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## A new species of *Alsodes* (Anura: Leptodactylidae) from Cerro Mirador, Cordillera Pelada, southern Chile

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*Abstract.*—A new species of frog, *Alsodes valdiviensis*, is described from the locality of Cerro Mirador, Cordillera Pelada, southern Chile, based on adults, osteology, and karyotype. No sympatric occurrence of another congeneric species is known from the type locality.

The Cordillera Pelada (65 km length, maximum altitude 1100 m) is part of the Chilean Coastal Range situated between the rivers Calle-Calle and Bueno (Valdivia Province, southern Chile, Fig. 1). In the near past, most surface of this area was covered by *Nothofagus* (Fagaceae) and *Fitzroya cupressoides* (Cupressaceae) forests; however, high degree of human-induced disturbance can be observed (forestry and fire) and few spots of the original forests remain. One of these residual areas is Cerro Mirador (40°08'S, 73°40'W) where a series of herpetological collections was made between 1998 and 2000. As a result of this fieldwork a new species of frog of the genus *Alsodes* was collected. Frogs of the genus *Alsodes* Bell 1843, are distributed in central and southern Chile and along the eastern slope of the Andes, in Argentina (south of Mendoza city) (Formas et al. 1998). The following species have been described: *A. australis*, *A. barrioi*, *A. gargola*, *A. hugoi*, *A. illotus*, *A. kaweshkari*, *A. laevis*, *A. montanus*, *A. monticola*, *A. nodosus*, *A. pehuenche*, *A. tumultuosus*, *A. vanzolinii* and *A. verrucosus*. The taxonomic status of *A. illotus* and *A. laevis* are not clear (Cei 1980, Frost 1985).

In this paper the new species of *Alsodes* collected from Cerro Mirador is described, including karyotype, C-banded chromosomal pattern, and osteology. The new taxon is compared with its congeners.

### Materials and Methods

The description of the new species is based on 13 frogs (see Specimens Examined) from Cordillera Pelada, Valdivia Province, southern Chile. Specimens and microscopic slides were deposited in the Instituto de Zoología, Universidad Austral de Chile (IZUA). Measurements were taken with a dial caliper to the nearest 0.1 mm. Adults were measured according to Cei (1962). The following data were taken: snout-vent length (SVL), head length, head width, tibia length, and foot length. Internarial distance was measured according to Cei (1980). Eye diameter was taken according to Duellman (1970). Osteological observations were made on four adult specimens (IZUA 2220, 2221, 3221, 3222), in which cleared and stained skeletons were prepared following the methods of Hollister (1934) and Song & Parenti (1995). Carpal elements were identified according to Fabrezi & Alberch (1996).

The chromosomal characteristics were observed from five specimens of the new species (two males, one female, and two juveniles; IZUA 3237–3241) and adult female (IZUA 3317) of *Alsodes barrioi* which were injected with 0.1% colchicine. After two hours, the frogs were anaesthetized with diethyl ether, cut open ventrally under sterile conditions and the intestine carefully removed. Metaphase plates were obtained by squashing intestinal epithelium

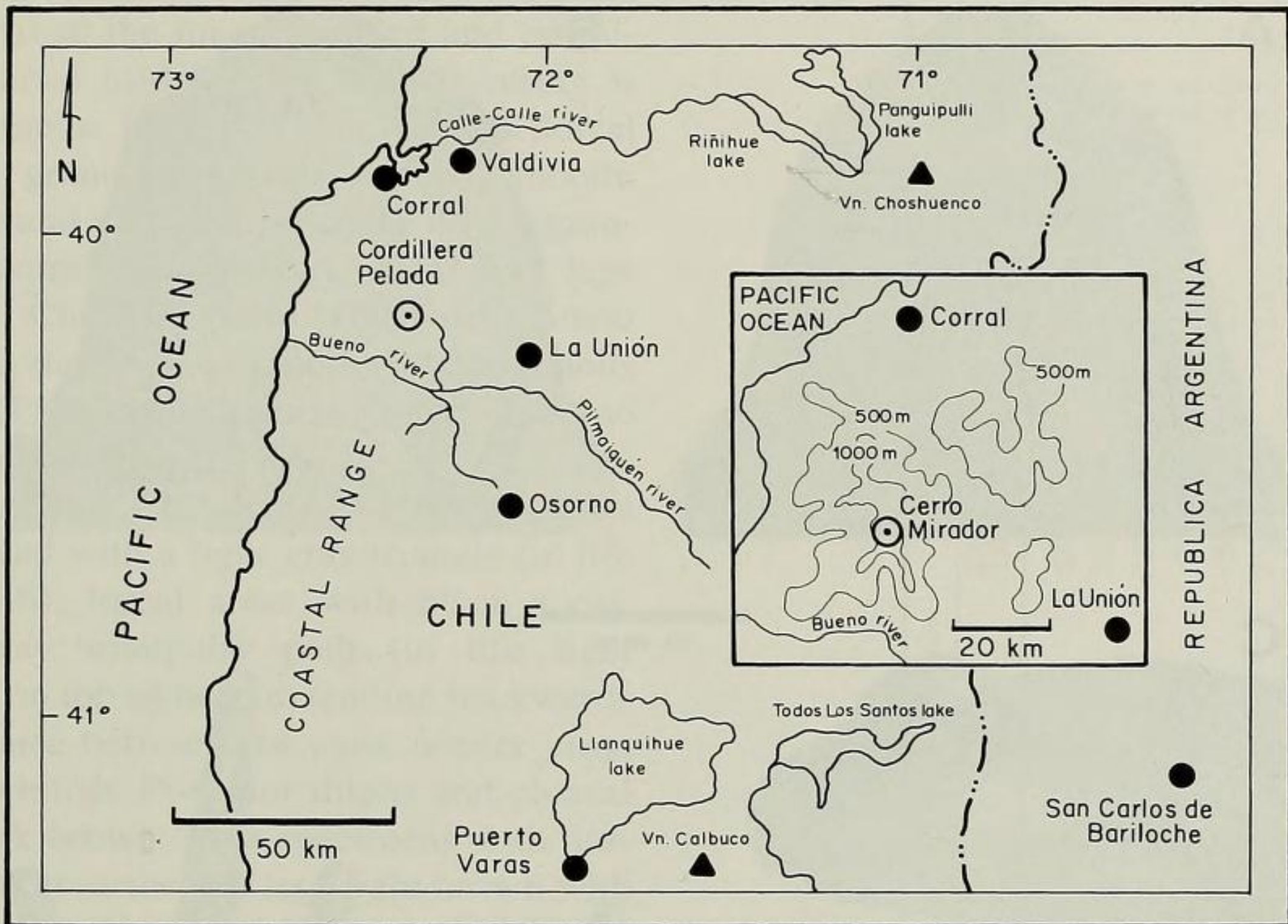


Fig. 1. Type locality of *Alsodes valdiviensis*.

fragments. These were hypotonically treated with distilled water, then fixed in acetic-alcohol (1:3), and finally placed in 45% acetic acid. Small fragments of tissue were squashed between a glass slide and cover slip and dipped in liquid nitrogen; thereafter, the cover slip was removed with a razor blade and chromosomes were allowed to air dry. After three days, the chromosomes were stained for 15 min in Sørensen's buffer (pH 6.8), containing 4% Giemsa solution (Formas 1991). Centromeric positions were determined according to Levan et al. (1964). Chromosomes were treated to reveal C-band patterns according to Sumner (1972).

## Results

### *Alsodes valdiviensis*, new species

**Holotype.**—IZUA 3202, an adult male collected by Lila Brieva, César C. Cuevas and José Nuñez on 13 November 2000; at Cerro Mirador (40°08'S, 73°40'W; 1100 m altitude) 60 km W La Unión (by road) Provincia Valdivia, Región de Los Lagos.

**Paratypes.**—Two adult males from the type locality: IZUA 3203, 3241.

**Diagnosis.**—A large-sized species of *Alsodes* (39.5–63.4 mm) having the following combination of characters: (1) snout strongly truncated in dorsal profile; (2) toes thin and fringed; (3) webbing reduced; (4) legs and arms without dark bars; (5) head with a yellowish triangle; (6) medium-sized nasals; (7) columella absent; (8) transverse processes of the Presacral Vertebra VI laterally oriented; (9) 26 banded chromosomes.

**Description of the holotype.**—Body robust, arms and legs well developed. Head 1.2 times wider than long; its length 31.5% of snout–vent length. Snout truncated in dorsal and lateral profiles (Fig. 2A, C), canthus rostralis well developed, straight; loreal region slightly concave in cross section with minute granules; nostrils anterolateral, approximately midway between tip of snout and anterior border of the eye; eye diameter 1.7 times eye–nostril distance; interorbital distance 1.5 times internarial distance. Tympanum absent; postocular fold well developed. Tongue rounded with notch at the

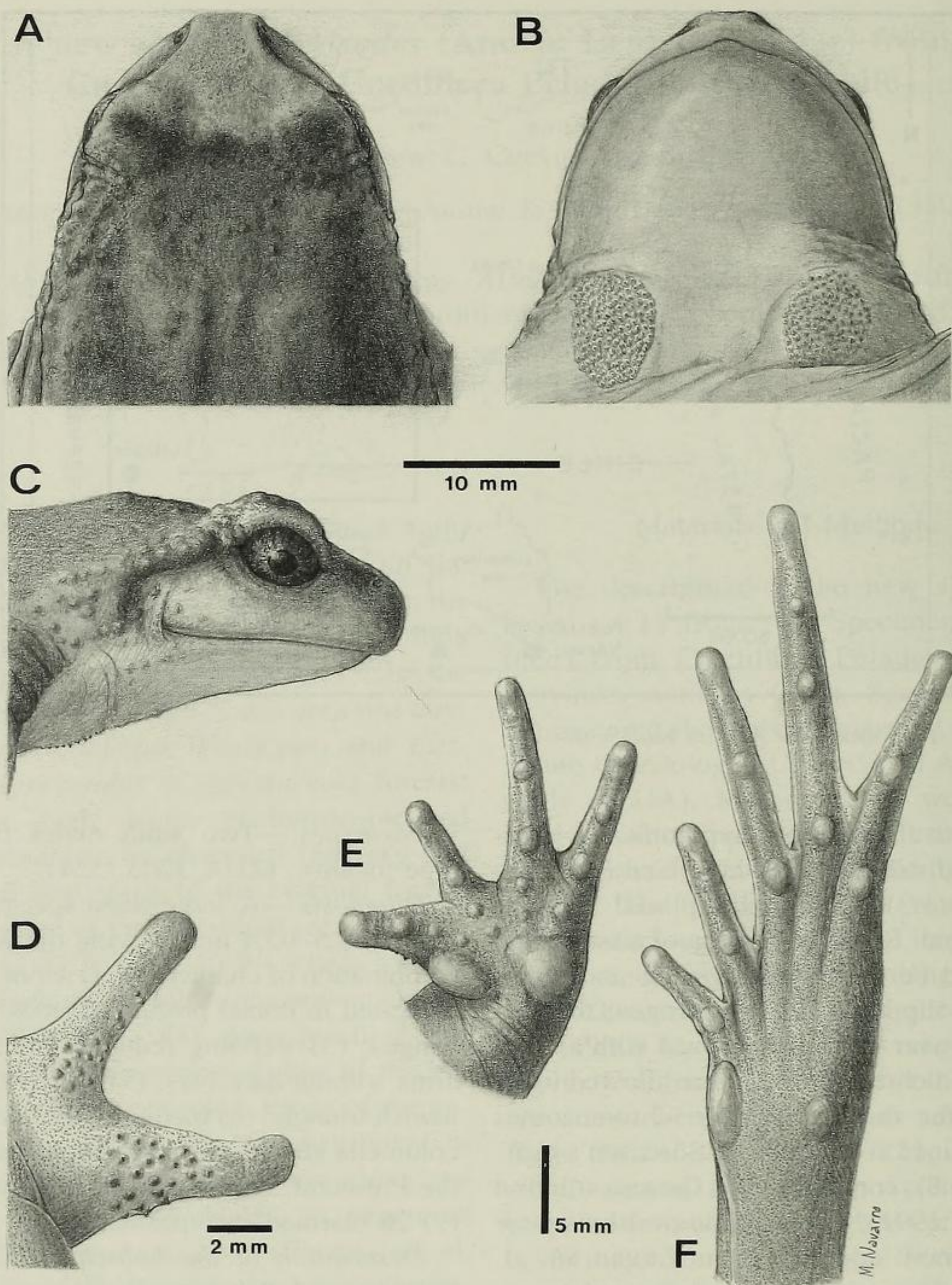


Fig. 2. Morphological details of the male holotype IZUA 3202 of *Alsodes valdiviensis*. Dorsal (A), ventral (B), and lateral (C) views of head, nuptial asperities (D), palmar (E), and plantar surfaces (F).

tip; choanae rounded; dentigerous processes of vomer between choanae, bearing 6–7 teeth. Forelimbs of males not hypertrophied. Fingers in order of increasing length: I = II–IV–III. Webbing of hand absent. Fingers long with globular tips. Palmar tubercles prominent, ovoid in form; palmar tubercles small (4), prominent and rounded (Fig. 2E). Males with dorsal surface of first

finger with thorny excrescences; second finger with a narrower band of spines (Fig. 2D). Hind limbs normally developed; tibio-tarsal joint reaches the anterior border of the eye. Toes long, thin and fringed; in order of increasing length: I > II > III = V > IV; tips rounded. Webbing present, thin, but reduced. Inner metatarsal tubercle oval, prominent, elongate; outer palmar tubercle

smaller than the inner, rounded and prominent. Tarsal fold present, thin, covering  $\frac{3}{4}$  of the tarsus (Fig. 2F). Flanks and dorsal surface granular; ventral surface smooth; skin around vent and posterior thighs granular; ventral skin smooth. Arms and legs smooth. Chest of males with two bilateral rounded dark-brown patches of keratinous spines (Fig. 2B). Measurements of the type series are shown in Table 1.

*Coloration.*—In alcohol, dorsal surfaces gray; head with a light gray triangle (in life yellowish); loreal areas with black spots; dark gray triangular path (in life light brown) on top of head extending backwards from space between the eyes. Venter gray; throat whitish. Posterior thighs and cloacal area dark brown. Live specimens with dorsal surfaces, arms and legs light brown with golden tints. Venter and throat whitish. Iris black with bronze reticulations.

*Osteology.*—Skull massive, slightly wider than long, rounded in dorsal aspect with broadly rounded snout; subrectangular-shaped in lateral profile. Endochondral ossification of neurocranium limited to ossification of exoccipitals and prootic. Exoccipitals widely separated from one another dorsomedially; ventromedially fused, unstalked occipital condyles. Prootic ossification limited to anteromedial part of otic capsule and not in contact with exoccipitals dorsomedially. Frontoparietals well developed and not in contact; bones acuminate anteriorly and overlying dorsolateral braincase from anterior part of the orbit posteriorly to contact the anteromedial border of exoccipitals and medial margins of prootics. Dorsum of braincase with a large frontoparietal fontanelle (0.5 times skull length); the anterior half wider than the posterior one. Nasals tear-like in form, medium-sized, widely separated one from the other, posterolaterally oriented. Parasphenoid massive, alae medium-sized, in right-angle with cultriform process, slightly dilated, and associated with prootic anteriorly; posteromedial process slightly extended; anterior extreme of cultriform process

Table 1.—Measurements (mm) of the type series, adults, and juveniles of *Alsodes valdiviensis*.

Character	Males			Females			Juveniles	
	Holotype IZU A 3202 male	Paratype IZUA 3203 male	Paratype IZUA 3241 male	IZUA 1529	IZUA 3240	IZUA 1530	IZUA 3237	IZUA 3238
Snout-vent length	58.6	58.6	52.9	59.8	39.7	63.4	30.1	34.2
Head length	18.5	18.7	18.5	21.1	13.8	20.5	9.7	12.4
Head width	22.5	22.3	20.6	21.5	13.9	22.6	9.9	12.4
Eye diameter	7.2	6.6	5.7	7.1	4.6	7.9	2.6	3.5
Internarial distance	5.9	5.8	4.5	5.4	3.4	5.3	2.9	4.0
Tibia length	29.3	25.3	24.8	30.9	18.0	28.7	12.3	15.2
Foot length	47.3	44.3	39.1	51.5	27.2	48.1	19.8	23.4

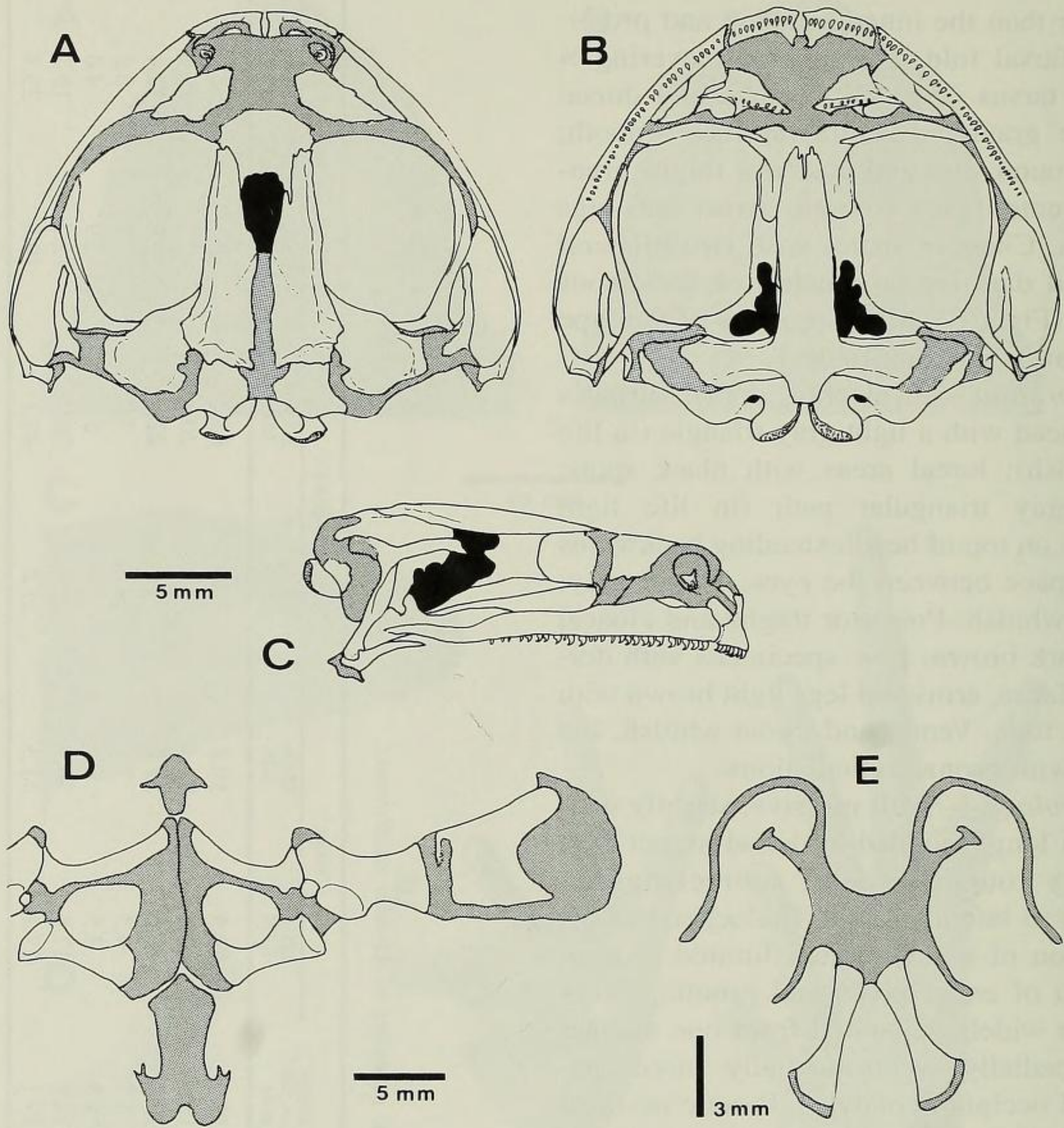


Fig. 3. Dorsal (A), ventral (B), and lateral (C) views of the skull of the specimen IZUA 3221 of *Alsodes valdiviensis*. Pectoral girdle (D), and hyoid (E).

notched, almost reaching the neopalatines. Neopalatines slender, slightly curved (anteriorly concave) medially reaching up the sphenethmoid, laterally in contact with maxillae. Prevomers medium-sized separated medially and oblique in position, bearing seven well developed teeth. Maxillary arcade composed of robust premaxillae with alary processes dorsally directed, ten developed teeth, palatine processes well developed; slender maxillae with low pars facialis, lacking orbital processes, 29–31 maxillary teeth, and short quadratojugals not articulating with maxillae. Pterygoids slender, lacking flanges, anterior ramus ter-

minating nearly the anterior part of orbit and not in contact with the palatine shelf of the maxilla; posterior ramus well developed reaching the palatoquadrate cartilage; medial ramus terminating on anteroventral margin of otic capsule and in slight contact with prootic bone. Squamosals T-shaped in lateral aspect, with slender otic and zygomatic rami; otic ramus shorter than zygomatic; otic ramus located along dorsolateral margin of cartilaginous crista parotica; ventral ramus straight contacting the quadratojugal. Jaw articulation at the same level of fenestra ovalis. Operculum present. Stapes and tympanic annulus absent.

Hyoid corpus relatively narrow, about 70% broader than midline length; hyoglossal sinus narrow and deep; hyalia simple, uniform in shape, and lacking processes; anterolateral processes of hyoid medium-sized and distally expanded, slender, directed anterolaterally; posterolateral processes slightly elongated, slender, arcuate, directed posterolaterally; posteromedial processes well ossified, robust, broadly separated from one another anteriorly; terminating in cartilage posteriorly.

Pectoral girdle arciferous and delicate. Clavicles slender, well ossified; transverse axis of clavicular region quite straight, but anterior margin of bone arcuate. Coracoids straight, short; sternal and glenoid ends slightly expanded. Pectoral fenestra shallow, nearly as long as broad, anterior margin and medial margin cartilaginous, posterior margins formed by coracoid, lateral margin cartilaginous. Epicoracoids cartilages well developed; anterior termini anterior to medial end of clavicles and broadly separating these bones. Omosternum well developed, cartilaginous, distal end arrow-shaped. Sternum cartilaginous, as long as clavicle, distally expanded, with two delicate cartilaginous fibres posteriorly, notched.

Scapula short, robust, as long as clavicle, bicapitate, pars acromialis cartilaginous, pars glenoidalis much smaller than pars acromialis. Suprascapula broadly expanded; anterior margin and corpus ossified as cleithrum, posterior and lateral borders cartilaginous.

Vertebral column composed of eight procoelus, nonimbricate, independent presacral vertebrae. Vertebrae short and broad, with overall width of neural arch about two times width of centrum, and centrum width about equal centrum length. Presacral I (atlas) with moderately separated, shallow cervical cotyles. Presacrals II–III with low neural spines. Presacrals IV–VIII with neural spines vestigial or absent. In order of increasing size, lengths of transverse processes and sacrum are as follow: III < Sa-

crum < IV < II < V = VI = VII < VIII. Ends of transverse processes of vertebrae II–VIII and Sacrum cartilaginous. Transverse processes of Presacral II distally not expanded and anterolaterally expanded; transverse processes of Presacral III slightly expanded distally with slight posterolateral orientation; Presacral IV not expanded distally and posterolateral orientation. Transverse processes of Presacrals V–VIII sharp with those of V posterolaterally oriented, those of VI laterally oriented, and those of VII–VIII anterolaterally oriented. Sacral diapophyses not dilated, rounded, distal end cartilaginous, posterolaterally oriented; sacrum with bicondylar articulation with urostyle. Urostyle robust bearing dorsal crest that is best developed anteriorly and that is flanked by lateral flanges of bones that diminish in size posteriorly.

Overall length of pelvic girdle about equal to length of Sacrum plus presacral vertebral column. Iliac shaft robust, bearing dorsolateral crest and low, laterally oriented dorsal prominence. Interiliac profile a narrow U-shaped with base of U about half the width of the distance between anterior ends of ilia. Ilium forming anterior margin of round acetabulum; preacetabulum forming approximately a 90° angle to iliac shaft. Iliac narrowly separated from ischia posteriorly. Ischia not articulating with one another medially, forming posterior margin of acetabulum. Dorsal and posterior margins of ischium cartilaginous. Ventral margin of acetabulum formed by cartilaginous pubis.

Humerus much longer and robust than radioulna; anterior, males with the humeral flanges well developed. Phalangeal formula for manus: 2–2–3–3; terminal phalanges pointed. Seven carpal elements, most of them cartilaginous, except a small ossified nucleus on palmar surface of ulnare, and a bulky ossified nucleus on palmar surface of radiale. Prepollex with two elements, distal one longer than the proximal; Distal Carpal 2 independent, Distal Carpal 3–5 fused, Element Y, radiale and ulnare independent (Fig. 4D).



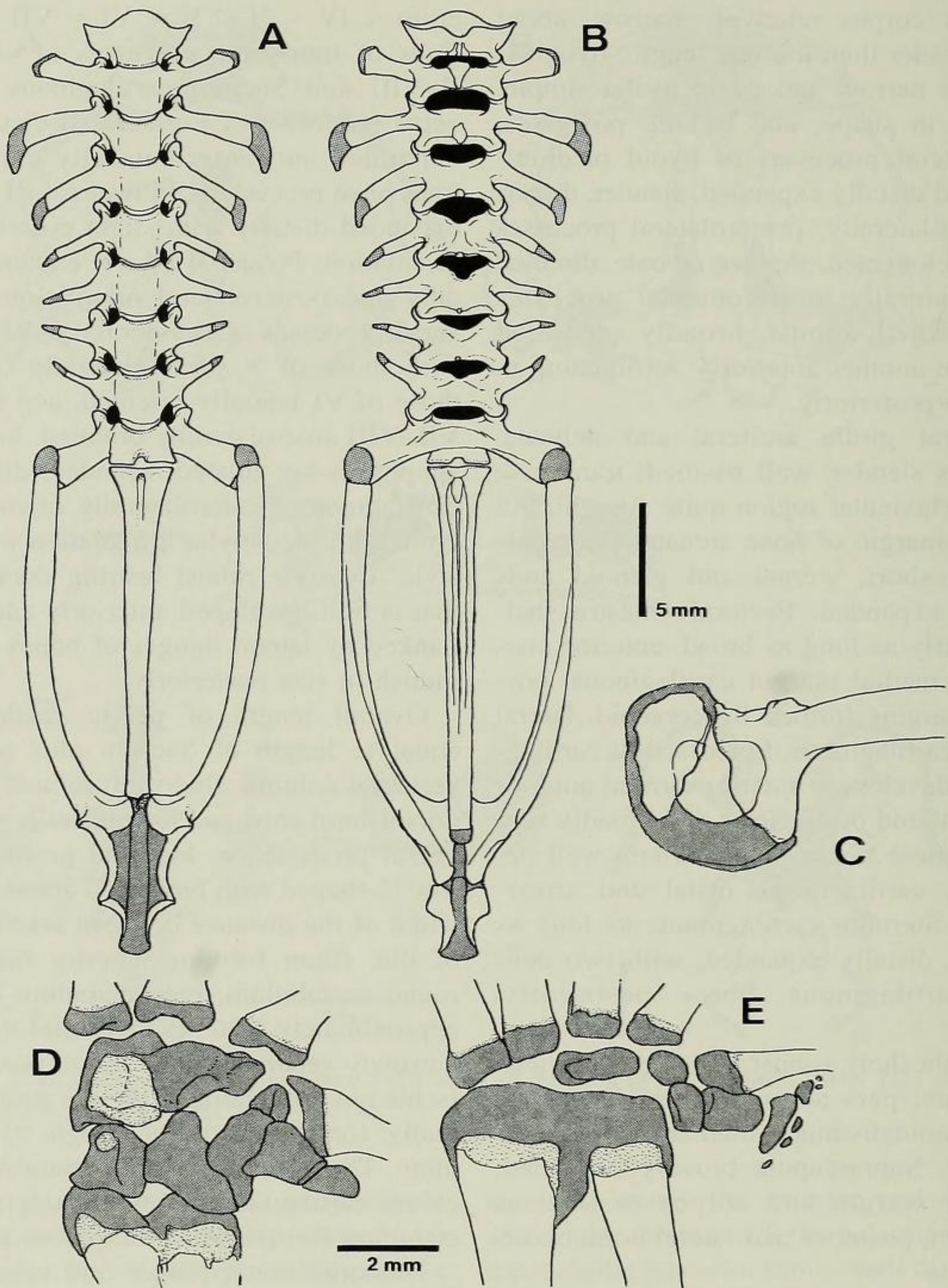


Fig. 4. Dorsal (A) and ventral (B) views of the vertebral column of the specimen IZUA 3221 of *Alsodes valdiviensis*. Lateral view of the acetabulum (C), carpus (D), and tarsus (E).

Femur and tibiofibula similar in length. Tibiale and fibulare fused proximally and distally. Phalangeal formula of foot: 2-2-3-4-3; terminal phalanges pointed. Tarsal elements cartilaginous. Prehallux with two elements; 6-7 small supernumeraries elements for which homology is unresolved.

Centrale and Tarsale 2 and 3 independent (Fig. 4E).

*Chromosomes.*—The examination of 15 metaphase plates from both sexes revealed a diploid number of  $2N = 26$ . All chromosomes are biarmed and the fundamental number (FN) is 52. Pairs 1, 3, 8-11 and 13

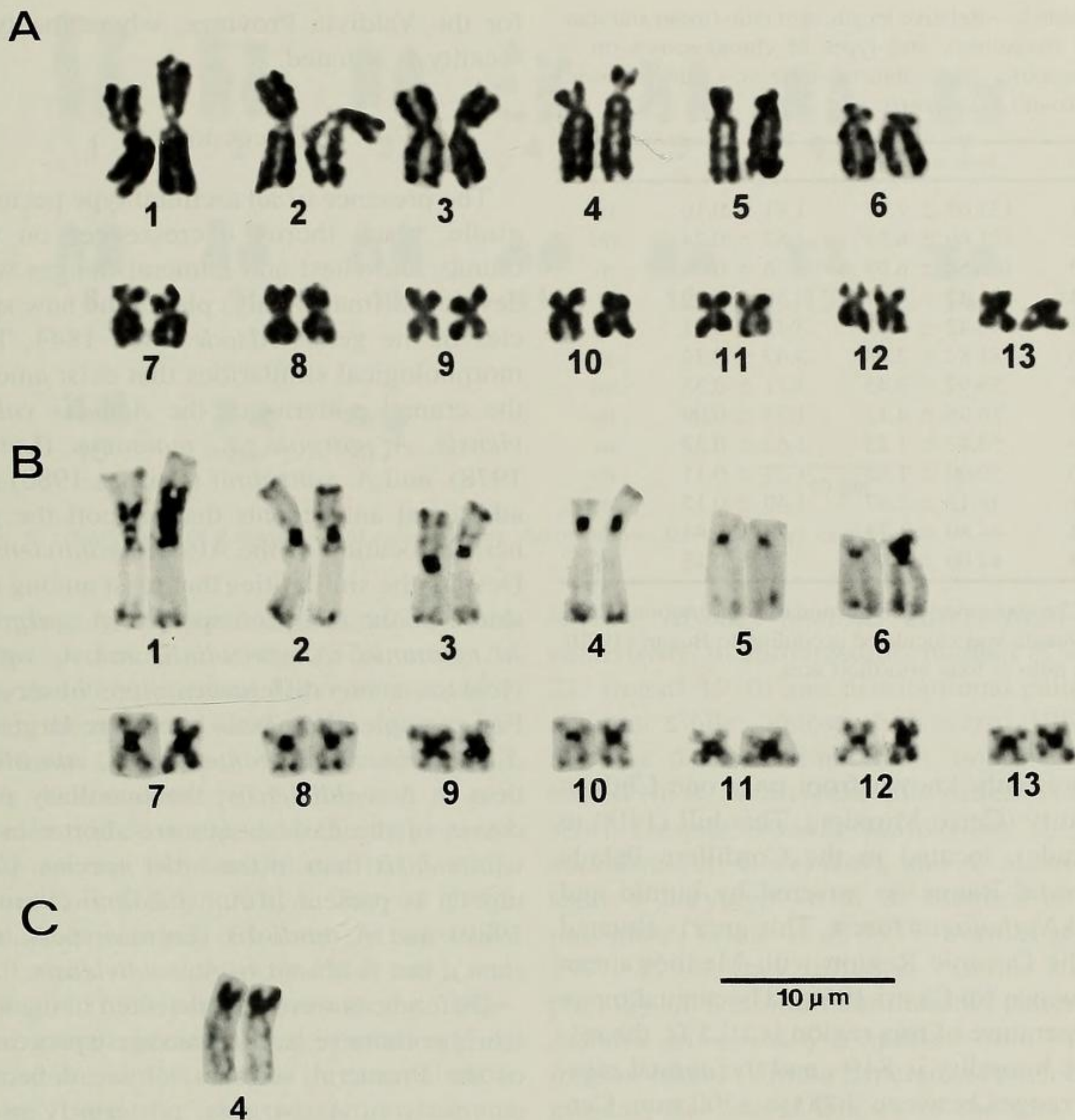


Fig. 5. Chromosomes of *Alsodes valdiviensis*. Standard karyotype (A), C-banded karyotype (B), and Nucleolus organizer regions (C).

are metacentric, pairs 2, 7, and 12 are submetacentric, and pairs 4, 5 and 6 are subtelocentric. Pair 4 has a secondary constriction in the smaller arm (Fig. 5A). When chromosomes are arranged in pairs of decreasing length, pairs 1–4 are large (>100 units), pair 5 and 6 are intermediate (between 80 to 100 units), and 7–13 small (<80 units). A summary of the relative length, arm ratio and type of chromosomes is presented in Table 2.

The C-banded karyotype shows constitutive heterochromatin in the centromeric

region of all the chromosomes (Fig. 5B). Heterochromatic bands can be discerned in the pericentromeric region of the pairs 1, 2, 9 and 11. Thin heterochromatic bands can be discerned at all the telomeres, except short arm of pair 5. Interstitial constitutive heterochromatin apparently does not occur in chromosomes of *A. valdiviensis*. Silver staining of chromosomes showed the NOR to be located within the secondary (nucleolar) constriction in the short arm at pair 4 (Fig. 5C).

*Distribution and ecology.*—The species

Table 2.—Relative length, arm ratio (mean and standard deviations), and types of chromosomes (m = metacentric; sm = submetacentric; st = subtelocentric) of *Alsodes valdiviensis*.

Pair	Relative length	Arm ratio	Type
1	133.65 ± 7.97	1.41 ± 0.10	m
2	121.60 ± 6.58	1.87 ± 0.74	sm
3	106.52 ± 6.93	1.36 ± 0.08	m
4*	101.42 ± 4.52	4.38 ± 0.39	st
5	98.42 ± 2.33	3.15 ± 0.91	st
6	81.82 ± 7.08	3.67 ± 0.72	st
7	59.92 ± 2.45	1.71 ± 0.33	sm
8	56.95 ± 4.11	1.33 ± 0.09	m
9	53.42 ± 1.23	1.63 ± 0.32	m
10	50.00 ± 1.85	1.27 ± 0.11	m
11	48.17 ± 2.87	1.40 ± 0.15	m
12	44.80 ± 1.71	1.72 ± 0.44	sm
13	42.00 ± 1.09	1.28 ± 0.13	m

\* Chromosomes with secondary constriction. Relative length was calculated according to Bogart (1970). Arm ratio = long arm/short arm.

is presently known from only one Chilean locality (Cerro Mirador). This hill (1100 m altitude), located in the Cordillera Pelada (Coastal Range) is covered by humid and cool *Nothofagus* forest. This area is situated in the Oceanic Region with Mediterranean Influence (di Castri 1968). The annual mean temperature of this region is 10.5°C, the relative humidity is 84%, and the annual rainfall ranges between 2000 to 2500 mm. Cerro Mirador is the highest point of the Coastal Range in Valdivia Province and during the winter is covered by snow. The *Fitzroya cupressoides* forests are remarkable in this area, and they are associated with *Nothofagus antarctica* and *N. pumilio*. During spring and summer, adult males were found under logs at the border of the forest. Males with nuptial asperities were captured during November and December. Mating call is unknown. At this locality the following species of reptiles and amphibians were observed: *Liolaemus pictus*, *Batrachyla antartandica*, *B. leptopus*, *Rhinoderma darwinii*, *Eupsophus calcaratus*, *E. vertebralis*, *Hylorina sylvatica* and *Pleurodema thaul*.

*Etymology*.—The new taxon is named

for the Valdivia Province, where the type locality is situated.

## Discussion

The presence of an arciferal type pectoral girdle, black thorny excrescences on the thumb, and chest and humeral flanges well developed (males only) places the new species in the genus *Alsodes* Bell 1843. The morphological similarities that exist among the cranial patterns of the *Alsodes valdiviensis*, *A. gargola*, *A. montanus* (Lynch 1978), and *A. vanzolinii* (Formas 1980) are additional antecedents that support the generic allocation of the *Alsodes valdiviensis*. Despite the similarities that exist among the skulls of the analyzed species (*A. gargola*, *A. montanus*, *A. vanzolinii*, and *A. valdiviensis*), some differences were observed. For example, the nasals bones are larger in *A. gargola*, *A. montanus* and *A. vanzolinii* than in *A. valdiviensis*; the maxillary processes of the nasal bones are shorter in *A. valdiviensis* than in the other species. Columella is present in *A. vanzolinii* (Formas 1980) and *A. nodosus* (Formas, pers. observ.); but is absent in *A. valdiviensis*.

Differences were also detected in the vertebral column (e.g., the transverse processes of the Presacral vertebra VI are deflected anteriorly in *A. gargola*, posteriorly in *A. montanus*, and in *A. vanzolinii*; but they are laterally oriented in *A. valdiviensis*).

Cei (1980) considered that two morphological different evolutionary lines exist in the genus *Alsodes*. One stock has a rather simple horny ornamentation on the thumb pad (e.g., *A. nodosus* and *A. tumultuosus*), and the other showing a more complex spiny structure on the first finger [e.g., *A. australis*, *A. kaweshkari*, *A. hugoi* (Formas et al. 1997, 1998; Cuevas & Formas 2001)]. The characteristics of the nuptial pads of *A. valdiviensis* suggest that this species can be included in the stock with simply horny ornamentation.

Based on the snout–vent length (SVL), frogs of the genus *Alsodes* can be divided



Fig. 6. Karyotype of a female of *Alsodes barrioi*. Arrow shows the secondary constriction.

into three group species: the small-sized group species [*A. vittatus* (37.4 mm), *A. gargola* (40.8 mm), and *A. verrucosus* (42.4 mm)]; the medium-sized group species [*A. monticola* (49.1 mm), *A. montanus* (50.2 mm), *A. vanzolinii* (51.1 mm) and *A. pehuenche* (52.3 mm)]; and the large-sized group species [*A. tumultuosus* (61.5 mm), *A. nodosus* (58.5 mm), *A. barrioi* (58.5 mm), *A. kaweshkari* (61.1 mm), *A. australis* (55.0 mm), *A. valdiviensis* (53.2 mm), and *A. hugoi* (69.0 mm)]. Among the large-sized group species *A. valdiviensis* and *A. barrioi* are almost similar in external morphology and for this reason specimens (IZUA 1529–1530) from Cordillera Pelada (Valdivia Province) were confounded by Formas et al. (1997) with *A. barrioi* (now *A. valdiviensis*). The chromosomic evidences show that the specimens of Cordillera Pelada (*A. valdiviensis*) have 26 biarmed chromosomes whilst *A. barrioi* from Nahuelbuta Range (Arauco Province) have a distinctive karyotype with 34 chromosomes (Fig. 6) (nine biarmed pairs and eight monoarmed ones; Veloso et al. 1981; this paper). The distributional pattern of *A. barrioi* is restricted to Nahuelbuta Range, whilst *A. valdiviensis* has been only collected in the Pelada Range. The chromosomic and distributional patterns are appropriate antecedents to distinguish *A. valdiviensis* from *A.*

*barrioi*. *Alsodes nodosus* differs from *A. valdiviensis* in chromosomic number ( $2N = 22$ ; Bogart 1970) and distributional pattern (Central Chile; Veloso & Navarro 1988); likewise the hind limbs of *A. nodosus* are barred (in *A. valdiviensis* this pattern is absent). Despite *Alsodes valdiviensis*, *A. tumultuosus*, *A. kaweshkari*, and *A. australis* share a karyotype with 26 biarmed chromosomes (Veloso et al. 1979; Formas et al. 1997, 1998), they differ in external morphology of feet and distributional patterns. *Alsodes kaweshkari*, a species from Wellington Island (Ultima Esperanza Province), presents the lateral fringes of the toes totally fringed (reduced in *A. valdiviensis*). *Alsodes tumultuosus*, from the western slopes of Los Andes Range from Central Chile (Los Andes Province), shows a medium developed webbing pattern between the toes V and IV (in *A. valdiviensis* this membrane is reduced). The dorsal pattern of *A. tumultuosus* is reticular with irregular dark spots (in *A. valdiviensis* the dorsal pattern consists in a wide irregular ribbon extending above the eyes). *Alsodes valdiviensis* has a yellowish triangle on the head; this character is absent in *A. tumultuosus*.

*Alsodes valdiviensis* differs from *A. australis* in having the snout rounded in dorsal view (truncate in *A. valdiviensis*) and a disjunct distributional patterns [*A. valdiviensis*

is restricted to the Cerro Mirador (Valdivia Province) whilst *A. australis* has been collected in Llanquihue and General Carrera Provinces (Formas et al. 1997)].

Based on our karyological determination of 26 biarmed chromosomes, *A. valdiviensis* belongs to the *monticola* group (Formas & Vera 1983). Karyotypes with 26 biarmed chromosomes (FN = 52) have been postulated by Reig (1972) and Formas & Cuevas (2000) as the primitive condition for members of the family Leptodactylidae. If a karyotype with 26 biarmed chromosomes is considered primitive in *Alsodes*, the presence of 34 chromosomes (FN = 52) in *A. barrioi* (Veloso et al. 1981, Formas et al., this paper) should be considered as a derived condition.

#### Specimens Examined

*Abbreviations.*—Departamento de Biología Celular y Genética, Universidad de Chile (DBCG), Chile; Instituto de Zoología, Universidad Austral de Chile (IZUA), Chile; Museo de Zoología, Universidad de Concepción (MZUC), Chile.

*Alsodes australis*: IZUA 1626–1628 (type series); Puente Traihuanca, General Carrera Province, 420 m, Chile.

*Alsodes barrioi*: IZUA 3200–3201, 3317 (chromosomes); Rucapehuén, Cordillera de Nahuelbuta, Arauco Province, Chile.

*Alsodes gargola*: IZUA 3079; Laguna Tonchek, Cerro Catedral, Parque Nacional Nahuelhuapi, Río Negro Province, 1750 m, Argentina.

*Alsodes kaweshkari*: IZUA 1624 (holotype); Puerto Edén, Isla Wellington, Ultima Esperanza Province, 10 m, Chile.

*Alsodes montanus*: IZUA 824; Estero Covarrubias, Santiago Province, 2400 m, Chile.

*Alsodes monticola*: IZUA 3114–3115; Balderas, Isla Wellington; 3122–3124 Puerto Río Frío, Isla Wellington, Ultima Esperanza Province, Chile.

*Alsodes nodosus*: IZUA 768–773, 777

(cleared and stained skeleton); Aguas Claras, Petorca Province, 150 m, Chile.

*Alsodes pehuenche*: IZUA 3242–3244; Valle del Pehuenche, Malarhue Province, 2500 m, Argentina.

*Alsodes tumultuosus*: DBCG 161–162; La Parva, Santiago Province, 2600 m, Chile.

*Alsodes valdiviensis*: IZUA 3202 (holotype), 3203, 3241 (paratypes), 1529–1530; 2220, 2221, 3221, 3222 (cleared and stained skeletons), 3237–3241 (chromosomes); Cordillera Pelada, Valdivia Province, 1020 m, Chile.

*Alsodes vanzolinii*: MZUC 12063–12070; Ramadillas, Arauco Province, 100 m, Chile.

*Alsodes verrucosus*: IZUA 2215–2218; Puyehue, Osorno Province, 500 m, Chile.

*Alsodes vittatus*: MZUC (untagged); Cordillera de Pemehue, Malleco Province, 1152 m, Chile.

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