

APPENDIX I

Specimens Examined

Physalaemus deimaticus.—BRAZIL: Minas Gerais: Serra do Cipó, Jaboticatubas (JJ 6057, holotype; JJ 6058, paratype).

Physalaemus erythros.—BRAZIL: Minas Gerais: Parque Estadual do Itacolomi, Ouro Preto (MNRJ 27539, holotype; MNRJ 27986, 30608, paratypes).

Physalaemus rupestris.—BRAZIL: Minas Gerais: Parque Estadual do Ibitipoca, Lima Duarte (MNRJ 10551, holotype; MNRJ 10552–53, paratypes; MNRJ 28812–24; MZUFV 4083–84).

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A NEW SPECIES OF *ABRONIA* (SQUAMATA: ANGUIDAE)
FROM THE SIERRA MADRE DEL SUR OF GUERRERO,
MEXICO, WITH COMMENTS ON *ABRONIA DEPPII*

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ABSTRACT: We describe a new species of lizard of the genus *Abronia* from the Sierra Madre del Sur of Guerrero, Mexico. This species previously was confused with its presumed sister taxon *Abronia deppii*. The discovery to the north of the Balsas Basin of additional specimens referable to *A. deppii* and a morphological comparison of these specimens to the populations of *Abronia* inhabiting the highlands of Guerrero to the south of the Balsas Basin clearly indicate that distinct species are present on each side of the Balsas Depression. Examination of the type material of *A. deppii* reveals that this name should be associated with the northern populations, and the southern population, often allocated to *A. deppii*, is an undescribed species. This new species is distinguished from *A. deppii* by having enlarged knob-like posterior head scales, no azygous scale between interparietal and interoccipital, a greater number of scale whorls on unregenerated tail, a greater number of infralabial scales, and dorsal and ventral coloration differences. We discuss the natural history of the new Guerrero species.

Key words: *Abronia deppii*; *Abronia martindelcampoi* sp. nov.; Anguidae; Guerrero, Mexico; Lacertilia; Taxonomy

THE ZOOLOGICAL literature on the lizard previously known as *Abronia deppii* has involved considerable confusion, apparently because of inadequate descriptions and the imprecise designation of the type locality. Additionally, a perplexing problem has arisen since the discovery of a disjunct population that was referred to *A. deppii* by Sánchez-H. and López-F. (1980). These authors reported *Abronia* from northwest of the Balsas Basin. They compared external morphological data for their only specimen (now catalogued in the Museo de Zoología, Facultad de Ciencias,

UNAM, as MZFC 764) with data for specimens identified as *A. deppii* by Bocourt (1878) and Bogert and Porter (1967) from the Sierra Madre del Sur in the State of Guerrero. Because of limited materials, no striking differences in scalation were noted between specimen MZFC 764 from the State of Mexico and descriptions of material from Guerrero.

Although they did not examine the type and paratype (Zoologisches Museum, Berlin; ZMB 1149, 1150, respectively), Sánchez-H. and López-F. (1980) proposed rejection of the restriction of the type locality of *A. deppii* to Omilteme, Guerrero, suggested by Smith and Taylor (1950). Sánchez-H. and López-F. (1980) suggested a corrected restriction to Temascaltepec-Real de Arriba, State of Mex-

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ico, in the vicinity of Valle de Bravo. One of the reasons for their proposal was the well documented fact that the collector of the type series of *A. deppii*, Ferdinand Deppe, never visited Guerrero, but traveled extensively in the State of Mexico (Sibley and Davis, 1946; Stresseman, 1954; Taylor, 1969).

During the last few years, several persons at various Mexican institutions have discovered additional specimens of *Abronia*, both in the mountains north of the Balsas Basin and in the Sierra Madre del Sur of Guerrero (Castro-Franco, 1987; Flores-Villela and Hernandez-Garcia, 1989; Flores-Villela and Muñoz Alonso, 1993). These specimens allow a more critical assessment of variation within and among the populations currently assigned to *A. deppii*.

MATERIALS AND METHODS

The present study is based on 37 adult specimens of *Abronia*, 9 and 28 individuals from the northern and southern populations, respectively (Appendix I); a few juveniles were also examined and their identities verified, but their morphological data are not included. We also had available a set of photographs, both black-and-white and color, of the type (ZMB 1149) and paratype (ZMB 1150) of *A. deppii* (Wiegmann, 1828).

We analyzed external morphological characters that traditionally have been used by other workers (Bogert and Porter, 1967; Campbell, 1982; Campbell and Frost, 1993; Good and Schwenk, 1985). Body measurements were taken with vernier calipers to the nearest 0.1 mm.

Based on our analysis of morphological characters and bolstered by the striking pattern of allopatry found among most species of the genus *Abronia* (e.g., Campbell and Frost, 1993, documented only one known case of sympatry), we regard northern and southern samples as representing two distinct species. These species differ from each other in details of scalation, body proportions, and color pattern. Flores-Villela (1993) indicated that the Guerrero population was a distinct species differing from *A. deppii*. The phylogenetic analyses published by Campbell and Frost (1993), Campbell et al. (1998), and Chippindale et al. (1998) clearly suggest that the populations to the north and south of the Río Balsas Depression represent different species

and represent sister taxa. The type specimen (ZMB 1149) and the paratype (ZMB 1150) of *A. deppii* possess morphological characteristics that unquestionably associate them with specimens of the northern populations (see Campbell and Frost, 1993), confirming that the restriction of the type locality for this species to Temascaltepec-Real de Arriba, State of Mexico, by Sánchez-H. and López-F. (1980) is appropriate.

In order to more clearly diagnose the new species from Guerrero, a redescription of *A. deppii* follows.

Abronia deppii (Wiegmann, 1828)

Gerrhonotus deppii—Wiegmann, 1828

Gerrhonotus deppii—Wiegmann, 1834; Günther, 1902

Abronia deppii—Gray, 1838; Tihen, 1949; Campbell and Frost, 1993

Gerrhonotus (Abronia) deppii—Bocourt, 1878

Type.—Zoologisches Museum, Berlin (ZMB 1149). One paratype (ZMB 1150: see Fig. 1).

Type locality.—Originally given as "Mexico," restricted to Temascaltepec-Real de Arriba, State of Mexico by Sánchez-H. and López-F. (1980). Restricted in error to the vicinity of Omilteme, Guerrero, by Smith and Taylor (1950).

Diagnosis.—This species has (1) the supra-auricular scales weakly developed knob-like, having no indication of spines; (2) supranasals not expanded and not in contact at dorsal midline; (3) frontonasal usually in contact with frontal; (4) posterior internasals almost twice as long as anterior internasals (1.8); (5) no canthals; (6) three anterior temporals in each side; (7) parietal separated from supraoculars; (8) single occipital; (9) posterior head scales weakly developed knob-like; (10) anterior superciliary not contacting the cantholoreale; (11) posterior subocular separated from the lower primary temporal by the penultimate scale in the supralabial series; (12) preauricular scales slightly enlarged and in one row; (13) two postmentals; (14) posterior infralabials elongated; (15) preauricular scales slightly enlarged; (16) six longitudinal nuchal scale rows; (17) 24–28 transversal dorsal scale rows; (18) 10–12 longitudinal dorsal scale rows; (19)

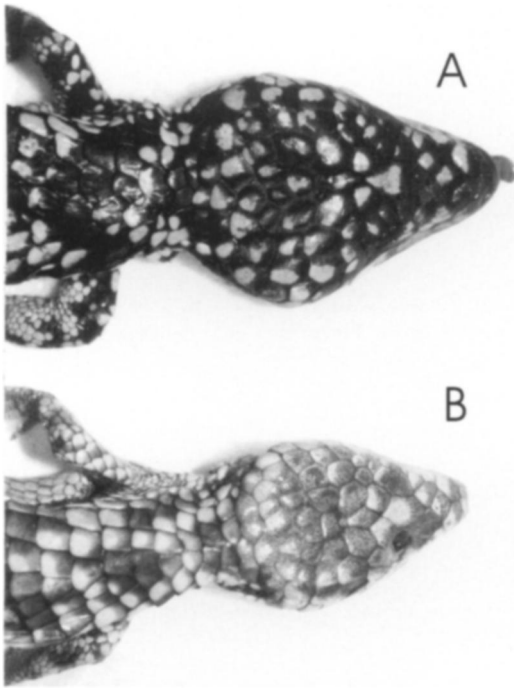


FIG. 1.—Dorsal aspect of the head of type and paratype of *Abronia deppii*. A: ZMB 1149; B: ZMB 1150. Photograph by George R. Zug.

12–14 longitudinal ventral scale rows; (20) six, sometimes seven, dark dorsal bands.

Abronia deppii can be distinguished from the Guerrero population by weakly developed knob-like posterior head scales (Fig. 2); lower anterior temporal in broad contact with antepenultimate supralabial; azygous scale between interparietal and occipital frequently present (about 60% of cases); head width < 22 mm in adult males and < 18 in adult females; ratio of head width to head length < 0.75 in adult males; scale whorls on tail 68–80 (\bar{x} = 77); infralabial scales 7–8; preauricular scales only slightly enlarged; longitudinal dorsal scale rows 10–11; dorsum with well defined bold black crossbands, confluent and more or less symmetrical on vertebral region; dorsal head coloration with pattern of black and white irregular blotches; ventral color in adult males tends to be reddish, occasionally bright red; upper lips marked with black. Differs from other species of the subgenus *Abronia* (sensu Campbell and Frost, 1993) by having oblique longitudinal rows of dorsal scales, where *fuscolabialis*, *taeniata*, and *graminea* have

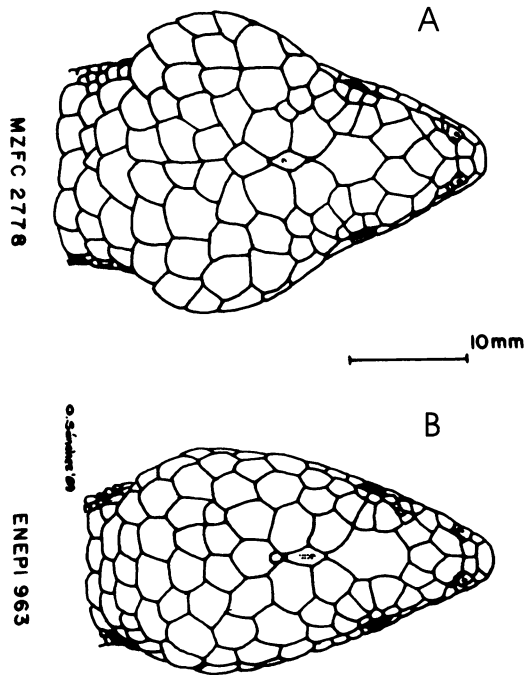


FIG. 2.—Dorsal aspect of the head A: of the holotype of *Abronia martindelcampoi*, adult male, MZFC 2778; B: of an adult male *A. deppii*, ENEPI 963. Notice the well developed knob-like posterior head scales of *A. martindelcampoi*, as well as the presence of an azygous scale between the interparietal and interoccipital in *A. deppii* (present in 54% of the individuals examined, see text for details). Head length is approximately the same for both specimens.

parallel longitudinal scale rows, where *taeniata* and *graminea* do not; has one lower temporal contacting postocular series; and a single occipital, where *mixteca* and *oaxacae* have three occipitals and two primary temporals contacting postocular series; has body coloration that it is not uniformly green, where *graminea* is; has six nuchals, where *graminea* has four (only juveniles of *graminea* have bands on the dorsum of the body).

Description.—A species of *Abronia* having 24–28 (\bar{x} = 26.2) transverse dorsal scale rows; 10–12 longitudinal dorsal scale rows (\bar{x} = 10.6); 34–37 (\bar{x} = 35) transverse ventral rows; 12–14 (\bar{x} = 13.3) longitudinal ventral scale rows; 76–80 scale whorls on unregenerated tails; usually minimum of six nuchal scales (one of 12 specimens had 5); 6–8 (\bar{x} = 6.6) scales between hind legs; 9–10 supralabials; anterior temporals 3/3; posterior temporals 3/3; 5/5

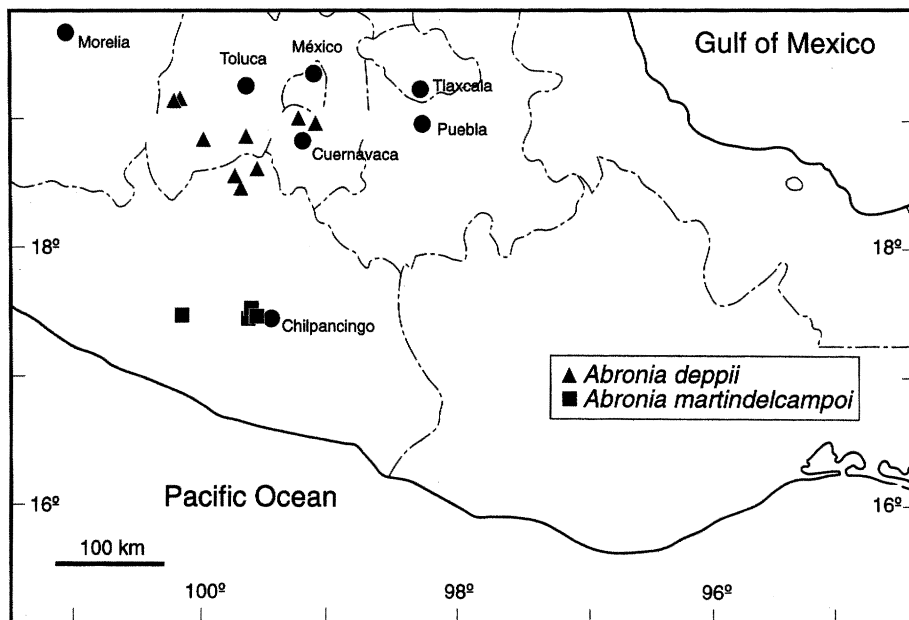


FIG. 3.—Distribution of *Abronia deppii* and *A. martindelcampoi* in South Central Mexico. Triangles represent known localities for *A. deppii* and squares show known localities for *A. martindelcampoi*; dots refer to major cities. See Appendix I for specific localities.

medial supraoculars; one temporal in contact with postocular; usually one subocular (2 of 12 specimens had 2, see Good, 1988:20); two postmentals; and a single occipital. Supranasals not expanded; frontonasal and frontal usually in contact; no contact of anterior superciliary and cantholoreal (only 1 of 12 had contact); lateral neck scales enlarged; osteoderms reduced or absent on dorsum of adults.

Coloration.—Dorsal ground color whitish or grayish in preservative (white in life); usually with six or occasionally seven dark dorsal bands confluent on mid-dorsum; adult males with tendency toward especially dark dorsum. Tail with 11–15 ($\bar{x} = 12.6$) dark bands; dorsum of head with sharply defined irregular black and white blotches. Ventral coloration whitish with reddish hues on gular and pectoral regions (in some adult males, venter intense red-orange, as well as plantar and palmar surfaces).

Measurements.—Maximum snout-vent length in adults 115 mm; maximum head length 31 mm; head width 21.8 mm.

Distribution.—This species is known from several localities in the mountain ranges north of the Balsas Basin (Fig. 3), from the Sierra de

Chichinautzin, Morelos, to Temascaltepec-Real de Arriba, Mexico, from approximately 1850–2600 m above sea level (see Appendix I for specific localities).

The species of *Abronia* from the highlands of Guerrero was originally allocated to *A. deppii* (Bocourt, 1878). However, in view of our current understanding of the type material of *A. deppii* and the variation exhibited by this species, we propose that the populations from Guerrero be known as:

Abronia martindelcampoi sp. nov.

Abronia deppii—Smith and Taylor, 1950; Tihen, 1954; Bogert and Porter, 1967 [also spelled as *deppeii*]; Good and Shwenk, 1985; Good, 1988

Abronia deppi—Davis and Dixon, 1961

Holotype.—Adult male, Museo de Zoología, Facultad de Ciencias UNAM (MZFC 02778). Collected in Mexico, Guerrero, Chilpancingo, Omiltemi, Orilla Norte in oak forest at 2250 m on 7 April 1985 by Antonio Muñoz Alonso (Field number AMA-033).

Paratypes.—Mexico, Guerrero, Chilpancingo, Parque Ecológico Estatal Omiltemi: MZFC 02774–77, 02779–82, 02875; Atoyac,



FIG. 4.—*Abronia martindelcampoi*, paratype from 0.8–1.6 km NE Puerto del Gallo, Guerrero, Mexico; now cataloged as UTA-R 12136. Photo by W. W. Lamar, courtesy of J. A. Campbell.

Carrizal de Bravos (MVZ 164922); Atoyac, Carrizal de Bravos, 60 km by road (LACM 109262); Atoyac, Carrizal de Bravos, 1 km SW (MVZ 110941, 164922, 134109); Vicinity of Chilpancingo (AMNH 72543, MVZ 45005); Omiltemi (BMNH 1913.7.19.98, 1913.7.19.99, 1913.7.19.100, 1913.7.19.101; MVZ 57173, UTA-R 4451, 5645, 5646, 5653); Puerto del Gallo (UTA-R 4151); 0.8–1.6 km NE Puerto del Gallo (UTA-R 12136); San Miguel Totolapan, 1 km W of Toro Muerto (MZFC 765).

Diagnosis.—This species has (1) supra-auricular scales protuberant and knoblike, with no indication of spines; (2) supranasals not expanded and not in contact at dorsal midline; (3) frontonasal present and usually not in contact with frontal; (4) posterior internasals almost twice as long as anterior internasals (1.6–2.0); (5) no canthals; (6) three anterior temporals; (7) parietal not in contact with median supraoculars; (8) a single occipital; (9) posterior head scales strongly convex and knoblike; (10) anterior superciliary not in contact with cantholoreal; (11) posterior subocular in broad contact with lower primary temporal; (12) preauricular scales notoriously enlarged and in one row; (13) postmentals usually two (only 1 out of 14 had one); (14) posterior infralabials usually elongated; (15) six

longitudinal nuchal scales; (16) dorsal scales in 23–27 transverse rows; (17) dorsal scales in 10–12 longitudinal scale rows; (18) ventral scales in 12–14 longitudinal scale rows; and (19) 5–6 brown dorsal markings in adults (Fig. 4).

Abronia martindelcampoi differs from *A. deppii* in having (1) well developed enlarged knob-like posterior head scales (Fig. 2); (2) lower anterior temporal fused with penultimate supralabial; (3) no azygous scale between interparietal and interoccipital; (4) preauricular scales notoriously enlarged; (5) head width in adult males >22 mm and >18 mm in females; (6) ratio of head width to head length >0.75 in adult males; (7) number of scale whorls on unregenerated tail 77–86 ($\bar{x} = 80.7$); (8) number of infralabial scales 8–10 (only one had seven); (9) number of longitudinal dorsal scale rows 10–12; (10) dorsal ground color grayish to pale olive green in life (grayish in preservative) with dark brown markings which, if confluent on the vertebral region, may be asymmetrical; (11) dorsum of head pale brown to olive green, usually unblotched, individual scales with fine dark vermiculations, some specimens with large dark area on top of head, more, rarely a few, black individual scales (including both upper anterior temporals); (12) ventral region immaculate cream colored

in adults, rarely with faint suggestion of yellowish orange (see below); and (13) upper lips mostly unmarked. It differs from other species of the subgenus *Abronia* (sensu Campbell and Frost, 1993) in having oblique longitudinal rows of dorsal scales, where *fuscolabialis*, *taeniata*, and *graminea* have parallel longitudinal scale rows and *taeniata* and *graminea* do not; in most specimens, one lower temporal contacts the postocular series and a single occipital, where *mixteca* and *oaxacae* have three occipitals and two primary temporals contacting postocular series; has body coloration that is not uniformly green like *graminea*; has six nuchals, where *graminea* has four (only juveniles of *graminea* have bands on the dorsum of the body).

Description of holotype.—Measurements (all measurements in mm): Snout–vent length 115; head length (from tip of snout to posteriormost edge of head) 31.5; head width 25.2; head depth 14.7; tail length 163.

The supra-auricular scales are knob-like and without any indication of spines; small supranasals and not in contact at dorsal midline; rhomboid frontonasal, separated from frontal; posterior internasals 1.6 times larger than anterior internasals; cantholoreal evident from above the head and large; anterior superciliary not in contact with cantholoreal; and a single occipital. On each side of the head are 10 supralabials; three anterior temporals; three posterior temporals; three scales between occipital and first nuchal row; five median supraoculars; one temporal contacting the postocular; one subocular; parietal not in contact with median supraoculars; preauricular scales in one row and notoriously enlarged; two postmentals; and posterior infralabials enlarged. The following combinations of scales all fail to make contact with one another: frontonasal-frontal, temporal-subocular, superciliary-prefrontal, and superciliary-cantholoreal. The postparietals are not reduced; the lateral neck scales are enlarged. The specimen has 27 transverse dorsal scale rows; 12 longitudinal dorsal scale rows; 2 postmentals; 6 nuchal scales across neck; 34 transverse ventral rows; 14 longitudinal ventral scale rows; 80 scale whorls on unregenerated tail; 6 scales between hind limbs; 20 lamellae under fourth toe. A weak lateral fold is present; the lateral dorsal scales are arranged in oblique

rows, and no osteoderms are present beneath the scales on the trunk.

Coloration.—Head olive green with each dorsal scale having fine dark vermiculations, with only a faint indication of dark blotches on the first nuchal row; supralabial region slightly paler than dorsum of the head; black markings behind ear openings. Ground color of dorsum pale olive green with some brownish areas, with six narrow, dark crossbands, each about one scale wide (Fig. 4). Dorsolateral scales with white posterior edge; tail inconspicuously marked (13 bands). The ventral region is immaculate and cream colored (in preservative), and the gular region is pale.

Color variation.—In some specimens the dorsal crossbands are interrupted middorsally and are asymmetrical. The ground color may be olivaceous to pale brown, and the tail blotches may be relatively conspicuous (in preservative); the dorsolateral scales may lack white posterior edges, while in other specimens white-tipped scales may cover the dorsum. The ventral coloration in some specimens is pale orange, but usually is not intense (the only specimen that apparently had bright orange ventral coloration was MVZ 45005). The color described by Good (1988) in his account of *A. deppii* is based on *A. martindelcampoi*.

Comparisons.—For comparisons with other species of the genus, see table 1 in Good and Schwenk (1985) under *A. deppii*.

Distribution.—This species is known only from the Sierra Madre del Sur (Fig. 3), Mexican State of Guerrero from 2100 to 2600 m above sea level (see Appendix I for specific localities). There is one specimen (BMNH 1913.7.19.102) from Amula, Guerrero, tentatively assigned to this taxon.

Etymology.—This species is named after the late Rafael Martín del Campo y Sánchez in recognition of his contributions to the development of modern Mexican herpetology, and particularly for his knowledge of gerrhonotine lizards.

Miscellaneous natural history notes.—During field work at Omiltemi, Guerrero, we collected an *Ophryacus undulatus* whose stomach contained an *A. martindelcampoi*. A courting pair of *A. martindelcampoi* was collected in pine-oak forest on 4 August 1985. A female collected May 1989 by Jack Sites at Omiltemi gave birth to six young, and another

specimen (UTA-R 5653), collected August 1975 by J. A. Campbell, gave birth to two young in December 1975. Davis and Dixon (1961) reported that a female taken in June contained enlarged ovarian follicles. The defensive display consists of opening and expanding the lower jaw and biting. Results of an analysis of the gonads of the female suggest that the species is a fall breeder.

In a recent visit to Omiltemi, the type locality of *A. martindelcampoi*, we found that there is no longer a protected state park; instead, logging and other human activities were taking place, even though the city of Chilpancingo (capital of Guerrero) receives high quality water from the mountains around Omiltemi. This new situation may put populations of *A. martindelcampoi* and the biota of that portion of the Sierra Madre del Sur at risk.

RESUMEN

Se describe una especie nueva de lagartija del género *Abronia* proveniente de la Sierra Madre del Sur, Guerrero, México. Esta especie fue confundida en el pasado con *A. deppii*. El hallazgo de especímenes provenientes de la parte norte de la cuenca del Balsas y su estudio morfológico, indican que las poblaciones de *Abronia* que habitan las tierras altas al sur de la cuenca del Balsas deben ser reconocidas como un taxón diferente. *A. martindelcampoi* sp. nov. se distingue de *A. deppii* por presentar las escamas posteriores de la cabeza alargadas y redondeadas a manera de perilla; por la ausencia de una escama áziga entre la interparietal y la interoccipital; por presentar un mayor número de hileras de escamas en la cola, no regenerada; mayor número de escamas infralabiales y por las diferencias en coloración dorsal y ventral. Se agregan comentarios sobre la historia natural de *A. martindelcampoi*.

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- APPENDIX I
- Specimens Examined*
- Abronia deppii*.—MEXICO: MEXICO 1 km SSW from Valle de Bravo, 2000 m (UTA-R 31634, formerly MZFC 764); Valle de Bravo (MZFC 4307); Avandaro, approximately 2050 m (MZFC 2015); Ixtapan de la Sal, Km 9 on the road to Zacualpan-Mamatla, 1900 m (ENEPI 963); Km 9 on road from Zacualpan to Mamatla, 40 km from Ixtapan de la Sal (MZFC 6294, formerly ENEPI 1001); GUERRERO: Ixcateopan de Cuahutémoc, Km 28 on road Taxco-Ixcateopan, 2100 m (MZFC 3992); Pedro Ascencio de Alquiciras, Cruz Alta, 2560 m (MZFC 3991); Tetipac, Arroyo las Damas, 1850 m (MZFC 3993); MORELOS: Derrame del Chichinautzin, 2250 m (MZFC 2015); Huitzilac, N of CEBETIS, 2600 m (EBUM 0425). *Photographic material*.—MEXICO: no specific locality (ZMB 1149, type); no specific locality (ZMB 1150, paratype).
- Abronia martindelcampoi*.—MEXICO: GUERRERO: Amula (BMNH 1913.7.19.102); Atoyac, Carrizal de Bravos, 2407.9 m (UC-MVZ 164922); Carrizal de Bravos, 60.3 km SW by road (LACM 109262); Carrizal de Bravos, 0.96 km SW, 2200 m (UC-MVZ 134109); Chilpancingo Omiltemi, 2250 m (MZFC 2781, 2784, 2875; ENEPI 964; UC-MVZ 57173; UTA-R 4451, 5653); Omiltemi, 2436 m pine-oak forest (UTA-R 5645–46); Omiltemi, 2 km SE, 2250 m (MZFC 2774, 2775, 2777); Omiltemi, N of town, 2250 m (MZFC 2776, 2778 holotype); Omiltemi, 500 m E of town, 2250 m (MZFC 2779); Omiltemi, 2 km E, Barranca de Potrerillos, 2200 m (MZFC 2780); Omiltemi NW of town, 2250 m (MZFC 2782); Omiltemi SW side of town, 2250 m (MZFC 2783); Omiltemi (BMNH 1913.7.19.98–101); San Miguel Totolapan, 1 km W of Toro Muerto, 2600 m (MZFC 765); Filo de Caballo?, 2000 m (MZFC 766); Vicinity of Chilpancingo (AMNH 72543; UC-MVZ 45005); Puerto del Gallo (UTA-R 4151); 0.8–1.6 km NE Puerto del Gallo, 2560–2804 m (UTA-R 12136).
- Other materials examined*.—*Abronia martindelcampoi* MEXICO: GUERRERO: Atoyac, Carrizal de Bravos, 1 km W by road (LACM 127415); Carrizal de Bravos, 0.96 km SW, 2200 m (MVZ 110941); Chilpancingo, Omiltemi 2286 m elevation (MVZ 57163).