APPARENT SYMPATRY OF TWO SUBSPECIES OF THE WHITE-CROWNED SPARROW, *ZONOTRICHIA LEUCOPHRYS PUGETENSIS* AND *GAMBELII*, IN WASHINGTON STATE

EUGENE S. HUNN, 204 Fair Ave., Petaluma, California 94952; enhunn323@comcast.net

DAVID BEAUDETTE, 2160 E. Fry Blvd., PMB 197, Sierra Vista, Arizona 85635; xeracris@gmail.com

ABSTRACT: White-crowned Sparrows (*Zonotrichia leucophrys pugetensis*) breed throughout the lowlands of western Washington, but before 1953 there was just one record of this subspecies east of the Cascade Range. Over the last 35 years, however, because of logging and development, *pugetensis* has spread and now occurs at and east of the Cascade crest, with definite evidence of nesting by 1988 on the eastern slopes of the Cascades. Gambel's White-crowned Sparrow (*Z. l. gambelii*) was first recorded nesting in the Cascades of northern Washington in 1957. Beaudette confirmed its nesting in the central Washington Cascades at Naches and Stevens passes in 1994 and 1996, when he observed singing males of both *pugetensis* and *gambelii* in close proximity to each other. In 2006 Hunn recorded songs of both subspecies in such a situation near Naches Pass. More recent reports extend the area of apparent sympatry south to White Pass in Yakima County and east of the Cascade crest in Kittitas and Yakima counties. The situation suggests that the White-crowned Sparrow as now defined might include two (or more) species.

The White-crowned Sparrow includes five recognized subspecies (Dunn et al. 1995), which constitute two clearly defined groups: (1) a boreal/montane group, which includes *Z. l. leucophrys*, breeding in eastern Canada; *Z. l. gambelii* of western Canada to Alaska (and now south in the Cascade Range in Washington State); and *Z. l. oriantha* of the Rocky Mountains, Great Basin ranges, and the Sierra Nevada and southern Cascades—all of which are migratory; and (2) a Pacific coastal lowland group, which includes *Z. l. nuttalli* of central coastal California and *Z. l. pugetensis*, breeding from northwesternmost California to southern coastal British Columbia. Within these groups, the subspecies intergrade where their ranges come in contact (Chilton et al. 1995). Until recently the two groups were geographically isolated.

Subspecies *nuttalli* is rather strictly coastal and sedentary. Subspecies *pugetensis* has a wider habitat tolerance, and it occurs throughout the coastal lowlands of its range; it is partly migratory, wintering south to southern California. Both these subspecies share short primary projections reflecting their more sedentary habits. The other three subspecies migrate considerable distances to their wintering grounds and share longer primary projections (Dunn et al. 1995).

Sixty years ago Jewett et al. (1953:648) characterized *Z. l. pugetensis* as a "common migrant and summer resident… in clearings and prairies in the Transition Zone west of the Cascade Mountains." The examples they cited included a single exception, a summer record at Goose Prairie near Bumping Lake (elevation 1000 m), high on the eastern slopes of the Cascades in Yakima County. Subspecies *Z. l. gambelii* was not known to

breed in Washington, but was judged, rather, a "common spring… and fall… migrant… from the plains of eastern Washington to the parks near timber line in the Cascade Mountains … wintering casually in the eastern part of the state" (op. cit.:647). The AOU (1957) concurred. Field work over the past 35 years has shown that the current status and distribution of these two subspecies in Washington is today quite different from those assessments, and we report here the first known case of apparent sympatry between these well-marked forms.

The first record of *gambelii* nesting in the state was from Hart's Pass, ~30 km south of the Canadian border, elevation 1900–2100 m (Farner 1958; see Figure 1 for location). A third subspecies, *Z. l. oriantha*, was added to the list of forms breeding in Washington in 1968, when Dennis Paulson found a nest in subalpine habitat at Salmo Pass, Pend Oreille County. Philip Mattocks (in litt. and *Audubon Field Notes* 24:702) collected a male in breeding condition at this site, at ~1800 m, in 1970. The report by Booth (1952) of nesting by the nominate subspecies, *Z. l. leucophrys*, in the Blue Mountains of southeastern Washington is attributable instead to *oriantha*. Presumably that population had simply been overlooked previously (Smith et al. 1997:470). Richard E. Johnson collected specimens in 1977 at 1830 m elevation on Mt. Misery, Blue Mountains (Connor Museum, Washington State University 77-548 and 77-630), and Dennis Paulson and John Wingfield observed territorial males there in 1996. The first breeding of *Z. l. pugetensis* on the east slope of the Cascades was recorded in 1988 along Morrison Creek in Kittitas County, at 700 m (loc. cit.). Territorial birds had been noted at Snoqualmie Pass (950 m) in the 1970s (Hunn 1982), however, and we noted singing male *pugetensis* regularly on the Cascades' east slope from Leavenworth, Chelan County (350 m), south to Conboy Lakes National Wildlife Refuge, Klickitat County (580 m), 1986–2003. This range expansion of *pugetensis* over the Cascade crest is no doubt mostly

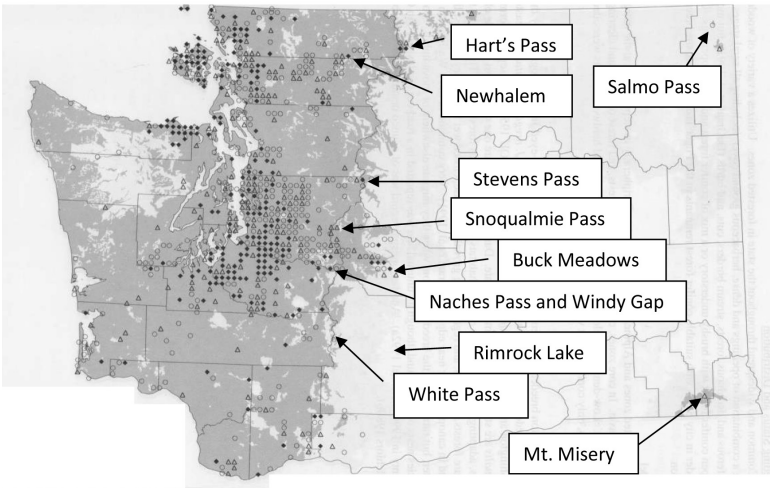

Figure 1. Locations cited in the text (base map from Smith et al. 1997:470).

Figure 2. *Zonotrichia leucophrys pugetensis*, Cooper Mountain Nature Park, Washington Co., Oregon, 13 May 2011.

Photo by David Irons

Figure 3. *Zonotrichia leucophrys gambelii*, Eugene, Lane Co., Oregon, 17 April 2010.

Photo by David Irons

attributable to extensive clear-cut logging, which had reached fever pitch by the 1980s (Smith et al. 1997; see also Addis et al. 2011).

METHODS

We reviewed our personal notes for the nesting season in the Washington Cascades, for Hunn since 1980, when he first noted the subspecies of singing White-crowned Sparrows, and for Beaudette since 1994. Hunn obtained audio recordings (analog with a Marantz PMD221 with a Sennheiser microphone and 13-inch parabolic reflector and digital with a Sony ICD-P330F with a Sennheiser K6 directional microphone), which we illustrate here with sonograms, of territorial males of both forms from the zone of apparent sympatry. Neither of us is an accomplished photographer, so our identifications have relied primarily on songs and observations of plumage tone, whether more or less brown or gray, particularly about the nape and flanks, and back striping, whether blackish on tan (*pugetensis*) or chestnut on gray (*gambelii*) (Figures 1 and 2).

Hunn reviewed the relevant literature (Jewett et al. 1953, Farner 1958, Chilton et al. 1995, Dunn et al. 1995, Wahl 1995, Smith et al. 1997, Stepniewski 1999, Beadle and Rising 2003, Wahl et al. 2005, Herlyn and Contreras 2009) and the Sound to Sage website (www.soundtosage.org), which summarizes data for King and Kittitas counties from the Washington Breeding Bird Atlas, much of which was recorded subsequent to that on which Smith et al. (1997) is based. Beaudette compiled his detailed written accounts of relevant observations from his participation in the atlas. Hunn then solicited reports and commentary from other local birders via www.tweeters.com, the Washington bird chat line, and received several additional reports and clarifications.

RESULTS

Beaudette documented several nests attended by pairs of *Z. l. gambelii* near Naches Pass, King County, 19 June and 3–7 July 1994 (see Figure 3). He wrote in his notes: "In the summer of 1994 I located a pair … in King County, Washington, … about 2 miles west of Naches Pass and in a clearcut at about 4500 [1372 m] feet elevation. They were observed on three dates [see below]. They were apparently double brooded. These are observations and not a formal study. No birds were banded or photographed; 19 June 1994, SE King County. T19N R11E section 33, el. 4550′ [1387 m]. A singing male *gambelii* present. A female *gambelii* at times just a few feet away. Both of these adults had food in bill and were agitated. They were observed feeding mobile young. Habitat: a regenerating clearcut with 4 foot to 15 foot tall Noble Fir [*Abies procera*] and Pacific Silver Fir [*A. amabilis*] with openings; 3 July 1994, at the same site listed on 19 June 1994, a singing male *gambelii* present. A female was observed nearby … on a nest … a cup in a small clump of fireweed, huckleberries, and other herbaceous plants. Nest was about three feet from two Pacific Silver Firs that were about 6 feet tall. Eggs, 3, greenish with reddish brown blotches—heaviest at the large end. Nest is 8 feet from a small rivulet. Nest elevation: 4540 feet [1384 m].…; 7 July 1994, female on the nest noted above, 3 eggs. Male singing nearby."

He noted the presence of territorial *Z. l. pugetensis* nearby at the same time and subsequently observed nests of both subspecies at Stevens Pass, on the King/Chelan County border on several dates between 15 June and 16 July 1996. "June 15, 1996, 4 singing males, Stevens Pass Ski Area, 3 singing male *pugetensis* and 1 singing male *gambelii*…, a singing male *pugetensis* was just 150 feet east of the *gambelii*; June 29, 1996, Stevens Pass Ski Area, a male *gambelii* singing just downhill from where it [presumably] was seen on 15 June 1996…, bill is orangish, back pale gray w/ reddish stripes; July 3, 1996, Stevens Pass Ski Area, 1 male *gambelii* singing,… a male *pugetensis* well upslope from the *gambelii*; at another location on the ski slope was a pair; both birds were very agitated and were seen just a few feet from each other, the male was carrying food in bill; the male looked to be a typical *gambelii*; [compare] the female: breast and flanks with a brown wash, back tan with blackish-brown stripes; the back was grayish along the outside edge, bill dull yellowish [thus apparently *pugetensis*]; July 4, 1996, nest, Stevens Pass Ski Area; adults are typical *gambelii*, male singing typical *gambelii* song, female on the nest; 4 eggs in nest, 4400′ [1341 m]…; nest on the ground in grass, forbs and low brush habitat, open area; July 16, 1996, nest, Stevens Pass Ski Area, y[oun]g in nest."

Hunn noted both subspecies singing on territories in close proximity to each other for several summers between 2006 and 2010 above and just below Government Meadows at Naches Pass in King County (at 1400–1525 m) and north of Windy Gap on the King–Kittitas County line (at ~1650 m). Identification was based solely on song. Hunn obtained digital audio recordings here of both subspecies on 12 June 2006 (Figures 4 and 5).

Since both subspecies favor open, brushy environments, territories have shifted somewhat as clearcuts have matured. Most recent reports are from an old burn and salvage-logged area at the crest just north of Windy Gap, ~4 km north of Naches Pass, at 1640 m (Figure 6). The most recent reports of apparent sympatry are of singing males of both forms at Buck Meadows, Kittitas County, 28 June 2012, by G. Shugart, who collected specimens (Slater Museum of Natural History, University of Puget Sound, Tacoma, Washington—PSM 25897 is *Z. l. pugetensis*, PSM 25763 is *Z. l. gambelii*). His notes are as follows (in litt., 2013): "Elevation was 4205-4210′ [1282–1283 m] at Buck Meadows in nets next to South Fork Manastash Creek [47.0358° N, 120.9478° W]. I hadn't expected *pugetensis*, but there were at least two birds singing at once. Probably more. … They were singing down along the creek in the flat [47.03668° N, 120.9505° W]. One *gambelii* was singing up on the hill side in rocky/scrub vegetation [47.0365° N, 120.9464° W], but it or another must have come down along the creek to the net. This was in last week of June 2012." D. Paulson (in litt., 2013) examined the specimens and concluded the following: "one specimen with *gambelii* song [is] typical *gambelii*, the other with *pugetensis* song [is] possibly intermediate.… This could well constitute evidence that they are interbreeding, at least at that place, which wouldn't be surprising if a *gambelii* of either sex found itself in a place surrounded by nothing but *pugetensis*."

In addition, there are reports of singing males of both forms north of Windy Gap (E. Houston, 5 July 2013), White Pass (G. McWethy, 13–14 July 2013), and near Rimrock Lake, Yakima County, 24 km east of White Pass,

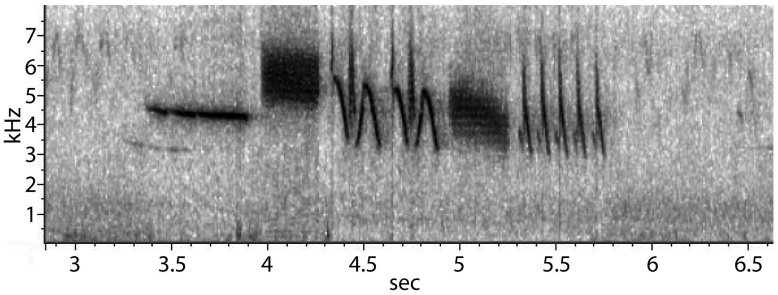

Figure 4. Song of *Zonotrichia leucophrys pugetensis,* 12 June 2006, Naches Pass trail head, 1400 m, King County, Washington.

Recording by Eugene Hunn

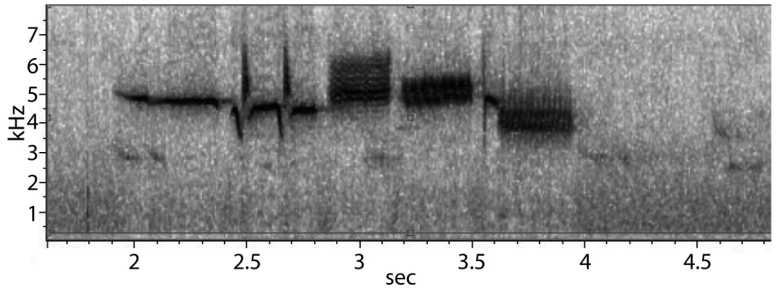

Figure 5. Song of *Zonotrichia leucophrys gambelii,* 12 June 2006, Naches Pass trail head, 1400 m, King County, Washington.

Recording by Eugene Hunn

at the unusually low elevation of ~800 m (W. Tweit, 6 July 2013; *gambelii* audio recorded). Away from Rimrock Lake, records of territorial *gambelii* are restricted to subalpine areas of the Cascades between 1300 and 2100 m. Wahl's (1995) report of *gambelii* from Newhalem, Whatcom County, at just 169 m elevation along the Skagit River ~40 km west of Hart's Pass, is likely an error, as Hunn recorded *pugetensis* there 21 June 1991, and a local observer, Hope Anderson (in litt., 2013), reported that *pugetensis* is common in summer at Newhalem, with no indication of *gambelii*. Subspecies *pugetensis* has not been documented on territory above ~1650 m, so the elevational zone of contact is limited.

DISCUSSION

Because of habitat alteration, the range of *pugetensis* now extends through several Cascade Mountain passes to the lower eastern slopes of that range. That subspecies apparently is adapting physiologically to mid-elevations in the central Cascades of Washington (Addis et al. 2011), and, elsewhere, it has been recorded in southern southeast Alaska since 2000

Figure 6. Habitat on the Cascade crest north of Windy Gap, site of frequent recent observations of both singing *Z. l. gambelii* and *Z. l. pugetensis*.

Photo by Eugene Hunn

(Gibson et al. 2013). Given the extensive clear-cut logging of coastal forests in British Columbia in recent years, this coastwise expansion of the range might have been anticipated.

The range of *Z. l. gambelii* now extends south along the Cascade crest to central Washington. Where the expanded breeding ranges of *pugetensis* and *gambelii* overlap, the two forms now nest in close proximity to each other with limited evidence of interbreeding, and they have done so for at least the past 20 years. This is in effect a "natural experiment" in which two long-isolated populations long considered to constitute a single species have now come in direct contact.

It is noteworthy that there is as yet no evidence of contact between *pugetensis* and *gambelii* on the Cascade crest north of Stevens Pass. Hunn noted singing *gambelii* but not *pugetensis* near Slate Peak north of Hart's Pass 11 July 1986 and 7 August 1992. Observers for the Breeding Bird Atlas noted what were presumably *gambelii* there also (see Wahl 1995, Smith et. al. 1997). In southwestern British Columbia, *Z. l. pugetensis* breeds from sea level up the Fraser River as far as the Sumallo Valley southeast of Hope at ~600 m, while *Z. l. gambelii* breeds in subalpine meadows above 900 m on the drier, more open eastern slopes of the northernmost Cascades in Manning Provincial Park (D. Cannings, in litt., 2013). Perhaps nesting *pugetensis* is largely absent north of Stevens Pass in part because of the rugged, timbered subalpine terrain characteristic of the northern Cascade

crest, an area that is for the most part protected from logging. The two forms thus remain isolated by unlogged forest in the northernmost Cascades.

The songs of *Z. l. nuttalli* and *Z. l. pugetensis*, in spite of their extensive dialect variation, have a distinctive structure, particularly in the opening phrases, which to our ears involve, for *pugetensis* at least, a melodic line beginning low, then high, followed by mid-level trills. The songs of *Z. l. leucophrys* and *Z. l. gambelii*, by contrast, share a melodic line beginning mid-level, followed by a lower trill, then high, and then descending notes (see Figures 4 and 5). Curiously, *Z. l. oriantha* sings both patterns: Rocky Mountain and Great Basin populations have songs reminiscent of *gambelii*, but those of Sierra Nevada populations more closely resemble the coastal pattern (Baptista and King 1980). On 26 July 2013, above 2600 m in the Ruby Mountains of northeastern Nevada, Hunn observed numerous examples of *oriantha* singing songs reminiscent of *gambelii*.

Distinguishing between these two White-crowned Sparrow subspecies groups on sight involves subtle but consistent characters. *Zonotrichia l. pugetensis* and *nuttalli* differ from *gambelii*, *oriantha*, and nominate *leucophrys* in at least four features: short versus long primary projection, reflecting shorter migrations or sedentariness; brown versus gray flanks, sides, and nape; black and tan versus chestnut and gray back striping; and white versus yellow bend of wing (Dunn et al. 1995). A combination of morphology, vocalizations, habitat preference, and pattern of migration clearly set these two forms of the White-crowned Sparrow apart.

How *Z. l. oriantha* fits within this complex remains uncertain. It breeds in the subalpine zone of "most mountain ranges throughout the e. part" of Oregon (Herlyn and Contreras 2009:253). It might come in contact with *pugetensis* in the Cascades of northern Oregon, as the latter has expanded its range into the mountains around Mt. Hood. Oregon observers report no evidence that *oriantha* breeds in the Cascades north of Willamette Pass, 190 km south of Mt. Hood, however (D. Irons in litt., 2013, contra Dunn and Alderfer 2011).

White-crowned Sparrow subspecies are suspected of having evolved in isolated refugia during the Pleistocene glacial advances (see Rand 1948). It seems reasonable to assume that the Pacific coastal forms were more completely isolated from the boreal/montane forms by a combination of continental and montane ice sheets than were the subspecies within each of the two groups.

A systematic study of the contact zone is needed to document the interactions of these two taxa along the crest of the Cascade Mountains more thoroughly. A wider sample of songs is desirable, as is photographic documentation of nesting pairs and, ideally, genetic comparisons of them. Our visual identification of subspecies was less than comprehensive, as we were not fully aware of the range of visible morphological contrasts during the period of our observations, relying primarily on gray versus brown coloration of flanks, sides, nape, and back. Also there are conspicuous gaps in coverage of potential contact sites, such as at Cascade Pass (1650 m), Rainy Pass (1500 m), and Washington Pass (1700 m) south of Hart's Pass and north of Stevens Pass, locations that would appear to be suitable for nesting by both *pugetensis* and *gambelii*. We hope that our initial summary will inspire such additional research.

ACKNOWLEDGMENTS

Thanks to the following observers for sightings and commentary: Hope Anderson, Matt Bartells, Gary Bletsch, Dick Cannings, Steve Giles, Evan Houston, David Irons, Barbara Jennings, Guy McWethy, Ryan Merrill, Dennis Paulson, Gary Shugart, Andy Stepniewski, Bill Tweit, and Wayne Weber. We are also grateful for the very helpful critical comments of Steven Heinl and Kimball Garrett, the reviewers for *Western Birds*, and to David Irons for permission to reproduce his photographs.

LITERATURE CITED

Addis, E. A., Davis, J. E., Miner, B. E., and Wingfield, J. C. 2011. Variation in circulating corticosterone levels is associated with altitudinal range expansion in a passerine bird. Oecologia 167:369–378.

American Ornithologists' Union. 1957. Check-list of North American Birds, 5th ed. Am. Ornithol. Union, Baltimore.

Baptista, L. F., and King, J. R. 1980. Geographic variation in song and song dialects of montane White-crowned Sparrows. Condor 82:267–284.

Beadle, D., and Rising, J. 2003. Sparrows of the United States and Canada: The Photographic Guide. Princeton Univ. Press, Princeton, NJ.

Booth, E. S. 1952. Ecological distribution of the birds of the Blue Mountains region of southeastern Washington and northeastern Oregon. Walla Walla College Publ. Dept. Biol. Sci. Biol. Sta. 7:65–107.

Chilton, G., Baker, M. C., Berrentine, C. D., and Cunningham, M. A. 1995. White-crowned Sparrow (*Zonotrichia leucophrys*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 183. Acad. Nat. Sci., Philadelphia.

Dunn, J. L., and Alderfer, J. K. 2011. Field Guide to the Birds of North America, 6th ed. Natl. Geogr. Soc., Washington, DC.

Dunn, J. L., Garrett, K. L., and Alderfer, J. K. 1995. White-crowned Sparrow subspecies: Identification and distribution. Birding 27:182–200.

Farner, D. S. 1958. A breeding population of *Zonotrichia leucophrys gambelii* in the northern Cascade Mountains of Washington. Condor 60:196.

Gibson, D. D., DeCicco, L. H., Gill, R. E. Jr., Heinl, S. C., Lang, A. J., Tobish, T. G. Jr., and Withrow, J. J. 2013. Third report of the Alaska Checklist Committee, 2008–2012. W. Birds 44:183–195.

Herlyn, H. G., and Contreras, A. L. 2009. Handbook of Oregon Birds: A Field Companion to *Birds of Oregon*. Ore. State Univ. Press, Corvallis.

Hunn, E. S. 1982. Birding in Seattle and King County: Site Guide and Annotated List. Seattle Audubon Soc., Seattle.

Jewett, S. A., Taylor, W. P., Shaw, W. T., and Aldrich, J. W. 1953. Birds of Washington State. Univ. of Wash. Press, Seattle.

Rand, A. L. 1948. Glaciation, an isolating factor in speciation. Evolution 2:314–321.

Smith, M. R., Mattocks, P. W. Jr., and Cassidy, K. M. 1997. Breeding Birds of Washington State, *in* Washington State Gap Analysis—Final Report (K. M. Cassidy, C. E. Grue, M. R. Smith, and K. M. Dvornich, eds.), vol. 4,. Publ. Zool. 1, Seattle Audubon Soc., Seattle.

Stepniewski, A. 1999. The Birds of Yakima County, Washington. A. Stepniewski, Yakima, WA.

Wahl, T. R. 1995. Birds of Whatcom County: Status and Distribution. T. R. Wahl, Bellingham, WA.

Wahl, T. R., Tweit, B., and Mlodinow, S. G. (eds.). 2005. Birds of Washington: Status and Distribution. Oregon State Univ. Press, Corvallis; www.soundtosage.org/soundtosage/.

Accepted 26 December 2013