A New Species of *Nanodacna* Clarke (Lepidoptera: ElachistIdae: Agonoxeninae) Feeding on the Seeds of *Austrocedrus chilensis* (Cupressaceae) in Andean Argentina

Jean-Francois Landry
Agriculture and Agri-Food Canada, Neatby Building, C.E.F., 960 Carling Avenue, Ottawa, Ontario, K1A 0C6, Canada, landryjf@agr.gc.ca

David Adamski
Department of Entomology, National Museum of Natural History, Smithsonian Institution, P.O. Box 37012, MRC 168, Washington, D.C., 20013- 7012, U.S.A., adamskid@si.edu

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A NEW SPECIES OF *NANODACNA* CLARKE (LEPIDOPTERA: ELACHISTIDAE: AGONOXENINAE) FEEDING ON THE SEEDS OF *AUSTROCEDRUS CHILENSIS* (CUPRESSACEAE) IN ANDEAN ARGENTINA

JEAN-FRANÇOIS LANDRY

Agriculture and Agri-Food Canada, Neatby Bldg., 960 Carling Ave, Ottawa, Ontario K1A 0C6, Canada, email: landryjf@agr.gc.ca

AND

DAVID ADAMSKI

Department of Systematic Biology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560-0168, USA, email: dadamski@sel.barc.usda.gov

ABSTRACT. Characters of the adult, larva, and pupa of *Nanodacna austrocedrella* Landry & Adamski, new species, are described and illustrated. The seed-feeding larvae cause damage to Andean Cedar, *ciprés de la cordillera* [*Austrocedrus chilensis* (D. Don.) Fl. & Bout., Cupressaceae] in Chubut Province, Argentina. The species is compared to other species of *Nanodacna* and to species of *Homoeoprepes* Walsingham from the Neotropics. Criteria for its inclusion in *Nanodacna* and the phylogenetic significance of characters of immature stages for relationships within the Agonoxeninae are discussed.

RESUMEN. Se describen e ilustran caracteres del adulto, larva, y pupa de *Nanodacna austrocedrella* Landry & Adamski, nueva especie. Las larvas que comen las semillas causan daño al ciprés de la cordillera [*Austrocedrus chilensis* (D. Don.) Fl. & Bout., Cupressaceae] en la provincia de Chubut, Argentina. Se compara la especie con otras especies de *Nanodacna* y a las especies de *Homoeoprepes* Walsingham de la region neotropical. Criteria para ser incluido en *Nanodacna* y la significación de caracteres filogeneticos de los estadios immaduros para relaciones entre Agonoxeninae son discutidos.

Additional key words: immature stages, phylogenetics, *Homoeoprepes*, Andean Cedar.

In 1995 and 1996 extensive damage was found to the fruit and seeds of *ciprés de la cordillera* (*Austrocedrus chilensis* (D. Don) Fl. & Bout., Cupressaceae) in the vicinity of Trevelin, Department of Futaleufu, Province of Chubut, Argentina. Damage was caused by larvae of a microlepidoptera that developed in the fruit and consumed the seeds. Due to the economic importance of the tree, the life history of the species, extent of the damage and infestation, and possible natural enemies had been under investigation by researchers at the Universidad Nacional de la Patagonia in Esquel (Chubut). Results of this study were published (Gomez & Klasmer 1997) but the species remained nameless. The purpose of this paper is to name and describe the species.

Two lots of specimens were sent to JFL in June 1996 with a request to provide an identification of the species, however those specimens were unmounted and in rather poor condition. The moths represented an undescribed species of *Nanodacna* Clarke.

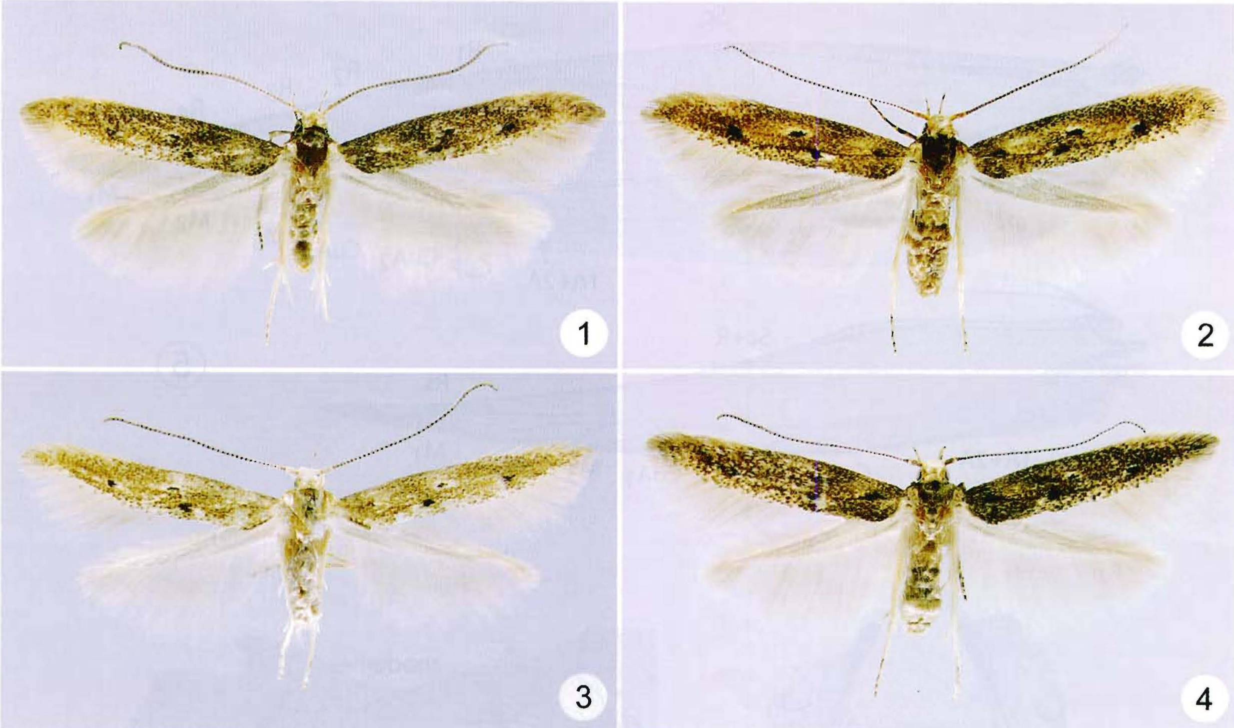
In order to obtain a series of good-quality specimens for describing the species, arrangements were made with the Argentinian research team (through the courtesy of Drs. Cecilia Gomez and Mario Rajchenberg) to obtain live larvae and host material in an attempt to rear the moths. These efforts were successful and in this paper we present the description of the adult, larva, and pupa of this new species. We indicate how to differentiate it from other species of *Nanodacna* and briefly discuss the composition and phylogenetic position of *Nanodacna*.

MATERIALS AND METHODS

Several lots of live larvae with fruit and pieces of bark of *ciprés de la cordillera* were received in Ottawa from the INTA-Trevelin Forest Station, Futaleufu, Chubut, Argentina between November 1996 and April 1997. Field collecting dates are 13 November 1996, 29 November 1996, 9 December 1996, 8 February 1997, and 10 April 1997. Lots were placed in screen cages in an incubator at 20°C with 40% R.H. and a 16:8 LD regime, and misted sporadically. Most larvae collected in November and December 1996 were very young and did not survive due to subsequent fruit deterioration. However, larvae of the February and April 1997 lots were mature when received and a number of the larvae had already pupated after burrowing in the bark chips and the styrofoam packing material. The photoperiod and temperature were reduced progressively during the month of May to mimic the onset of austral autumn; lights were turned off and the temperature set at 4°C from June to August. The process was reversed beginning in late August to achieve full daylight by mid-September.

Thirty-four adults emerged over the period of about a week at the end of September and the beginning of October 1997. Adults were killed, pinned and spread 24–48 hours after emergence. A number of larvae and pupae were preserved in 70% ethanol at the time that they were received from Argentina.

Adults were examined with a Nikon SMZ-U stereomicroscope with fiber-optic ring-light illumination at magnifications of 7.5–75×. Genitalia dissection and



FIGS. 1–4. *Nanodacna austrocedrella* adults. **1,** Holotype ♂, # CNC LEP 00001116; **2,** Paratype ♀, # CNC LEP 00001137; **3,** Paratype ♀, # CNC LEP 00001141, palest specimen of the type series; **4,** Paratype ♀, # CNC LEP 00001138, darkest specimen of the type series.

preparation followed Landry and Wagner (1995) except that Orange G was used exclusively as a stain in male preparations, and a combination of orange G and chlorazol black was used for female genitalia. Due to the highly tridimensional aspect of the male genitalia, some dissections were mounted whole and unaltered while others were separated on one side and "unrolled" to expose the most diagnostic features. Dissections were studied using a Nikon Eclipse E800 compound microscope at magnifications of 40–400×, in pure lactic acid on well slides and in Euparal on permanent slide mounts. To examine venation, wings were detached, wetted in 70% ethanol, bleached in diluted sodium hypochlorite (Javex®) for a few seconds, rinsed thoroughly in 30% ethanol, stained with orange G in lactic acid, dehydrated, and mounted in Euparal on slides.

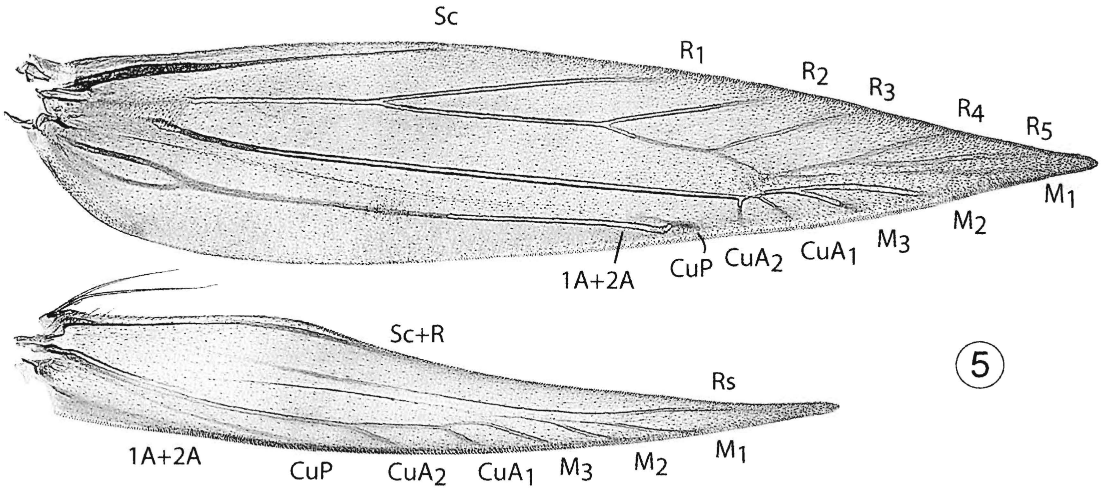
The ultrastructure of the larva and pupa was studied with an Amray 1810 scanning electron microscope at an accelerating voltage of 10 kV. For SEM examination, immature specimens were cleaned in 10% ethanol with a camel-hair brush, dehydrated in increasing concentrations of ethanol to absolute ethanol. After dehydration, specimens were critical-point dried using a Tousimis critical-point dryer, mounted on SEM stubs, and coated with gold-palladium (40/60%), using a Cressington sputter coater. All measurements were made using a dissecting microscope with a calibrated micrometer or generated by the electron microscope.

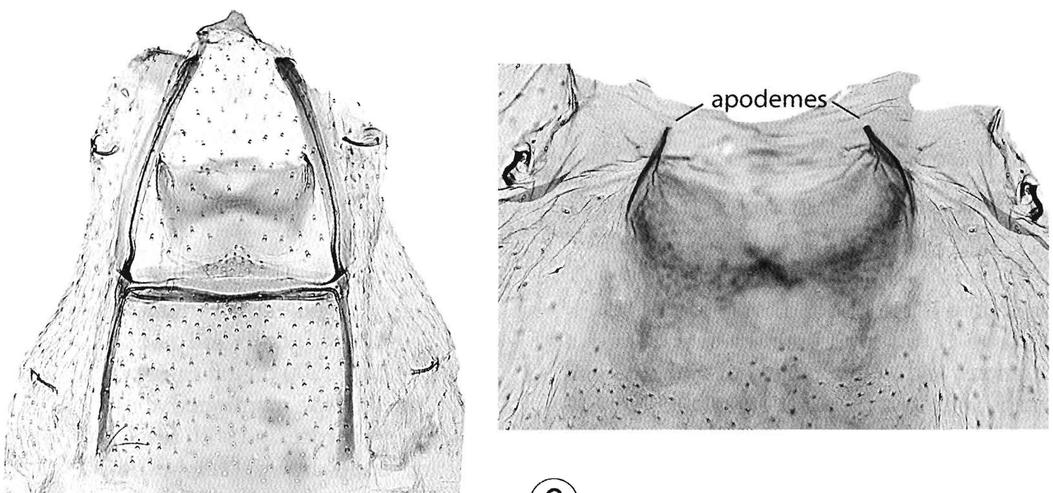
Photographs of adults and genitalia were taken with a Nikon DMX 1200 digital camera mounted on either Nikon microscope mentioned above. All images were subsequently processed with Adobe Photoshop®. For line art, hand-drawn sketches were digitized and processed in Adobe Illustrator® as scalable vector graphics.

The holotype and adult paratypes are deposited in the Canadian National Collection (CNC), Ottawa. Paratypes are also deposited in the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MBR), Buenos Aires, the National Museum of Natural History (USNM), Washington, D.C., the Natural History Museum (BMNH), London, and the Zoologisk Museum (ZMUC), Copenhagen, Denmark.

Nanodacna austrocedrella Landry & Adamski, new species

Diagnosis. Adults are small, fuscous brown to dark-brown moths with a slightly peppery appearance from the suffusion of dark scales over the creamy-white ground color (Figs. 1–4). The forewing bears three black spots of slightly raised scales in both sexes. The male has small, compact genitalia with an elongate-rectangular, hood-like tegumen, broad valvae with a deeply sinuate ventral margin, a large, inwardly directed





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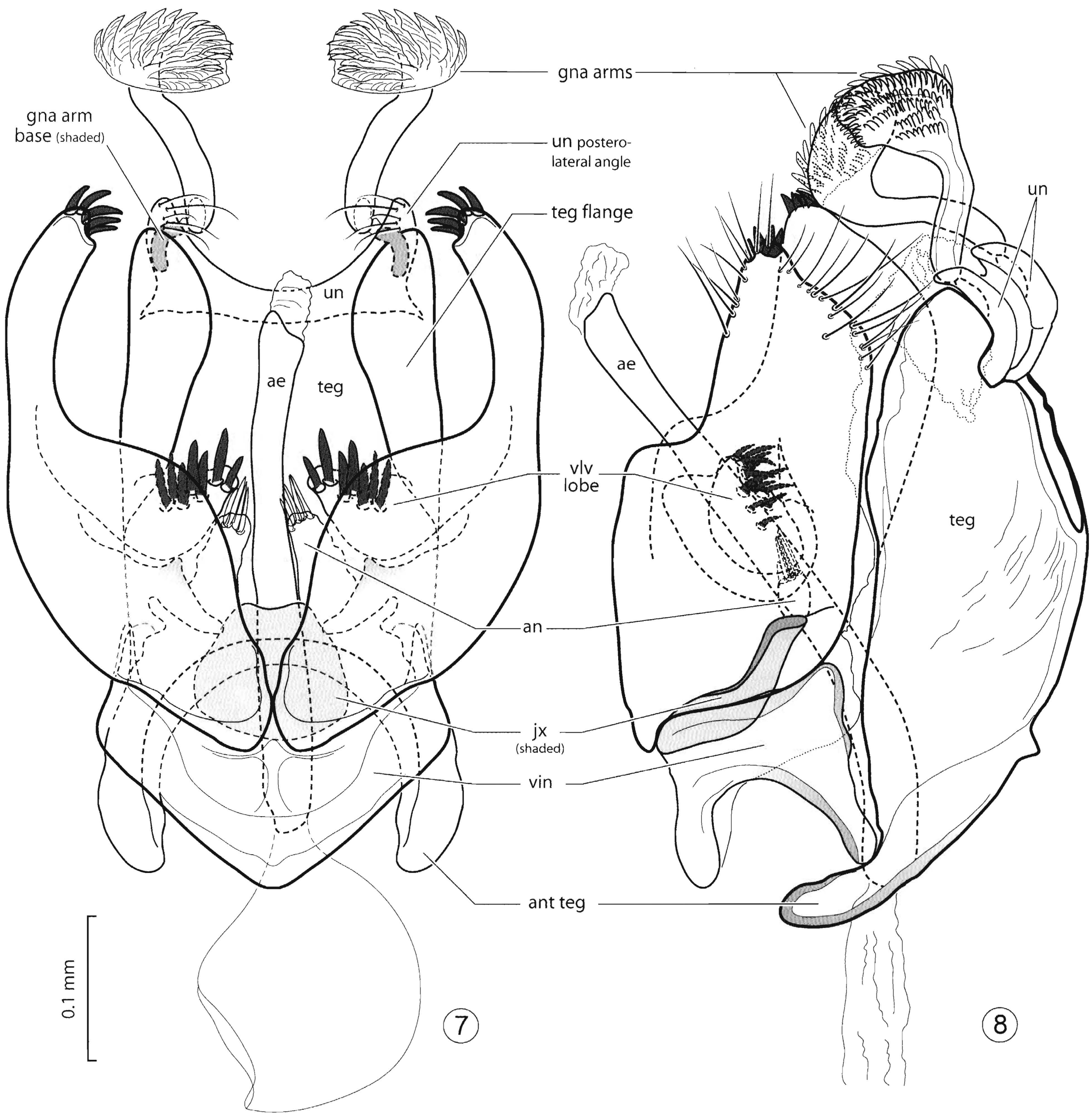
FIGS. 5–6. *Nanodacna austrocedrella*. **5,** ♀, wing venation (slide MIC 4767); **6,** Basal segments of abdomen; left: ♂ T1–T2 (slide MIC 4699); right: ♀ S1–2 showing apodemes (slide MIC 4768).

spinose process projecting from the costal margin and abutting the middle of the aedeagus, and a small cluster of short spines at apex (Figs. 7–9). In overall aspect, the genitalia have an appearance generally resembling that of *Homoeoprepes felisae* Clarke (from Colombia; figured in Clarke 1962, Fig. 4) but in the latter, the costal process of the valvae is not projected, the ventral margin of the valvae is evenly rounded and without an apical spine, and the paired arms of the gnathos are proportionally shorter with their rows of flat spines covering half their length. The female genitalia of *N. austrocedrella* (Figs. 10–14) are very simple with few remarkable features and resemble quite closely those of *H. trochiloides* Walsingham (from Costa Rica; Fig. 1 in Clarke 1962): the 8th abdominal segment is undifferentiated and mostly membranous, the ostium is small, indistinguishable, and situated submedially on S8, the ductus bursae is rather straight with a slight sclerotization near the inception of the ductus seminalis, the corpus bursae is elongate-ovoid with a pair of weakly developed signa in the distal portion of the bursa. Despite a general resemblance in their genitalia, *N. austrocedrella* and *Homoeoprepes* species are moths with very different habits and do not occur in the same geographic area (but see discussion below).

Description. Adult. (Figs. 1–4). **Forewing length** 4.0–5.1 mm, mean = 4.6, SD = 0.30; wingspan 8.7–11.3 mm, mean = 10.2, SD = 0.69 (n = 32). Moth with creamy-white ground color heavily suffused with dark-brown- to rusty-brown-tipped scales.

Head creamy-white, with dark-brown scales narrowly lining each side of frons; a few scales around eyes with fuscous tips; scales of



FIGS. 7, 8. *Nanodacna austrocedrella* male genitalia, both drawn from slide MIC 4765. **7,** Ventral aspect, setae of valvae omitted; **8,** Lateral aspect, setae of uncus and of left valva omitted. Abreviations: ae = aedeagus; an = anellus; ant teg = anterolateral arm of tegumen; gna = gnathos; jx = juxta; teg = tegumen; un = uncus; vin = vinculum; vlv = valva.

frons and vertex spatulate, appressed, arranged in fan from each side around eyes meeting along middle of vertex. Labial palpus upcurved with apex extended to top of vertex, third article nearly as long as second and creamy-white with some dark-brown near tip; second article dark-brown on outer side. Haustellum base with creamy-white scales. Antenna with scape creamy-white, with pecten of 20–25 filiform scales in both sexes; flagellum extended to two-thirds to three-quarters of forewing, with alternating creamy-white and dark-brown annulations throughout.

Dorsum of thorax with creamy-white ground color overlaid with fuscous-tipped scales. **Forewing** upper surface with creamy-white ground color densely suffused with fuscous to dark-brown–tipped scales; with three small patches of raised black scales, two near middle of wing, and one at end of cell in distal third on termen, each patch surrounded by narrow area of creamy-white; fringe scales pale-fuscous gray; underside gray white suffused with fuscous to dark-brown scales, margin around termen constrastingly paler, creamy to creamy-white; lanceolate, stigma absent; R4 and R5 stalked, R5 to anterior margin; M1 connate with R4–R5; M2 to CuA2 connate; CuP obsolete (Fig. 5). **Hindwing** and its fringe pale gray to pale fuscous gray; narrowly lanceolate, anterior margin bulged before middle, concave in distal two-thirds; cell absent; Sc+R running very close to anterior margin to its middle; M1 to CuA2 separate; CuP and 1A+2A obsolete; female frenulum with two

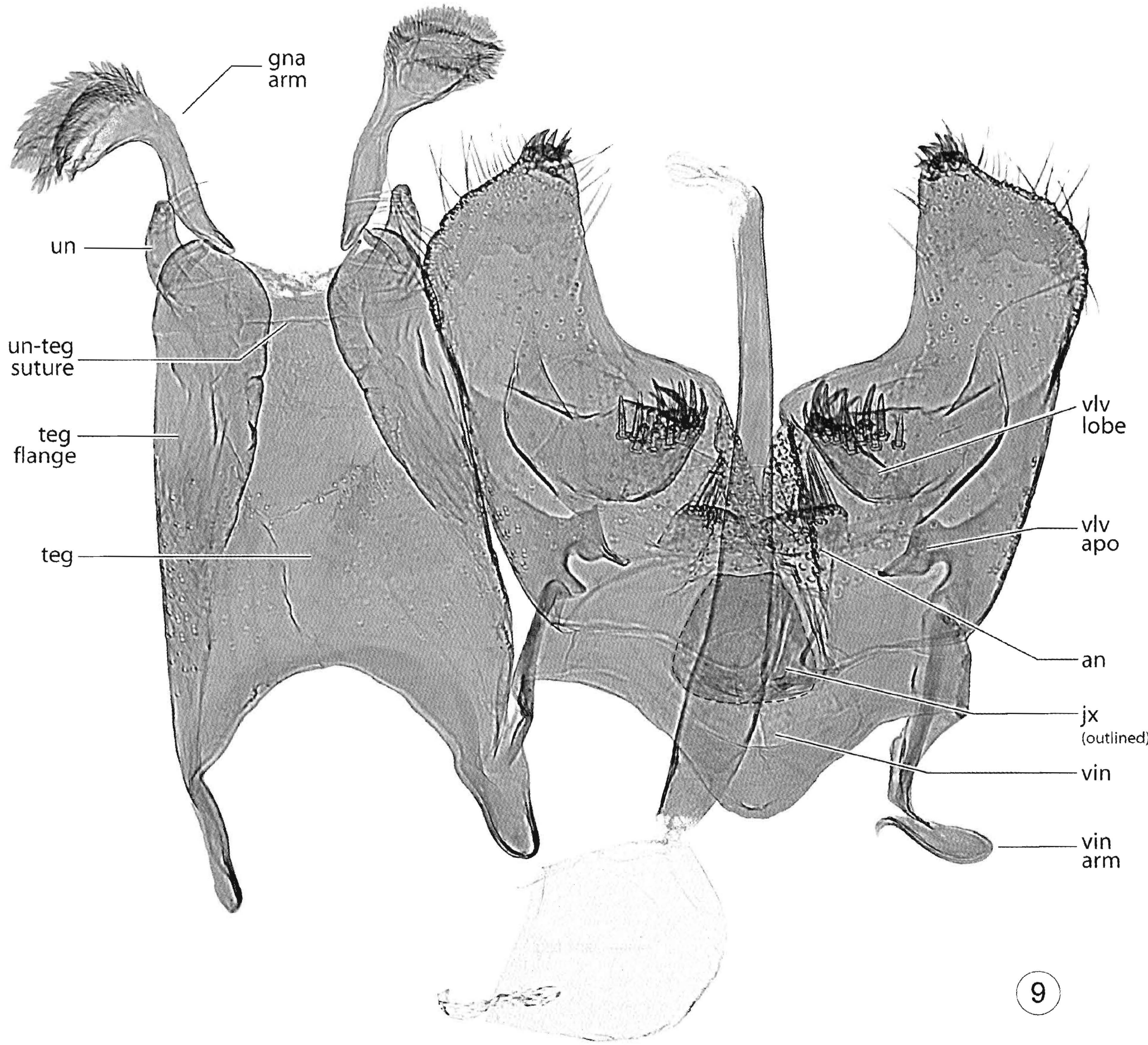
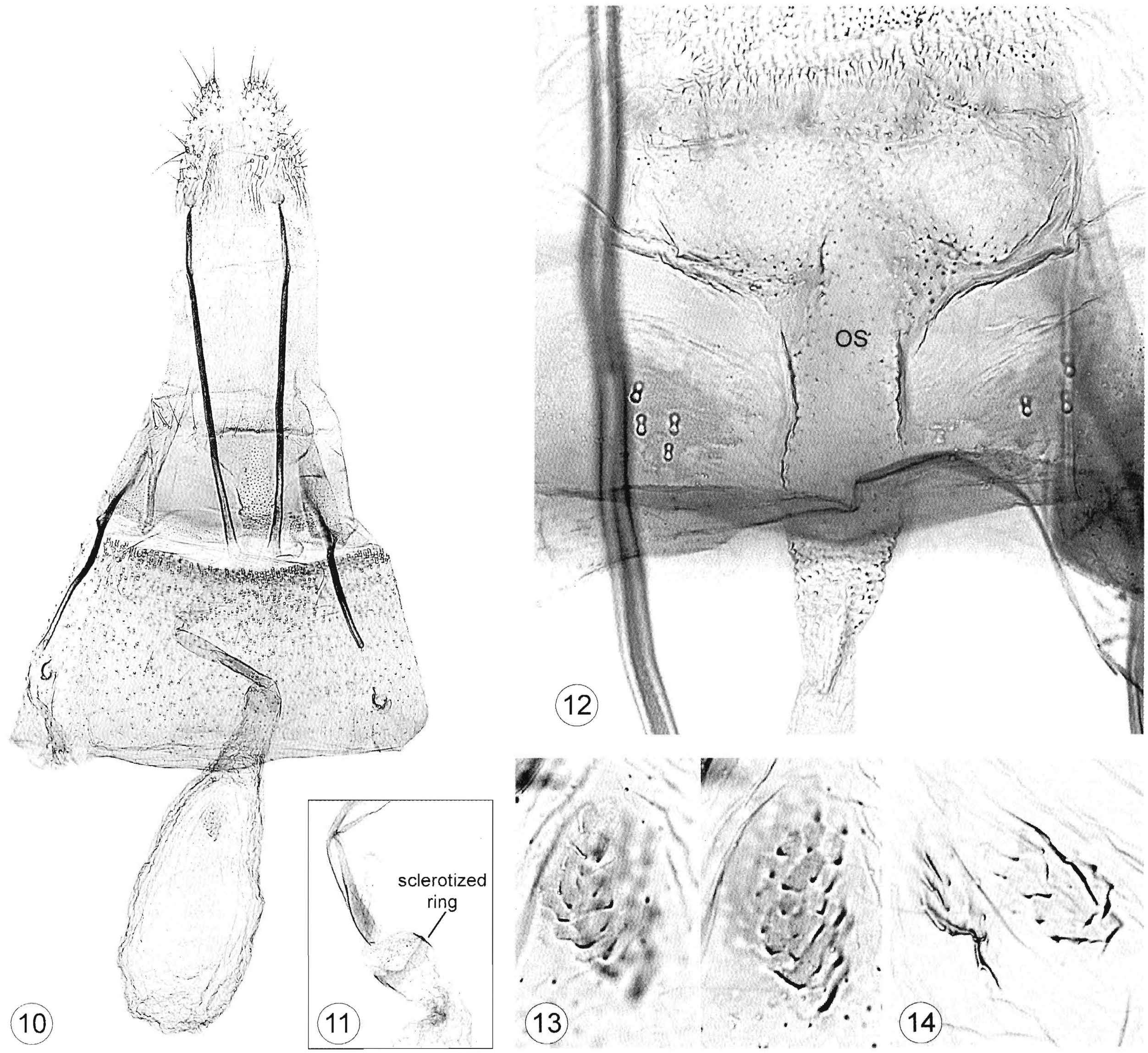


FIG. 9. *Nanodacna austrocedrella* male genitalia, slide MIC 4699, dorsal aspect with tegumen-uncus-gnathos complex separated on one side and "unrolled" to the left. Abreviations: ae = aedeagus; an = anellus; ant teg = anterolateral arm of tegumen; gna = gnathos; jx = juxta; teg = tegumen; un = uncus; vin = vinculum; vlv = valva; vlv apo = apodeme of valva.

acanthae. Fore- and midleg with outer side dark-brown; tarsi with dark-brown annulations. Hindlegs entirely creamy-white to buff white, in some specimens tarsi with dark-brown annulations. Wing venation similar in every respect to that of *N. ancora* (described by Clarke 1964; Fig. 96 in Clarke 1965a), the type species of *Nanodacna*.

Abdomen entirely creamy-white or gray white; internally S1–S2 transverse, barely sclerotized, without distinguishable venulae, apodemes rudimentary (Fig. 6). Terga and sterna unmodified, membranous.

Male genitalia (Figs. 7–9) compact. Tegumen elongate-rectangular, parallel-sided in dorso-ventral aspect, dorsally only slightly convex; sides inwardly folded so that ventrally tegumen is semi-closed and forms a broad gutter around anal tube. Uncus, a narrow, crescentic band fused to distal margin of tegumen (line of fusion distinct); lateral angles protruded as slightly incurved, kernel-shaped lobes with short, fine setae. Gnathos reduced to a pair of narrow, articulated, dangling arms that are about one-third length of tegumen; apex of each abruptly enlarged forming an ovoid knob with 8–10 crescentic rows of spinules. Vinculum a transversely narrow, V-shaped arch with lateral arms extended dorsally, articulating with downcurved anterior arms of tegumen. Valvae stiffly articulated to vinculum, short and broad, with ventral margin deeply sinuate near middle; distal portion sparsely setose marginally; apex with cluster of short spiniform setae; medially with a large, inwardly projected process terminated by a cluster of stout setae that abuts the aedeagus at level of anellus; anterodorsal angle developed into elaborately dissected apodeme attached to transtilla. Juxta present as trapezoid plate tightly attached (fused?) to middle of aedeagus, without projected lobes. Anellus developed as stiff, slightly sclero-

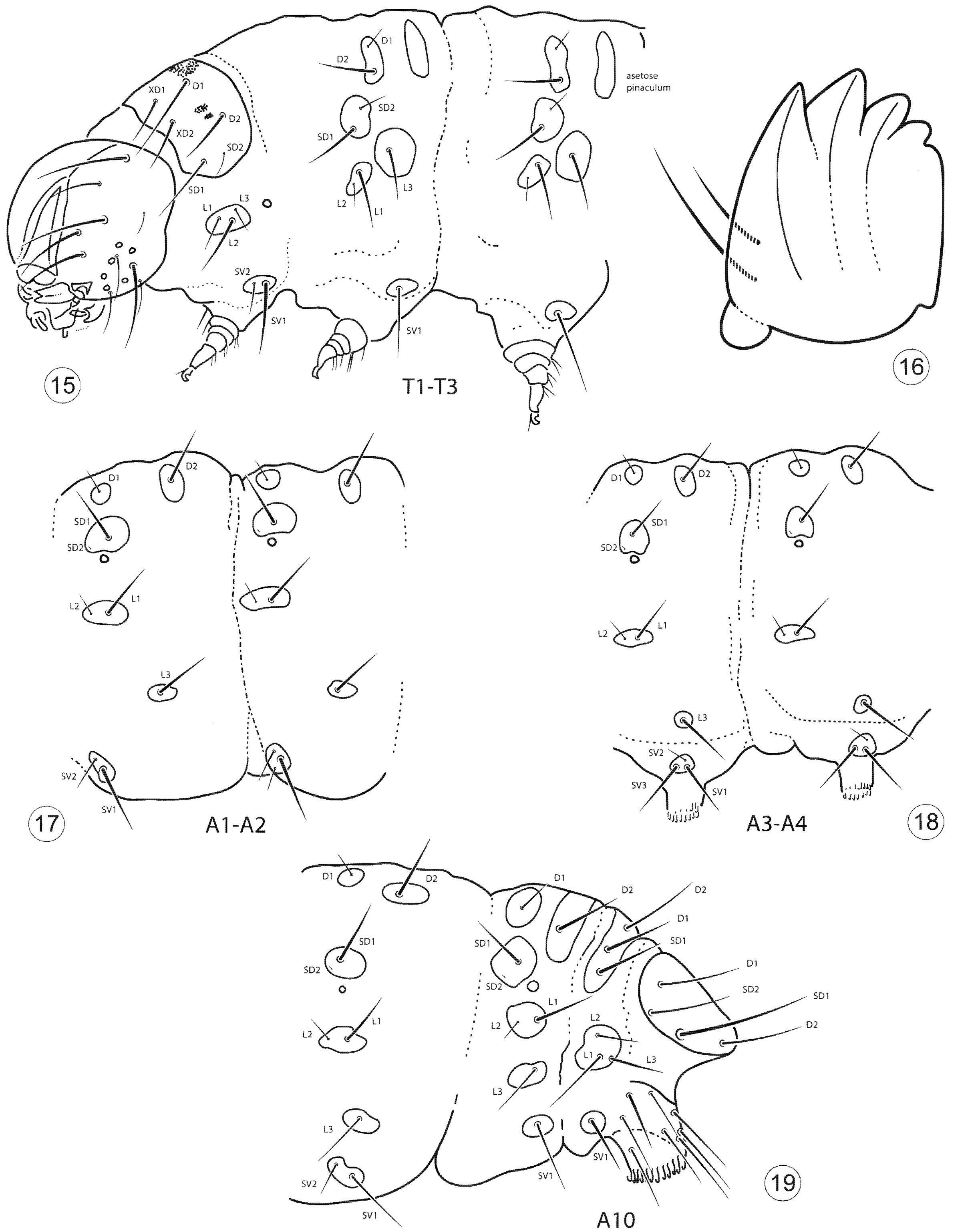


FIGS. 10–14. *Nanodacna austrocedrella* female genitalia. **10,** Genitalia, extended ovipositor and 7th segment (slide MIC 4766); **11,** Detail of anterior portion of ductus bursae and base of corpus bursae (slide MIC 4700); **12,** Details of sterigma and ostium bursae on S8 (slide MIC 4767); os = ostium; **13,** Signa, on left with focus on signum above, on right with focus on signum of same below (slide MIC 4766); **14,** Signa (slide MIC 4768).

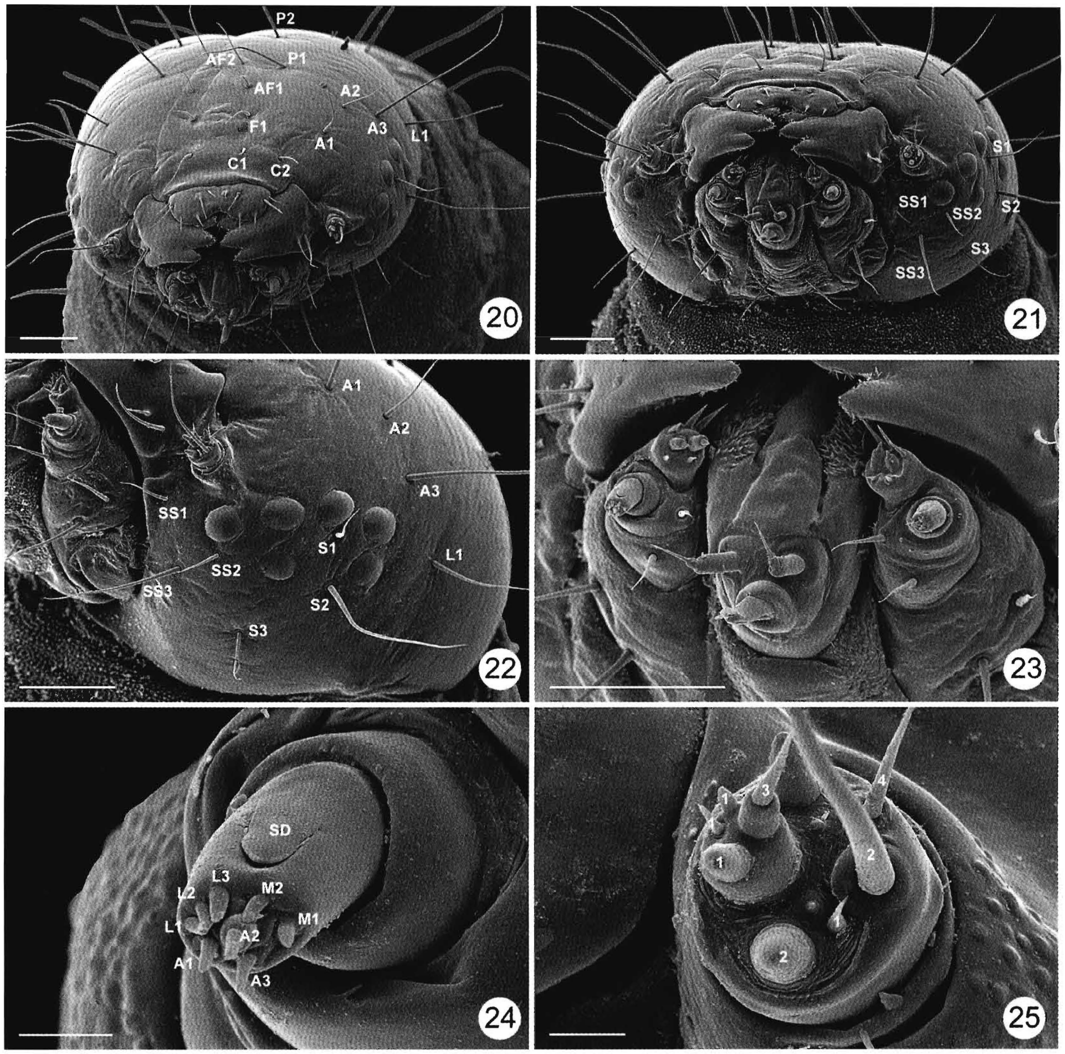
tized cone bracing middle of aedeagus, with cluster of stiff, short setae on each side slightly vendrad of aedeagus axis. Aedeagus very slightly sigmoid (lateral aspect in situ) with apex upturned; anterior portion slightly bulged; semi-ankylosed by juxta-transtilla; cornuti absent.

Female genitalia. (Figs. 10–14). Ovipositor proportionally short, 0.15 – 0.2 × length of abdominal segments 1–7, papillae anales conical, membranous, finely setose. Posterior apophyses about 1.5 – 2 × length of anterior apophyses. T8 transversely rectangular, lightly sclerotized, with posterior margin lines with 10–15 fine setae. Ostium bursae situated slightly beyond anterior margin of S8. S8 membranous except for a small, lightly sclerotized transverse area on each side of ostium bursae. Colliculum and a funnel-shaped medial area of S8 distad of ostium finely spinulose. Ductus bursae narrow, nearly straight (easily bends or twists in preparations), extended slightly beyond apices of anterior apophyses; inception of ductus seminalis situated at junction of corpus bursae and short sclerotized section on anterior end of ductus bursae. Corpus bursae finely spinulose, elongate-ovoid, broadest near anterior end; membrane thin and flimsy, with narrow, lightly sclerotized band forming an incomplete ring near posterior end (Fig. 11). Signa paired, weakly sclerotized; small patches of coarsely pointed microsculpture (obsolete in some specimens; Fig. 14).

Variation. The amount of dark suffusion of the forewings varies (Figs. 1–4), specimens with sparser fuscous suffusion appearing significantly paler overall (Fig. 3). The extent and distinctiveness of the three spots of raised black scales also varies, some spots being barely noticeable in some specimens. An appreciable amount of wear is



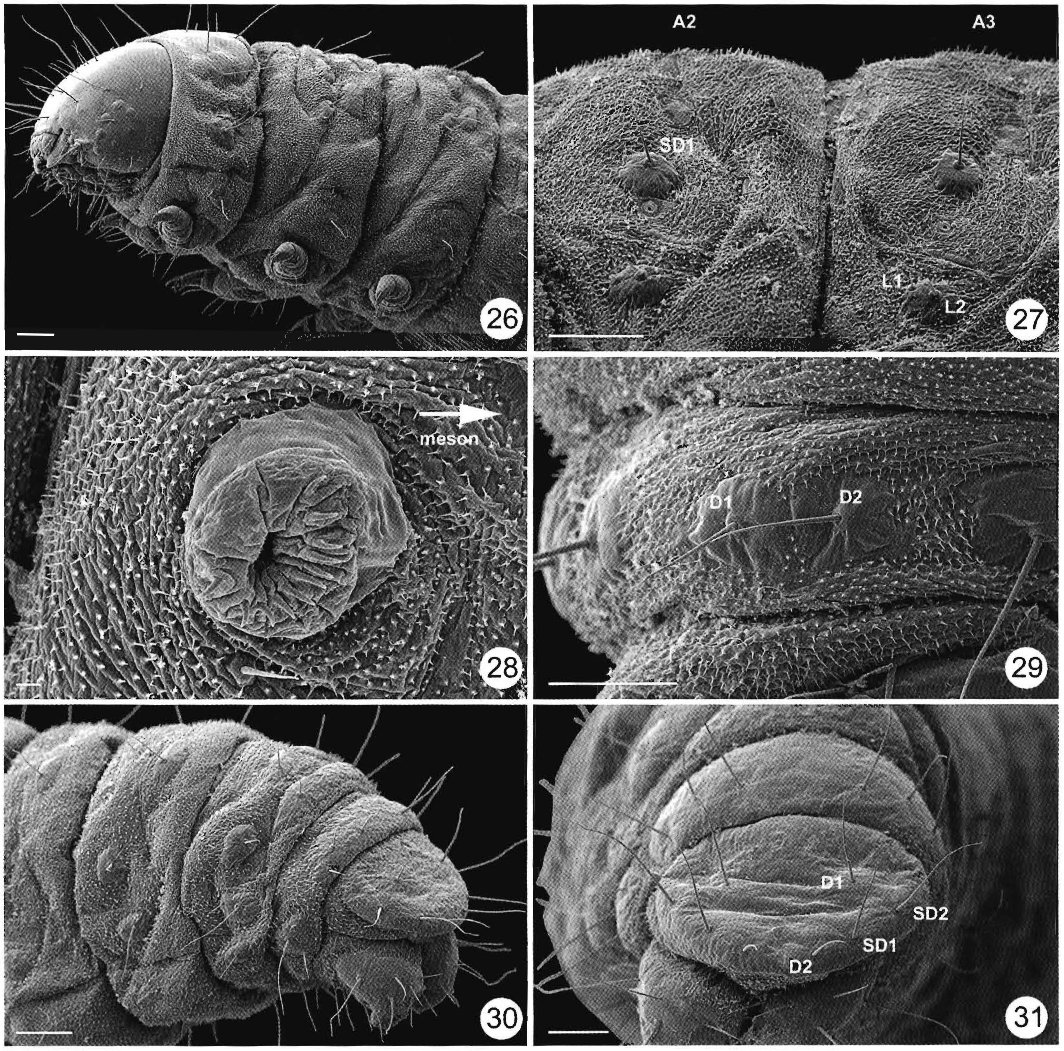
FIGS. 15–19. *Nanodacna austrocedrella* larval chaetotaxy. **15,** Head and thorax, lateral aspect; **16,** Mandible; **17,** Abdominal segments 1–2, lateral aspect; **18,** Abdominal segments 3–4, lateral aspect; **19,** Abdominal segments 8–10, lateral aspect.



FIGS. 20–25. *Nanodacna austrocedrella* larva. **20,** Head in dorsofrontal aspect; **21,** Head in subventral aspect; **22,** Head in anterolateral aspect; **23,** Submentum and spinneret; **24,** Maxillary palp; **25,** Antenna.

present in many specimens of the type series even though they were reared and carefully mounted. This wear may have resulted in part from the fact that emerging adults must crawl out of their narrow pupal galleries in the bark of their host. Dead specimens tend to become greasy on the head and thorax after they have been pinned.

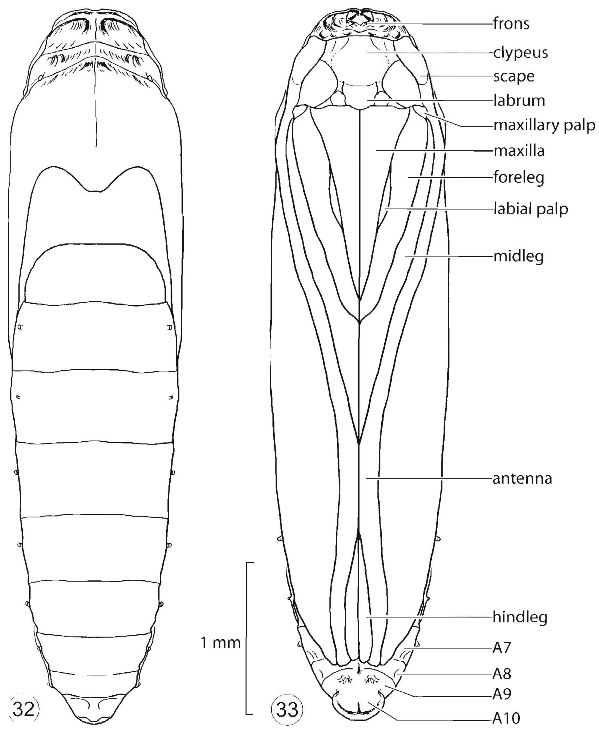
Larva. (Figs. 15–31): Length 0.9–3.4 mm [n = 112]. Body pale yellowish brown, with a dense covering of short microtrichiae; pinacula and sclerites of the thoracic legs slightly darker; head capsule, prothoracic shield, anal plate, and crochets dark yellowish brown; spiracles on T1 and A8 larger than spiracles on A1–A7 (spiracle on A8 being the largest), spiracle on A1 slightly larger than those on A2–A7. Head (Figs. 15, 20–22, 26): hypognathous; epicranium relatively smooth, with few short transverse wrinkles; adfrontal sclerites broad, delimiting frons dorsolaterally; AF1 near apex, longer than AF2, frons closed, F1 in straight line with C1 (Fig. 20), slightly farther from C1 than C1 is from C2; P1 closer to AF2 than P2; P1 longer than P2; MD1 and MD2 (not shown) in area posterolateral to P2; labrum with distal emargination medially, forming two lateral lobes; each lobe with three pairs of setae, mesal and lateral pair subequal, median pair equal in length; labium with spinneret projecting slightly forward; apex of maxillary palpus (Fig. 24) with sensilla arrangement and types similar to those of other gelechioids; six stemmata present and arranged as in Fig. 22. S1 close to stemma-1, S2 close to stemma-3, and S3 located in subgenal area distal to stemma-6; SS2 close to stemma-5, SS1 and SS3 along subgenal margin posterior to mandibular condyle; mandible with four prominent teeth and two subequal setae near base of condyle; sensilla types on antenna (Fig. 25) similar to those of other gelechioids. Prothorax (Fig. 15): shield with three pigmented spots, a large diamond-shaped spot on the posterior margin of middle, and two small, subequal spots near base of D2; XD1, XD2, and SD1 along submarginal area of anterior, SD1 about one-third longer than XD1 and XD2; SD2 short, posterolateral and proximal to SD1, anteriorad to D2 and D1; D1 longest seta on shield. L-group trisetose (some specimens bisetose, with L3 absent), L2 more than twice length of L1 and L3; L3 usually dorsad to L1 and L2; SV1 nearly 3 × length of SV2. Pterothorax (Fig. 15): D2 about twice length of D1, both on same pinaculum, an elongate pinaculum (without setae) posterior to pinaculum bearing D1 and D2; SD1 about 2 × length of SD2, both on same pinaculum anterior to pinaculum bearing D1 and D2; L2 in near straight line with SD1, about 2–3 × length of L2; L2 anteroventral to L1, both on same pinaculum; L3 dorsoposterior to L1;



FIGS. 26–31. *Nanodacna austrocedrella* larva. Head and thorax in lateral aspect. **27,** A2–A3, dorsolateral portion; **28,** Proleg on A3; **29,** A9 in dorsal aspect; **30,** A7–A10 in lateral aspect; **31,** A9–A10 in dorsal aspect.

SV1 in straight line with or slightly posterior to L3. Tarsal setae setiform. Abdomen: All V-group setae on A1–A10 equidistant: A1 and A2 (Figs. 17, 27): D2 about 2 × length of D1; D1 in near straight line with SD1; SD1 on large pinaculum slightly above spiracle; SD2 very short, indistinct; L1 slightly posterior to spiracle, about 2 × length of L2; L2 slightly anterior to spiracle; L3 ventral to and in near straight line with D2; SV-group bisetose on A1 and trisetose on A2. A3–6: (Fig. 18): setae as previous description of A1–A2, with SV-group trisetose, SV1 and SV3 of equal lengths, about 3 × length of SV2, and prolegs present, with crochets in uniordinal mesopenellipse. A7–A10 (Figs. 19, 30): A7 similar to description of A1–A2; A8 with D1 on separate pinacula, D2 setae on same elongate pinaculum; SD1 in near straight line with D1, dorsoanterior to spiracle; L2 and L1 on same pinaculum beneath spiracle; L3 posteroventral to L1–L2 pinaculum; SV-group bisetose, with SV1 about 3 × length of SV2; A9 with three pairs of setae; D2, D1, and SD1 on same elongate pinaculum; pinaculum extended to about level of dorsal rim of spiracle on A8; L-group trisetose, with L2 and L3 about equal in length and shorter than L1; SV-group unisetose; A10 shield (Fig. 31), with SD2, SD1, and D2 on submarginal area and D1 near mesoposterior area adjacent to SD2; crochets uniordinal.

Pupa. (Figs. 32–42): Length 1.9–2.2 mm [n = 10], elongate, smooth, with shallow transverse wrinkles on the forebody, spiracles protuberant (Figs. 32–34), cuticle unspined. Ecdysial line extended from posterior margin of metathorax to anterior margin of vertex. Frontoclypeal suture complete; frontoclypeus truncate, with median subtriangular concavity flanked by 3–5 wide, rounded ridges; frons quadrate, ventral part of clypeus flanked by mandibular sclerites. Vertex with prominent anterior transverse ridge, extended laterally and medially, demarcating two lateral rectangular concavities (Fig. 36); vertex and prothorax divided by a transverse suture. Labrum U-shaped, broader at posterior margin. Labial palpi exposed. Maxillary palpi present. Maxillae extended to about one-third the distance to the caudal wing margin. Prothorax narrowed medially, posterolateral margin with small axillary tubercle (Figs. 37–38). Prothoracic femur exposed. Antennae, prothoracic legs, and mesothoracic legs convergent. Mesothoracic legs longer than prothoracic legs. Metathoracic legs exposed at their tips. Mesothoracic spiracle a small circular opening. Antennae and wing cases extended to and ventrally concealing A5–A8; A9 lateroventrally just beyond antennal apices with a pair of barely elevated bumps, each bearing a short transverse row of several distally-hooked setae (Figs. 41, 42), laterally with small cav-



FIGS. 32–33. *Nanodacna austrocedrella* pupa. **32,** Dorsal aspect; **33,** Ventral aspect.

ity set with a few distally-hooked setae (Figs. 39, 40); A10 rounded, without setae.

Holotype ♂: [label 1] "ARGENTINA, Chubut/ Futaleufu, Trevelin, Instituto/ Nacional de Technologia / Agropecuaria Estacion / Forestal, em. 27–28.IX.1997/ leg. M. Rajchenberg"; [label 2] "JFL lot no. 97–99/ in bark of Austrocedrus / chilensis/ Larva–Pupa 8 Feb 1997"; [label 3, green] "genitalia slide ♂/ MIC 4765"; [label 4, blue] "Database #/ CNC LEP 00001116"; [label 5, orange] "HOLOTYPE ♂/ Nanodacna/ austrocedrella/ J.-F. Landry & Adamski/ CNC Type no. 22858" (CNC).

Paratypes, 14 ♂, 19 ♀ with database # CNC LEP 00001117–00001149.

11 ♂, 14 ♀ with same data as holotype except for adult emergence dates as follows: 4 ♂, 1 ♀, emerged 27–28 September 1997 (CNC ♀ slide MIC 4772); 7 ♂, 9 ♀, emerged 29–30 September 1997 (CNC ♂ slides MIC 4699, MIC 4763; CNC ♀ slides MIC 4766, MIC 4700); 2 ♀, emerged 3 October 1997; 2 ♀, emerged 6 October 1997 (CNC ♀ slide MIC 4767). (CNC, 2 in BMNH, 2 in MBR, 2 in USNM, 2 in ZMUC).

1 ♂, JFL lot no. 96-56, same locality data and host as holotype, larva collected 29 September 1996, leg. S. Rizzuto, C. Cuevas, emerged 27–28 September 1997 (CNC ♂ slide MIC 4764).

Argentina, Chubut, Futaleufu, Arroyo Los Rifleros, Propriedad "La106", JFL lot no. 96-55, larvae collected 13 November 1996: 1 ♂, 1 ♀, emerged 27–28 September 1997 (CNC ♀ slide MIC 4768); 2 ♀, emerged 29–30 September 1997; 1 ♀, emerged 3 October 1997. (CNC).

Argentina, Chubut, Futaleufu, Los Cipreses, Propriedad "Pelmén", JFL lot no. 96–100, larvae collected 10 April 1997: 1 ♂, 1 ♀, emerged 29–30 September 1997. (CNC).

Other specimens examined. The following four adult specimens are unpinned, rubbed and stored in microvials on pins, therefore they are excluded from the type series.

1 ♂: Argentina, Chubut, Futaleufu, Arroyo Los Rifleros, Propriedad "La106", in pure stand of Austrocedrus chilensis, 13 November 1996, M. Rajchenberg (CNC).

3 ♀: Argentina, Chubut, Futaleufu, 50 km Esquel, "Los Cipreses", 30 October 1995, C. Gomez (CNC).

Larvae and pupae. Same locality as holotype. 93 L, 8 January 1996; 99 L, 21 January 1996; 53 L, 8 February 1996; 17 L, 14 February 1996; 120 P, 26 April 1996; all leg. C. Gomez; in 70% ethanol (CNC).

Type locality: Instituto Nacional de Tecnologia Agropecuaria (INTA) Estacion Forestal, Trevelin, Departamento Futaleufu, Provincia de Chubut, Argentina.

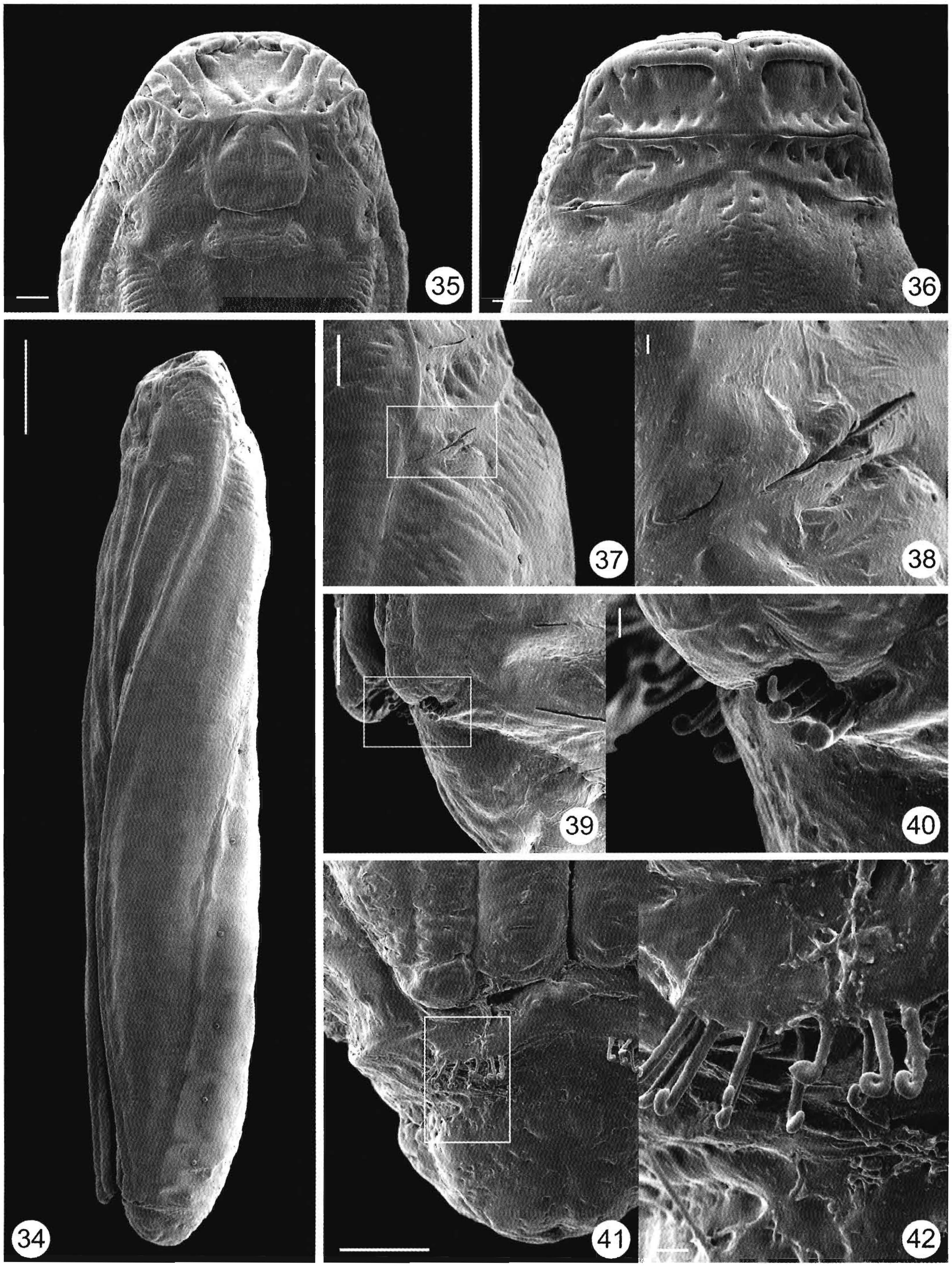
Etymology. The specific epithet is derived from the generic name of the food plant, *Austrocedrus*.

DISCUSSION

Placement and relationships of *N. austrocedrella*. The monophyly of the Agonoxeninae is weakly supported by homoplastic character states (Hodges 1998). The composition of the subfamily is far from settled, as evidenced by the recent transfer of a number of Neotropical species and genera previously scattered in other gelechioid families and groups (Hodges 1997, Becker 1999). Undoubtedly many undescribed species of this generally poorly known and little collected group remain to be discovered in the Neotropics. A number of changes of combination have also resulted from recent generic synonymies based on the study of hitherto poorly known Old World taxa (Sinev 1999).

Austrocedrella shares several features with other species of *Nanodacna:* similarly proportioned labial palpi, lanceolate wing shape, similar wing venation, lack of accessory cell in the forewing, male S1–2 without specialized pouch, similar range in body size. Clarke's (1964) description of *Nanodacna* emphasized wing venation characters. The genus is somewhat heterogeneous in genital characters and *austrocedrella* differs in that respect from all of the included species.

In genital features, *austrocedrella* shares several similarities with species of *Homoeoprepes* Walsingham, a Neotropical genus noted by Clarke (1962) as having "a very close affinity" with *Nanodacna*. *Homoeoprepes* are otherwise larger moths (18–27 mm in wing expanse; 8–13 mm for *Nanodacna*) differing in overall appearance, wing venation and wing shape, proportions of the head and labial palpi, and in having a specialized pouch on abdominal sternites 1–2 in males. Clarke (1962) did not specify in what respect he considered these two genera to be closely related, but he indicated their differences in wing venation and shape, which are quite pronounced. He weighted venational characters heavily in defining the genera but gave no weight to wing shape. Curiously, he did not mention the affinity between these two genera in his 1964 paper describing *Nanodacna*, comparing it in-



FIGS. 34–42. *Nanodacna austrocedrella* pupa. **34,** Lateral aspect; **35,** Head, ventral aspect; **36,** Head, dorsal aspect; **37,** Lateral area of prothorax with axillary ridge; **38,** Closeup of axillary ridge of fig. 37; **39,** Lateral aspect of apex of wings showing small sublateral cluster of hooked setae; **40,** Closeup of hooked setae of fig. 39; **41,** Ventral aspect of lateroapical portion of abdomen showing one of the two setose bumps; **42,** Closeup of the bump of fig. 41 showing hooked setae.

TABLE 1. Morphological characters of *Nanodacna* and *Homoeprepes*. Features possessed by *austrocedrella* are in bold.

	Nanodacna	*Homoeoprepes*
Labial palps	**third article about as long as second article**	third article about half as long as second article
Male S1–2	**without specialized structures**	with eversible lined sac with specialized scales
Vinculum	**broadened, expanded**	narrow, U-shaped band
Juxta	quadrate plate in *ancora* (type species), reduced in 1 species	**well developed quadrate plate**
Aedeagus	**upcurved or dorsally oriented apex**	nearly straight
Cornuti	present in 2 species (*indiscriminata, vinacea*)	**absent**
Anellus	without dorsally projected lobes or undeveloped	**with pair of dorsally projected setose lobes**
Transtilla	with or without spined patches above aedeagus	**with spined patches above aedeagus**
Valva	without costal process or without patch of spines	**with costal process bearing patch of spines**
Valva	fused to vinculum in 2 species; free in *ancora* (type species)	**free**
Signa	pair of well defined ridged sclerites	**pair of faint, diffuse spinulate sclerites**
Ostium	with sclerotized sterigma	**sterigma membranous**
Wing shape	**lanceolate with narrow pointed apex**	broad and rounded apex in 2 species, narrowed in 1 species
Accessory cell	**Absent**	present
FW Venation	**M2 and M3 stalked**	M2 and M3 separate
	R5 strong	R5 obsolete except at margin
	R2 equidistant from R1 and R3	R2 closer to R3 than R1
Number of features shared by *austrocedrella*	7	8

stead to *Blastodacna* Wocke, a Holarctic genus that does not occur in the Neotropical region. Because none of these genera is phylogenetically defined and there is no phylogenetic analysis of other constituent genera of the Agonoxeninae, it is difficult to place *austrocedrella* in any genus convincingly: shared features vary depending on the species considered in each genus (Table 1). This probably underlies the fact that a character analysis would result in a significant rearrangement of taxa. Characters of immature stages and life histories are unknown for *Homoeoprepes* and all species of *Nanodacna* except *austrocedrella*, and thus cannot be used for placement. We chose to include *austrocedrella* in *Nanodacna* by subjectively giving more weight to external adult features.

The genus *Nanodacna* was originally proposed by Clarke to accommodate two species of Agonoxeninae that he described from the Juan Fernandez Islands off the coast of Chile. Subsequently Clarke (1965b) also transferred to *Nanodacna* two other species previously described, namely *logistica* Meyrick from andean Argentina and *vinacea* Meyrick from amazonian Peru. With *austrocedrella*, the genus now comprises five described species as follows:

Nanodacna Clarke, 1964:125

ancora Clarke, 1964:126; type species of *Nanodacna* by original designation and monotypy; Juan Fernandez Islands, Chile; type series examined (USNM);

austrocedrella Landry & Adamski, new species; Chubut Province, Argentina;

indiscriminata Clarke, 1965a:93; Juan Fernandez Islands, Chile; type series examined (USNM);

logistica (Meyrick, 1931:387) (*Colonophora*); combination by Clarke (1965b:563); Rio Negro Province, Argentina; holotype examined (BMNH);

vinacea (Meyrick, 1922:574) (*Homaledra*); combination by Clarke (1965b:563); Rio Napo, Peru (not examined but illustrated in Clarke, 1965b:564).

In male genitalia *Nanodacna* is similar to other agonoxenine genera that have the gnathos as a pair of articulated rami each terminated in a lobe with rows or whirls of small spines, which is possibly a synapomorphy for these taxa (these are: *Amblytenes* Meyrick, *Araucarivora* Hodges, *Auxotricha* Meyrick, *Blastodacna* Wocke, *Chrysoclista* Stainton, *Dystebenna* Spuler, *Glaucacna* Forbes, *Heinemannia* Wocke, *Homoeoprepes* Walsingham, *Microcolona* Meyrick, *Spuleria* Hofmann, *Tocasta* Busck, *Zaratha* Walker). The gnathos of *Agonoxena* Meyrick and of *Pammeces* Zeller is configured differently; that of *Agonoxena* is composed of a single large median, spinose knob similar to that found in Depressariinae; that of *Pammeces* is a simple, V-shaped band without ornamentation. Inclusion of *Pammeces* in Agonoxeninae by Becker (1999) remains weakly supported.

Significance of immature characters of *Nanodacna* within the Agonoxeninae. Immatures of *N. austrocedrella* are significantly different from published descriptions of Agonoxeninae, which are based primarily on taxa of the Northern Hemisphere. The most notable features of the immature stages of *austrocedrella* are as follows. Larva: secondary setae absent; body covered with dense microtrichiae; T2–T3 each with a pair of asetose pinacula. Pupa: labial palpi exposed; forebody without spicules; lateral abdominal condyles absent; "pupal legs" of A9 reduced to a pair of barely elevated bumps; antennae and wing cases ventrally extended to A9, concealing A5–A8.

Lack of secondary setae in the larva is a feature shared with *Araucarivora, Chrysoclista, Cladobrostis* Meyrick, *Microcolona*, and *Haplochrois* Meyrick, which may be plesiomorphic for Agonoxeninae. Dense secondary setae are present in *Agonoxena* (Bradley 1966) and *Blastodacna* (Stehr 1987). The body of the larva is covered with dense microtrichiae, a feature shared with *Araucarivora*. Crochets are in a uniordinal mesopenellipse, which is the arrangement seen in other agonoxenines with known larvae. Presence of a pair of asetose thoracic pinacula is shared with *Haplochrois* (Kuznetsov 1916) and is a feature rarely seen in other Gelechioidea.

Labial palpi are exposed in the pupa of *N. austrocedrella,* a feature in which it differs from other Agonoxeninae. Lack of coarse spicules on the anterior half of the body from the vertex to the prothorax, such as found in *Araucarivora* (Hodges 1997), *Haplochrois*, and *Cladobrostis* and *Microcolona* (Fletcher 1933), are a trait shared with *Blastodacna* and *Chrysoclista*. Unlike the pupae of several other agonoxenine genera [*Agonoxena* (Bradley 1966), *Araucarivora* (Hodges 1997), *Cladobrostis* (Fletcher 1933), *Haplochrois* (Kuznetsov 1916, Bottimer 1926)], A9 of *N. austrocedrella* is without paired projected processes (the so-called "pupal legs" of authors; e.g., Hodges 1997). However, there is a pair of weakly elevated bumps bearing hooked setae that probably function as a cremaster. "Pupal legs" are likewise lacking in *Chrysoclista* which has A9 ventrally smooth, without hooked setae (pupae of *C. lineella* in CNC examined). The pupa of *N. austrocedrella* is proportioned differently from that of other agonoxenines, with the antennae and wing cases ventrally extended to A9 and concealing A5 to A8; other agonoxenines have proportionnally shorter wing cases that leave A4 to A8 variously exposed ventrally.

In phylogenetic reconstructions of the Gelechioidea using parsimony analysis both Hodges (1998) and Passoa (1995) included Agonoxeninae in a clade of Gelechioidea defined by the presence of lateral condyles in the pupa, which restrict pupal abdominal movement to an up-and-down motion. However, this character is subject to homoplasy. Except for *Araucarivora* (Hodges 1997), Agonoxeninae pupae have poorly developed lateral condyles (Bradley 1966, Bottimer 1926, Fletcher 1933, Kuznetsov 1916, Sinev 1979). *Nanodacna austrocedrella* represents an example where condyles are absent. This suggests that reduction of pupal lateral condyles is probably a synapomorphy of the Agonoxeninae, although this loss has occurred several times in related outgroups (*Coelepoeta* Walsingham, Xyloryctinae, and Peleopodinae [Common 1990, Passoa 1995]).

The *N. austrocedrella* pupa displays several unusual specializations, some of which are unique among known Agonoxeninae and may be apomorphic and, thus, not informative phylogenetically. Other features may be indicative of relationship or homoplastic. More cogent statements of relationships will require a detailed character and cladistic analysis, which is beyond the scope of this paper, as well as discovery of the immature stages of additional agonoxenine taxa.

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