter; ML594915441, 17 July 2023, Emily Weiser) did not mention or show evidence that any secondaries had yet been shed, and all but the innermost exposed secondaries had a dark sub-
terminal band, indicating juvenile feathers. On 2 and 3 August (Figure 2; also ML600108961), s1, and possibly s5, had emerged from beneath the greater coverts, but approximately six to seven of the next outer secondaries (among s2–s8/9) were missing or concealed beneath the greater coverts, which created a very large mid-wing gap. At least four or five dark-marked juvenile inner secondaries remained (among likely s9–s14), and the other inner secondaries (among s14–s16+) were gray with white tips but of unclear age. By 16 August (Figure 3), the outer secondaries from s1 to about s9 (possibly s10) appeared fully regrown. The next inner secondaries to about s15 were then missing or concealed by the greater coverts, and the innermost group, s16+, appeared unworn and new. On 21 August (ML606991671 and ML614207827) the secondaries from s1 to at least s12 and possibly s13 appeared fully grown, with s14 and s15 possibly growing but concealed. On 29 August (ML608298927 and ML608298926), all secondaries to at least s14 appeared replaced, with s15 possibly (and s16?) still growing. By 2 September (Figure 4) all secondaries, including the tertials, appeared fully regrown.

Rectrices

It was very difficult to judge which rectrices were actively molting, even from photographs showing the spread tail, so the following summaries should be considered qualitative at best. On 16 July Lagassé described the tail as “white” (ebird.org/ak/checklist/s144798045), and none of the other eBird checklists from 16 or 17 July (including some with photographs, albeit from great distances: e.g., ML594939661, 16 July 2023, Bill Carpenter, and ML594915441, 17 July 2023, Emily Weiser) indicated tail feathers with dark tips (as in predefinitive plumages). On 2 and 3 August (Figure 2), the central pair of rectrices (r1) appeared to be growing, the next two to three pairs

**Figure 5.** Black-headed Gull at Anchorage, Alaska, nearing completion of the second prebasic molt (only p10 appeared not yet fully regrown) on 14 September 2023.  
*Photos by Robert L. Scher*
Table 1  Replacement of Primaries during the Second Prebasic Molt of a Black-headed Gull at Anchorage, Alaska, 16 July–17 September 2023

<table>
<thead>
<tr>
<th>Date</th>
<th>Old</th>
<th>Missing</th>
<th>&lt;1/3</th>
<th>1/3-2/3</th>
<th>&gt;2/3</th>
<th>Fully grown</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 Jul</td>
<td>p7–10</td>
<td>p6–(5)</td>
<td>p3–4</td>
<td>p2 –(3)</td>
<td>p1–(2)</td>
<td>18–20</td>
<td></td>
</tr>
<tr>
<td>16 Aug</td>
<td>p10</td>
<td>p9</td>
<td>p8</td>
<td>p7</td>
<td>p6</td>
<td>p1–6</td>
<td>40–42</td>
</tr>
<tr>
<td>29 Aug</td>
<td>p10</td>
<td>p9</td>
<td>p8</td>
<td>p9</td>
<td>p6</td>
<td>p1–8</td>
<td>46–47</td>
</tr>
<tr>
<td>2 Sep</td>
<td>p10</td>
<td>p9–10</td>
<td>p8</td>
<td>p1–8</td>
<td>47–48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Sep</td>
<td>p10</td>
<td>p9–8/9</td>
<td>p8</td>
<td>p1–9</td>
<td>48–49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Sep</td>
<td>p10</td>
<td>p10</td>
<td>p8</td>
<td>p1–9</td>
<td>49</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*aSee Figure 2.
bSee Figure 3.
cSee Figure 4.
dSee Figure 5.

Figure 6. Primary-molt scores versus date for the Black-headed Gull observed at Anchorage, Alaska, from 16 July to 17 September 2023 (red circles) and average or apparent mean values published for adults in England (blue dash-dot line from Ginn and Melville 1983), for adults near Amsterdam (open circles from Walters 1978, black circle from Walters 1982), and for second-cycle birds on the Baltic coast of Poland (green dash-dot line from Meissner 2007). Vertical black lines represent the range of primary-molt scores that Walters (1978) estimated from recovered dead birds, corresponding with the average date each primary (labeled above each line) was shed. Note that after p5 and p6 were shed, the actual dates that Walters (1978) reported p7 to p10 were shed in adults ranged up to about four weeks on either side of the plotted average date.
(r2–4?) appeared missing or growing, and the remaining outer feathers were white (as in definitive plumage). On 16 August (Figure 3) r1–r3 appeared fully or mostly regrown, but one of the outer pairs (possibly r4 or r5) was now missing. On 21 August all rectrices appeared grown, except for possibly the outermost pair (r6) (ML614207827). By 29 August (ML608298928), and certainly by 2 September (Figure 4), all rectrices appeared fully regrown.

DISCUSSION

For the two full months of its stay in 2023, the Black-headed Gull observed in Anchorage showed no sign of ill health or poor physical condition, and it remained fully capable of flight. Despite the active wing and tail molt it moved daily along several kilometers of tidal flat, and it was observed to fly off when a raptor soared over and on several occasions when I tried to approach closer than about 25–50 meters. Therefore I consider the progress of its second prebasic molt to be likely representative of a normal and healthy second-cycle Black-headed Gull. General measures of the Anchorage Black-headed Gull’s second prebasic molt (i.e., duration and rate of primary, secondary and tail molt, and dates of primary molt) conform with most but not all other published accounts for this species.

Duration of Primary Molt

When first observed on 16 and 17 July 2023, the Black-headed Gull at Anchorage had already begun its second prebasic molt (p5 and p6 appeared to have been recently shed), and I scored the molt of its primaries as 18–20 (Table 1; ML594939661, 16 July 2023, Bill Carpenter; ML594915441, 17 July 2023, Emily Weiser). When last photographed two months later on 14 September (Figure 5), the bird had nearly completed its primary molt, as only p10 was not yet fully regrown (molt score 49; Table 1). As inferred from Walters’ (1978) multi-year field study of Black-headed Gulls around Amsterdam, the Netherlands, about four to six weeks had elapsed between the average dates when p1 and p5–6 were shed during the second prebasic molt. And from the apparent progress of growth in p10 between my observations on 21 August and 14 September, I estimate that p10 would have fully regrown by late September. Adding these intervals to the two months the bird was tracked in Anchorage, I infer that the replacement of the primaries during the second prebasic molt took approximately 3 to 3.5 months (early/mid-June through late September).

The estimated duration of the Anchorage bird’s primary molt, 3–3.5 months, is notably longer than the “average 2.5 months” Walters (1978) estimated for second-cycle Black-headed Gulls at Amsterdam, an interval repeated by Cramp and Simmons (1983) and Ginn and Melville (1983). But it is within the span of three to four months Malling-Olsen and Larsson (2004) and Pyle (2008) attributed to this species as a whole. Malling Olsen and Larsson (2004) further stated that second-cycle Black-headed Gulls molt the primaries at a pace slower than the approximately three months adults take.

Walters (1978) estimated an average date each primary was shed, on the basis of primaries collected off the ground during regular visits to his study sites. To determine the “average” duration of primary molt and to predict
the additional days p10 should take to fully regrow after it is shed, he then
assumed a single linear rate of change in molt score versus date, averaged
from a limited number of dead birds recovered during the study. However,
Dawson and Newton (2004) demonstrated that the score does not change
linearly over the full course of primary molt, especially in the early and
later stages, as a linear relationship does not account for the differences in
primary lengths and feather mass, and thus underestimates the duration of
molt, especially late in that cycle. Figure 6 confirms that the rate of primary
molt is nonlinear and likely explains the discrepancy between my results and
those of Walters (1978).

My observations of the second-cycle Black-headed Gull at Anchorage
bracketed the complete molt of four primaries (p6 to p9), from shedding
to full replacement, which individually appeared to each take roughly three
to four weeks to complete regrowth. As seen in Table 1, p6 was missing by
mid-July and regrown by mid-August, p7 was shed in the last half of July
and regrown by late August, p8 was missing by the beginning of August and
regrown by the end of August, and p9 was shed in the first half of August and
regrown by early to mid-September.

Secondary Molt

The Anchorage Black-headed Gull appeared to complete molt of its sec-
ondaries over four to five weeks (late July to early September) and followed
the pattern described by Pyle (2008) for gulls in general. Specifically, the
outer nine secondaries (s1–9) were replaced over a period of about two to
three weeks (late July to mid-August), while the remaining inner secondaries
(s10–s16+) were replaced over a longer period of about three to four weeks
(early/mid-August to early September). Additionally, the last secondaries to
regrow were s14 and s15, which are several feathers outward from the tertials.

Rectrix Molt

The Anchorage bird started its tail molt in late July, after p1 and p2 (pos-
sibly p3) were regrown and juvenile p9 (possibly also p8) and p10 remained,
when the primary-molt score was approximately 25 (visually extrapolated
from Figure 6). The duration of tail molt was also roughly four to five weeks
(late July through August). The schedule of this tail molt, in terms of start
and duration relative to molt of the primaries, closely matches that described
by Dwight (1925) for gulls in general. More specifically, it agrees with the
schedule of the second prebasic molt of Bonaparte’s Gull (Braune 1987) and
the second and third prebasic molts of the Western Gull (Larus occidentalis)
(Howell and Corben 2000).

When the Anchorage gull was first found in mid-July, its white rectrices
also resembled those of definitive plumage. It then proceeded to molt the
rectrices again after the primary molt had progressed further. Black-headed
Gulls can occasionally or rarely replace all rectrices with adult-like tail feath-
ers during the first preformative and/or first prealternate molts (Grant 1986,
Pyle 2008). Another possibility is that through injury the Anchorage gull had
previously lost its juvenile tail feathers, which it then replaced with feathers
mimicking the definitive plumage.
Dates of Primary Molt

During the second prebasic molt of the Black-headed Gull, at least in Europe, the primaries are replaced between mid/late-May and September, roughly two to four weeks earlier than during the definitive prebasic molt of adults (Cramp and Simmons 1983, Ginn and Melville 1983, Malling Olsen and Larsson 2004, Howell and Dunn 2007, Pyle 2008). Those conclusions are supported by field studies in the Netherlands (Walters 1978, 1982) and on the Baltic coast of Poland (Meissner 2007) (see Figure 6). Malling Olsen and Larsson (2004) also stated that Black-headed Gulls breeding in northeastern North America follow a molt schedule “slightly later” than populations in Europe. Furthermore, Howell and Dunn (2007) and Pyle (2008) stated that in east Asian Black-headed Gulls the prebasic molt may occur later than in European populations. And the California Rare Birds Committee (2007), Howell and Dunn (2007), and Pyle (2008) postulated that Black-headed Gulls occurring in western North America likely originate from east Asian populations rather than from birds breeding along the northeast coast of North America, in Iceland, or in Europe.

The Anchorage Black-headed Gull did not entirely fit these reported characteristics. The primary-molt scores I estimated for it appear to be roughly two to three weeks earlier than the corresponding average scores reported for adults in Europe, at least from mid-July through August (Figure 6). Additionally, my scores are consistent with those reported by Meissner (2007) for second-cycle Black-headed Gulls in Poland from late July to early August. Furthermore, the actual dates the Anchorage bird appeared to shed p5 through p10 (Table 1) match closely with the average dates Walters (1978) reported those primaries were shed in second-cycle Black-headed Gulls near Amsterdam. On the other hand, the Anchorage bird did not fully regrow p3 and p4 until late July, p6 and p7 until mid-August, and p9 until early to mid-September, all somewhat later than the typical dates of mid-July, late July, and late August, respectively, for complete regrowth of those same feathers as reported by Malling Olsen and Larsson (2004) for European birds.

There are multiple plausible explanations why my findings differ from the schedule of primary molt previously reported in the Black-headed Gull. The inconsistencies may simply reflect intraspecific variability, which in the Charadriiformes is wide, especially in migratory species (Pyle 2008). There may be no real statistical differences in molt schedule between the isolated populations of the Black-headed Gull. Or some individuals reaching the west coast of North America may originate from Europe. Regardless, further detailed field studies of the molt of the populations of the Black-headed Gull breeding in east Asia and eastern North America are warranted to clarify the variability in this species across its full global range.

ACKNOWLEDGMENTS

The manuscript benefited greatly from reviews by Steve Heinl, Thede G. Tobish, Amar Ayyash, Dan Ruthrauff, and especially Peter Pyle. I also thank Bill Carpenter, Emily Weiser, and Bob Waldrop, who provided their original photos, helping me qualify the molt of the Anchorage Black-headed Gull when it was first observed in mid-July and early August.
SECOND PREBASIC MOLT OF A BLACK-HEADED GULL AT ANCHORAGE

LITERATURE CITED


Accepted 12 February 2024
Associate editor: Daniel R. Ruthrauff
ABSTRACT: There have been many observations of corvids placing a hard-shelled food item onto a roadway, then consuming the food exposed when a passing automobile crushes the shell. However, it has been debated whether corvids perform this behavior intentionally. Our observation of an American Crow (Corvus brachyrhynchos) placing a bivalve on a road, then eating the meat exposed when the shell was run over, supports the idea that corvids intentionally use cars to crack shelled foods.

Species in the family Corvidae have been noted to crack open food items, including nuts (Brekke 2014), gastropods (Tanaka et al. 2013), and bivalves (Davenport et al. 2014), by dropping them onto hard substrates. Roadways are one of these substrates, but many observations reveal that the birds appear to wait until automobiles run over dropped food items before retrieving them (Maple 1974, Grobecker and Pietsch 1978), suggesting that they may be deliberately using automobiles as shell-crackers. In addition to dropping food onto roads from a height, Carrion Crows (Corvus corone) and a Clark’s Nutcracker (Nucifraga columbiana) have been observed walking onto roads to place food items such as walnuts (Nihei 1995, Ara et al. 2019) and, in one case, a salamander (Gorman 2021) in lanes of traffic. Adding to this body of observations, we report the first observation of an American Crow (C. brachyrhynchos) using an automobile to access the flesh of a bivalve by placing it on a road. While American Crows’ deliberate usage of vehicles to access shelled foods has been disputed (Cristol et al. 1997), we provide support here to the idea that they intentionally use automobiles as shell-crackers.

On 11 February 2023 we were at Arrowhead Marsh in Alameda County, California, attending a field trip for a class at the University of California. At 10:15, we noticed an American Crow carrying a dark object in its bill while walking toward the center of a paved secondary road. The crow set the object onto the road before flying up to perch on a nearby fencepost. Less than a minute later, a car driving toward the parking lot narrowly missed the object. Immediately thereafter, another car ran over the object. After the second car passed, the crow flew down onto the road, gathered the crushed object, then returned with it to the fencepost. From later examination of our pictures, we identified the object as a bivalve, probably a ribbed mussel (Geukensia demissa), from its large size, dark shell, oblong shape, and yellow-orange flesh. Another American Crow soon flew in and briefly perched on a fencepost next to the first. Both crows flew into a tree, then down into the grass on the other side of the road, where they began to eat the bivalve. There were no agonistic behaviors between the two crows; they appeared to share the food item. The entire observation lasted about 7 minutes.

While reports of corvids using cars as “nutcrackers” has often been ascribed as evidence of their advanced cognition, Cristol et al. (1997) criticized the assumption that American Crows were deliberately using cars to crack nuts when dropping food items onto roads, asserting that they were simply taking advantage of gravity. Yet, the preponderance of observations, including our own, provide evidence that corvids
are deliberately cracking open food via automobiles, as suggested by Caffrey (2001). Though it is possible that our crow incidentally benefited from the automobile crushing the mussel, we believe our observation reflects how American Crows adapt to and exploit an urbanizing world.

We thank the faculty (Rauri Bowie, Jim McGuire, and Alan Shabel) and graduate student instructors (Isaac Krone and Erin Person) of INTEGBI 104LF for providing us the opportunity to visit Arrowhead Marsh and develop our field observation skills. We also thank Daniel D. Gibson and Daniel S. Cooper for reviewing this article. Both authors contributed equally to this article.

LITERATURE CITED


Accepted 31 October 2023
Associate editor: Daniel S. Cooper
The Black-chinned Hummingbird is widespread in western North America, nesting mainly in riparian and oak woodlands. Its nesting ecology has been investigated in various areas, but in this issue of Western Birds Joseph C. Ortega and Catherine P. Ortega report a study from a new area, southwestern Colorado. The rate of apparent nest success they observed, 42%, is similar to that reported elsewhere. All nest failures were due to predation, and predation of eggs was much more likely than predation of nestlings. A nest's chance of survival increased through the nesting cycle.

Vagrant birds may seem too atypical to inform us about their species' basic biology. But extended observation of a unique individual—identifiable when only one of a species is likely nearby—can reveal details of the species' life cycle. Robert L. (Buzz) Scher took advantage of such an opportunity with a Black-headed Gull (Chroicocephalus ridibundus) at Anchorage, Alaska, where the species is a casual summer visitor with 10 local records. Followed for two months during its second prebasic molt, the bird evidently took 3 to 3.5 months to complete that molt, longer than the 2.5 months previously suggested as typical.
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