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formed in some boxes over pools (30% of boxes in December, 30% in January, 0 in February) and riffles (50% of boxes in December, 20% in January, 20% in February). In all cases, water was flowing under the surface ice, and no anchor ice had formed on the bottom of the streams.

No *A. truei* were found in the boxes. However, using a dip net we found *A. truei* in 4 of 4 streams searched: in 1 stream in November, 2 streams in December, 1 stream in January, and 4 streams in February. We found 9 adults and 12 larvae under rocks (< 35-cm diameter) in riffles. These had not burrowed into the stream bed. There may be geographic variation in overwintering locations, as *A. truei* in western Washington appear to burrow into the stream substrate (H. A. Brown, pers. comm.).

The presence of anchor ice in some streams may preclude their use by this species. In the 10 streams observed, the water flowed all winter under deep layers of snow, and we suspect that the snow protected the streams from freezing and allowed the frogs to overwinter in the water. If anchor ice had formed in the study streams, the frogs probably would have been frozen. Because *A. truei* remain in

the streams in winter, it is imperative that management activities near these 1st- and 2nd-order streams preserve the integrity of the stream structure and adjacent habitat. In particular, management activities that affect winter stream flow and icing conditions may adversely affect *A. truei*. Additional research is warranted on distribution of *A. truei* relative to winter stream conditions, winter survivorship, and to determine if *A. truei* also are buried in the substrate in winter.

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AGGREGATIONS OF SHARPTAIL SNAKES (*CONTIA TENUIS*) ON THE EAST SLOPE OF THE CASCADE RANGE IN WASHINGTON STATE

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The sharptail snake (*Contia tenuis*) is a little-studied species with a known distribution extending from southern British Columbia to the southern extent of the Sierra Nevada Range (Blaustein and others 1995, McAllister 1995, Spalding 1995, Stebbins 1985). Some aspects of habitat and life history have been reported for British Columbia (Spalding 1993, 1995), Oregon (Brodie and others 1969, Nussbaum and others 1983) and California (Cook 1960) where the species is found primarily west of the Cascade and Sierra Ranges. The lack of recent sightings in western Washington (Slater 1939, J. Slipp pers. comm.), however, suggests that the species' distribution may presently be limited to a few localities on the east side of the Cascade Range for which there are no published habitat descriptions. Here we report on habitat characteristics and the size-sex composition of 2 aggregations of *C. tenuis* found on the east slope of the Washington Cascade Range, Kittitas County. We use the term aggregation to describe relatively high concentrations of snakes within con-

finer patches of habitat, unlike what we observed elsewhere in the vicinity where *C. tenuis* were seldom encountered.

On 14 April 1996, we conducted a survey for *C. tenuis* along the north shoreline of the Yakima River, south of the town of Cle Elum (585 m elevation, T20N R15E S27). We found 22 *C. tenuis* under loosely-embedded, exposed cobbles in a 1 × 35 m plot on the north side of a human-created, earthen levee, about 30 m north of the Yakima River and 30 m south of an oxbow slough. The area where the snakes were found is partially shaded by a black cottonwood (*Populus trichocarpa*)–quaking aspen (*Populus tremuloides*) riparian forest. The surrounding hillsides above the Yakima River floodplain are vegetated by a mosaic of ponderosa pine (*Pinus ponderosa*) forest and disturbed grassland. The substrate within the plot consists of cobbly mineral soil, overlain in some areas by a 2 to 10 cm layer of moist, decaying leaves and other organic debris. Each *C. tenuis* emitted a foul-smelling fluid from the vent when first handled.

Unfortunately, we did not determine the sex or measure all of the individuals prior to their release. The group appeared to be composed of 12 adults, 5 juveniles, and 5 hatchlings. Three adult females measured 308, 251 and 244 mm total length (TL), 2 adult males measured 182 and 181 mm TL, and 3 hatchlings measured 101, 105 and 105 mm TL. As many as 5 individuals were found coiled together beneath a single river cobble, and, on several occasions, *C. tenuis* were found under rocks with neonate Northwestern garter snakes (*Thamnophis ordinoides*). Four *C. tenuis* (UMMZ #214149–214152) were collected and deposited at the Museum of Zoology, University of Michigan. Searches elsewhere in the vicinity yielded an occasional *C. tenuis*, but no other aggregations were observed.

Sharptail snakes were found here on 5 subsequent visits. On 26 April 1996, 10 individuals were found in the same 1 × 35 m plot. Three males measured 223, 215 and 166 mm TL and 7 hatchlings ranged 107 to 114 mm TL (mean = 109 mm). On 7 May 1996, we returned and found 1 adult female (261 mm TL), 2 juveniles (158, 171 mm TL), and 1 hatchling (112 mm TL) beneath rocks in the plot. The female was under a rock with a juvenile *T. ordinoides*. Additional searches in the immediate area revealed an aggregation of 6 male *C. tenuis*, 3 adult long-toed salamanders (*Ambystoma macrodactylum*) and 1 juvenile *T. ordinoides* in a patch of loose, angular rock in a partially-shaded, 1-m² area on the south side of the levee, about 2 m from the Yakima River shoreline. These male *C. tenuis* ranged 181 to 246 mm TL (mean = 218 mm). On 3 June we returned and found a single hatchling in the 1 × 35 m plot, a male and a gravid female¹ in the 1 m² plot, and other individuals dispersed along the bank of the river and the slough in the vicinity; all snakes were found coiled up beneath rocks. During a search on a 13 July visit, only 1 individual, an adult female, was found coiled beneath a cobble in the 1 × 35 m plot. It escaped before measurements were taken.

Egg-laying by *C. tenuis* is reported to occur in June and July (Nussbaum and others 1983), but the dates

¹ The gravid female *C. tenuis* found on 3 June was maintained in captivity at the University of Victoria by Lynn Norman who recorded the following data (Patrick Gregory, pers. comm.). On 4 June 1996, the female was 249 mm snout-vent length and weighed 6.9 g. On 14 July 1996, after depositing 3 eggs, it weighed 4.88 g. Single eggs were laid on 7, 12 and 14 July. The 1st egg weighed 0.44 g and measured 15.5 × 6.9 × 3.5 mm; the 2nd egg weighed 0.37 g and measured 23.4 × 6.85 × 4 mm; the 3rd egg weighed 0.1 g and measured 8.7 × 4.7 × 2.5 mm. None of the eggs were viable and the 2nd egg in the series appeared to be better calcified than the other 2.

of breeding are unknown (Gregory and Campbell 1984, Spalding 1993, 1995). Our observations of April–May aggregations, followed by the appearance of a gravid female, and the apparent dispersal of adults, suggest that this species has a spring breeding period. Furthermore, the relative abundance of hatchling *C. tenuis* in the aggregations also suggests that egg-laying and hibernation had occurred nearby.

Contia tenuis is afforded no special status in Washington despite its apparent limited distribution and the paucity of sightings since it was described in 1852 from a specimen collected at “Puget Sound” (Baird and Girard 1852). Whether the species is actually rare, or its secretive habits severely limit detection, is presently undetermined. However, this site contains the highest relative abundance of *C. tenuis* ever reported in Washington (J. W. Slipp pers. comm., S. F. Cook pers. comm., pers. obs.). In fact, we know of few other sites in Washington where *C. tenuis* has been recorded in recent years. Additional surveys are badly needed to determine the extent of the species’ distribution and status in this and other regions of Washington state.

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PACIFIC AND AMERICAN GOLDEN-PLOVERS BREEDING IN SOUTHWESTERN ALASKA

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The American and Pacific golden-plovers (*Pluvialis dominicus* and *P. fulva*) have extensive tundra breeding ranges in both the New World (*dominicus*) and Old World (*fulva*). The 2 species converge and breed sympatrically in portions of western Alaska (Fig. 1, after Johnson and Connors 1996). Potential nesting habitats occur widely across west-central Alaska, but explorations have been insufficient to reveal the presence of breeding golden-plovers (Johnson and Connors 1996). Williamson and Peyton (1962) suggested that golden-plovers were likely to nest in the vicinity of Lake Iliamna in southwestern Alaska. Here I report results of surveys that I conducted between the Alaska Range and Kuskokwim Mountains which greatly expand the breeding range of both species in Alaska.

METHODS

Between 20 May and 15 July in 1994 and 1995, I conducted surveys for breeding golden-plovers along the western foothills of the Alaska Range between Stony River and Lake Iliamna (Fig. 1). This region is characterized by high plains and vast plateaus of glacial ground moraine with extensive *Dryas*-lichen dwarf shrub tundra between 800 and 1300 m elevation (Racine and Young 1978). I initially located plovers from the air from a Piper PA-18 aircraft flown at an altitude of 40 m and an air speed of

120 km/hr. When plovers were seen, a suitable landing area was located and visual landmarks or a hand-held GPS receiver was used to locate the site on foot. At each site a single observer recorded the location (latitude and longitude), elevation, habitat, species, number, and behavior of all plovers seen. Photographs of breeding-plumage birds and vocalizations were used to identify plovers to species using characteristics described by Connors et al. (1993) and Johnson and Connors (1996). When possible, single birds and pairs were approached to search for nests or young. Each site was visited only once each year and no sites were surveyed both years. The distribution of plovers within the greater survey area was plotted by connecting the most peripheral locations for each species.

RESULTS AND DISCUSSION

I observed 131 individual *P. dominicus* at 23 different sites during the 2 yr. In addition, 3 nests and 14 pre-fledged chicks of *P. dominicus* were located among 9 of the sites. Seventy-one *P. dominicus* sightings were of adult males in flight display. I observed 37 adult *P. fulva* among 5 sites visited and found 3 downy young < 10-days old and a nest containing 1 addled egg. Twenty-three *P. fulva* sightings were of adult males in flight display. I also located 44 other adult *Pluvialis* sp. from the air but was unable to land in