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## Two New Species of *Wockia* Heinemann (Lepidoptera: Urodidae) from Coastal Dry-Forests in Western Mexico

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**TWO NEW SPECIES OF *WOCKIA* HEINEMANN (LEPIDOPTERA:  
URODIDAE) FROM COASTAL DRY-FORESTS IN WESTERN MÉXICO**

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*Abstract.*—Two new species of *Wockia* Heinemann, 1870 (Lepidoptera: Urodidae), *W. chewbacca* and *W. mexicana*, are described from primary dry-forests in western México. A new host record is reported for the genus from larvae of *W. chewbacca* feeding on leaves of *Casearia nitida* (L.) Jacq. (Salicaceae). Several shared genitalic features and DNA barcode similarities suggest a congeneric relationship between the two Mexican species but uncertain generic placement within Urodidae. Scanning electron micrographs of the larva and illustrations of the larva and pupa of *Wockia chewbacca* are provided, along with illustrations of male and female genitalia of both Mexican species. Three unusual features found in the larval stage are documented for *W. chewbacca* include; a multi-lobed integument, recurved D2 seta on the shield of T1, and a “hydroid bush” consisting of multiple sensilla trichoidea on the apical turret of the antenna. Locality data indicate the existence of Neotropical elements of *Wockia* and an expanded distributional range for the genus.

*Key Words:* *Anchimacheta*, chaetotaxy, Chamela, DNA barcodes, genitalia, genetic distance, Neotropics, pupa, *Spiladarcha*, Urodidae, *Urodus*

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*Wockia* Heinemann, 1870 is a small genus within the Urodidae which, until now contained three named species: *W. asperipunctella* (Bruand 1851) with a Holarctic range, *W. balikpapanella* Kyrki, 1986, from Borneo, and *W. koreana* Sohn, 2008, from Korea. They are relatively small, gray-colored moths with a typical forewing pattern consisting of a narrow, oblique band of raised scales near the basal 1/3. Larvae of *W.*

*asperipunctella* are exposed feeders on leaves of *Populus* and *Salix* (Salicaceae) (Brown 1895, Chrétien 1905, Sohn and Adamski 2008). Since the mid 19th century, *Wockia* was known only from western Europe. However, recent discoveries in northern Asia (Sohn and Adamski 2008), Malyasia (Kyrki 1986), and in North America (Heppner 1997, Landry 1998) have expanded our knowledge of its range. Kyrki (1988) described adult and larval features of *Wockia* and they include: labial palpi porrect, short,

\* Accepted by David R. Smith

with a tuft of scales medially, blunt apically; antenna lamellate in the male, filiform in female; chorda of forewing present; valva deeply divided apically; costal lobe digitate; ovipositor telescopic; antrum wide; ductus bursae short; and larva with AF-group bisetose and ad-frontal area with one puncture.

The position of *Wockia* remains unsettled. Historically, the genus was placed alternatively in Yponomeutidae or Plutellidae (Leraut 1980, Zagulyaev 1989). Kyrki (1988) showed that it lacked defining yponomeutoid features but possessed tortricoid abdominal articulation. He established the family Urodidae to include *Wockia* along with *Urodus* Herrich-Schäffer, 1854, and *Spiladarcha* Meyrick, 1913. The Urodidae seem appropriately placed in the Apoditrysia but their affinities and position remain unresolved (Dugdale et al. 1998).

The purpose of this study is to describe two new species of *Wockia* recently discovered in the dry deciduous forests of western México, to give some assessment of relationship between the two species by using morphological comparisons and DNA barcode analysis, and to discuss the relationships of these two species with other Urodidae.

#### MATERIAL AND METHODS

Herbivory studies of *Casearia nitida* (L.) Jacq. (Salicaceae) were conducted on sites located at the Estacion de Biología Chamela (EBC), Universidad Nacional Autónoma de México, in Jalisco, México. The station is near the Pacific coast of México (19°30'N, 105°03'W), has an area of about 3,300 hectares, and is thought to have been undisturbed for hundreds of years because there is no evidence of either natural or anthropogenic fire (Maass and Martinez-Yrizar 2001). The vegetation in this part of the Neotropical Region consists of mainly deciduous plant species intermixed with semi-deciduous species that are primarily

distributed along several large streams within the forests (Lott 1987). The annual rainfall averages about 788 mm, and is concentrated but not totally restricted to the months between July and October (Garcia-Oliva et al. 2002). The mean temperature is about 25° C, with less than a 5° C difference between the warmest and coolest months (Maass and Martinez-Yrizar 2001).

Larvae of *Wockia chewbacca* were found on leaves of the tropical deciduous tree *Casearia nitida* (L.) Jacq. (Salicaceae) (Fig. 4). This plant species is distributed throughout the Neotropics from México to South America. *C. nitida* grows from 2–6 meters in height in the forests that encompasses EBC (Lott 1993). Leaf flush and flowering occurs during the first two weeks of the rainy season (between June and July), and seeds mature between August and September. Adults of *Wockia mexicana* were collected from a sheet illuminated by blacklight at or near the study sites where larvae of *W. chewbacca* were collected.

For SEM study, larvae and pupae were cleaned in a full-strength solution of all-purpose cleaner, Formula 409™ detergent, and subsequently dehydrated in increasing concentrations of alcohol to absolute alcohol. 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. The ultrastructure of the larva and pupa was studied with an Amray 1810 scanning electron microscope at an accelerating voltage of 10 kV.

Gross morphological observations and measurements of the larva and pupa were made using a dissecting microscope (reflected light) with a calibrated micrometer. Genitalia were dissected as described by Clarke (1941), except mercurochrome and chlorazol black were used as stains. The Methuen Handbook of

Colour (Kornerup and Wanscher 1978) was used as a color standard. All types and voucher specimens of immature stages generated from this study are deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM), and Instituto de Ecología, Universidad Nacional Autónoma de México, Ciudad Universitaria, México, D.F. (UNAM). Authorship for the species described herein is attributed to the senior author. We follow Chase et al. (2002) for family placement of *Caesaria nitida* into Salicaceae.

DNA barcode sequences were produced at the University of Guelph, Ontario, Canada. For the DNA barcoding method used, see Hebert et al. (2004) and Hajibabaei et al. (2006). Sequence information was entered in the Barcode of Life Database (BOLD) ([www.barcodinglife.org](http://www.barcodinglife.org), Ratnasingham and Hebert 2007) along with a photo and collateral information (collecting data) for each specimen. Process numbers given with the sequences cited below refer to sequence numbers in BOLD. Sequences for the new species have been submitted to GenBank with the accession numbers 752230–752256. Genetic distances were analyzed with MEGA4 software (Tamura et al. 2007).

***Wockia chewbacca* Adamski, new species**  
(Figs. 1–3, 5–28)

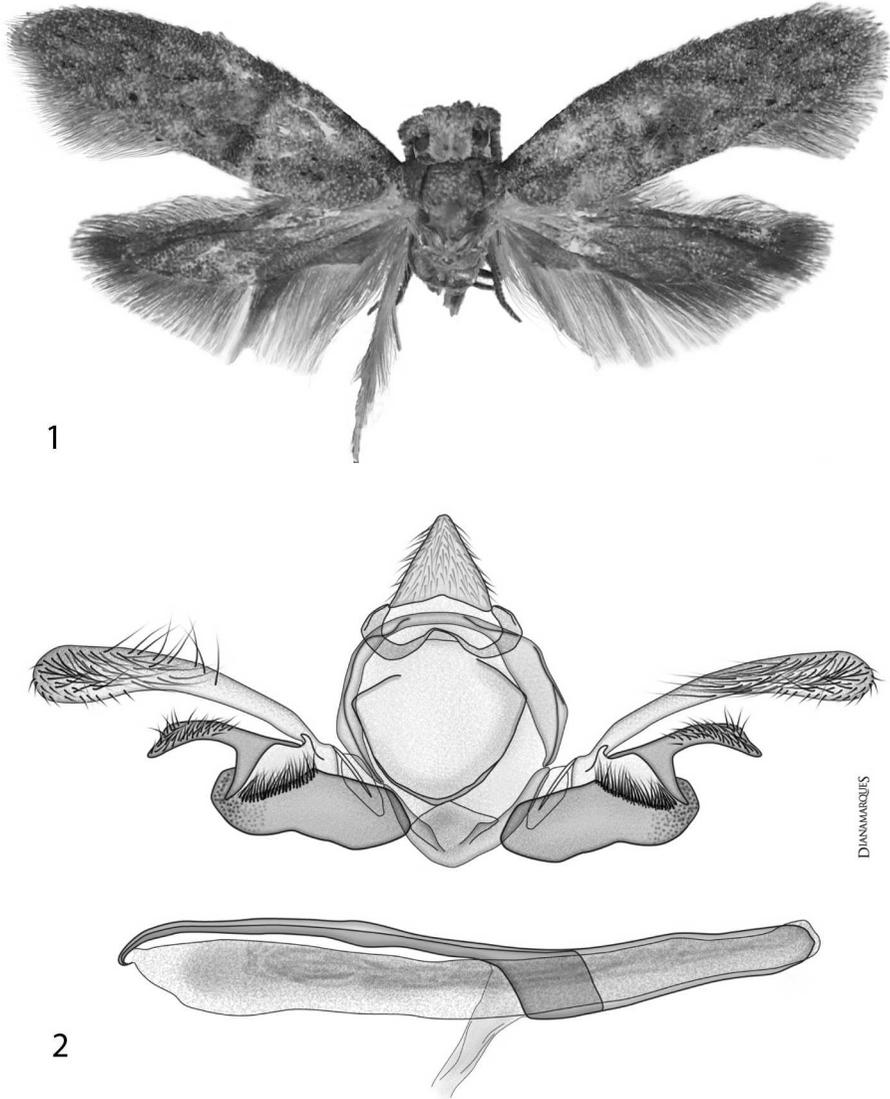
**Diagnosis.**—*Wockia chewbacca* is similar to *W. mexicana* in size and color pattern, however, the former species can be distinguished from the latter by having a slightly more arched costal margin of the forewing, a more linear apical half of the costal lobe of the valva, a smaller saccular lobe of the valva, a vinculum that is not ventrally produced, and a longer aedeagus.

**Adult description.**—**Head:** Scales of vertex and frontoclypeus pale brown tipped with white or gray tipped with

white; ventral margin of frons white; scape with gray scales tipped with white, flagellum gray; flagellum wider basally in male than in female; outer surface of labial palpus with gray scales tipped with white intermixed with gray scales and few white scales, inner surface usually with more white; proboscis naked.

**Thorax:** Tegula gray intermixed with few brown scales or with gray scales tipped with white; mesonotum pale brown, or mostly gray except dark gray along anterior margin, or gray intermixed with brown scales; Frontlegs with coxa, trochanter gray, distal 2/3 of femur dark gray intermixed with few dark-gray scales tipped with white, distal margin of tarsomeres with a narrow white band; midleg with coxa, trochanter, and basal 1/3 of femur pale gray, distal 2/3 of femur gray intermixed with gray scales tipped with white, tibia dark gray intermixed with dark-gray scales tipped with white; tarsomeres as above; hindleg with coxa, trochanter, and basal 3/4 of femur pale yellow, distal 1/4 of femur gradually darkening to end; tarsomeres as above. Forewing (Fig. 1): length 5.2–6.8 mm (n = 12), gray and pale-gray scales tipped with white and few white scales; basal 1/4 with two brown spots of raised scales, one anterior to CuP and slightly closer to base than second spot, second spot posterior to CuP; a narrow, oblique band of raised scales near basal 1/3; band dark gray on inner surface, brown on outer surface. Undersurface gray. Hindwing: gray, usually darker than forewing.

**Abdomen: Male genitalia** (Fig. 2): Uncus conical, setose; gnathos a narrow band, gradually narrowed and curved posteromedially medially; tegumen rounded; vinculum a narrow band; valva deeply dissected, forming an elongate costal lobe and a shorter, broad, saccular lobe; costal lobe with distal 2/3 setose, gradually widened from base to a rounded apex; saccular lobe with inner



Figs. 1–2. Adult and male genitalia of *Wockia chewbacca*. 1, Holotype. 2, Genital capsule and aedeagus.

wall curved inwardly with a row of hairlike setae on an inclined distal margin, with an elongate, slightly down-curved, distally setose process; process with a widened bifurcate base; aedeagus elongate, slightly wider at base, gradually narrowed distally, with a narrow supporting rod from base to distal 2/3.

*Female genitalia* (Fig. 3): Ovipositor elongate, appearing as one membranous

part without any telescopic subdivisions from eighth segment to papillae anales; eighth tergum and sternum with setae along distal margin; ostium near posterior end of seventh sternum; antrum wide, gradually narrowed to a point beyond anterior margin of seventh sternum near inception of ductus seminalis; ductus bursae short; corpus bursae elongate; signum, a projection with a slightly serrate edge.

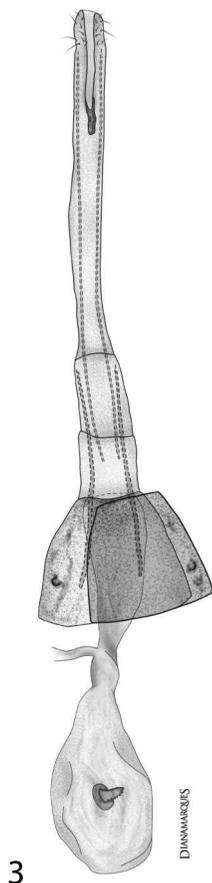


Fig. 3. Female genitalia of *Wockia chewbacca*.

Larva.—(Figs. 5–24): Length 7.5–8.3 mm ( $n = 6$ ). Body pale grayish brown or dark gray, with irregularly patterned brown spots on lateral surface (some field collected specimens are nearly black); body covered with hairlike microtrichiae with widened bases; all pinacula except, V-group pinacula, on apex of fleshy lobes; spiracle on T1 about as large as spiracle on A8, both larger than spiracles on A1–A7.

*Head* (Figs. 8–15, 24): Hypognathous, epicranial suture long, epicranial notch deep, forming two large, rounded hemispheres; frons and adfrontal sclerites demarcated by an alternating series of short, raised nodules and deep furrows perpendicular to margin; AF-group bisetose, with no puncture on adfrontal

sclerite; AF2 at apex of frons, longer than AF1; F1 on basal 1/3 of frons, slightly dorsal to A2; P1 above apex of adfrontal sclerites, ental to A2; P2 dorsolateral to P1, and slightly lateral to A3; C1–C2 diagonally situated on smooth area of frons along basal 1/3; A1 in vertical line with C2; A2 in line (parallel with adfrontal sclerite) with A1; A3 above antennal base and slightly above A2; L1 dorsolateral to A3; stem-matal pattern with stemma 3–5 in nearly straight line, stemma 1–2 dorsal lateral to stemma 3, and stemma 6 dorsoposterior to stemma 4; S3 posteroventral to stemma 1; S2 between and lateral to stemma 2–3; S1 between and lateral to stemma 4–5; SS1 between base of antenna and mandibular condyle; SS2 in straight line with and equidistant to SS1 and SS3; antenna angled posteriolateral from base with apical turret angled more acutely towards posterior direction; sensilla of antenna as in Figs. 12–13, with a “hydroid bush” consisting of multiple sensilla trichoidea on the apical turret; maxillary palpus elongate, flattened dorsoventrally, sensillar arrangement as in Figs 14–15; mandible with 2 subequal setae near condyle, and 6 apical dentitions; retinaculum a narrow, broadly rounded ridge, proximal to and nearly perpendicular with line of dentitions.

*Thorax* (Figs. 16, 20–21): T1 with L-group trisetose, anterior to spiracle; L1 about 2–2 1/2 times longer than L2 and L3, posteroventral to L2; L3 slightly longer and in horizontal line with L2; SV1 about twice length of SV2; V1s approximate, in a line posterior to coxal margins (not shown); shield with two pairs of raised lobes; a dorsolateral lobe bearing SD1, SD2, XD2, and D2, and a dorsomedian lobe bearing XD1 and D1; SD1 about 1/3 longer than XD2 and SD2, slightly posterior to XD2, each seta near top of dorsolateral lobe, D2 with a recurrent apical end, on posterior part of

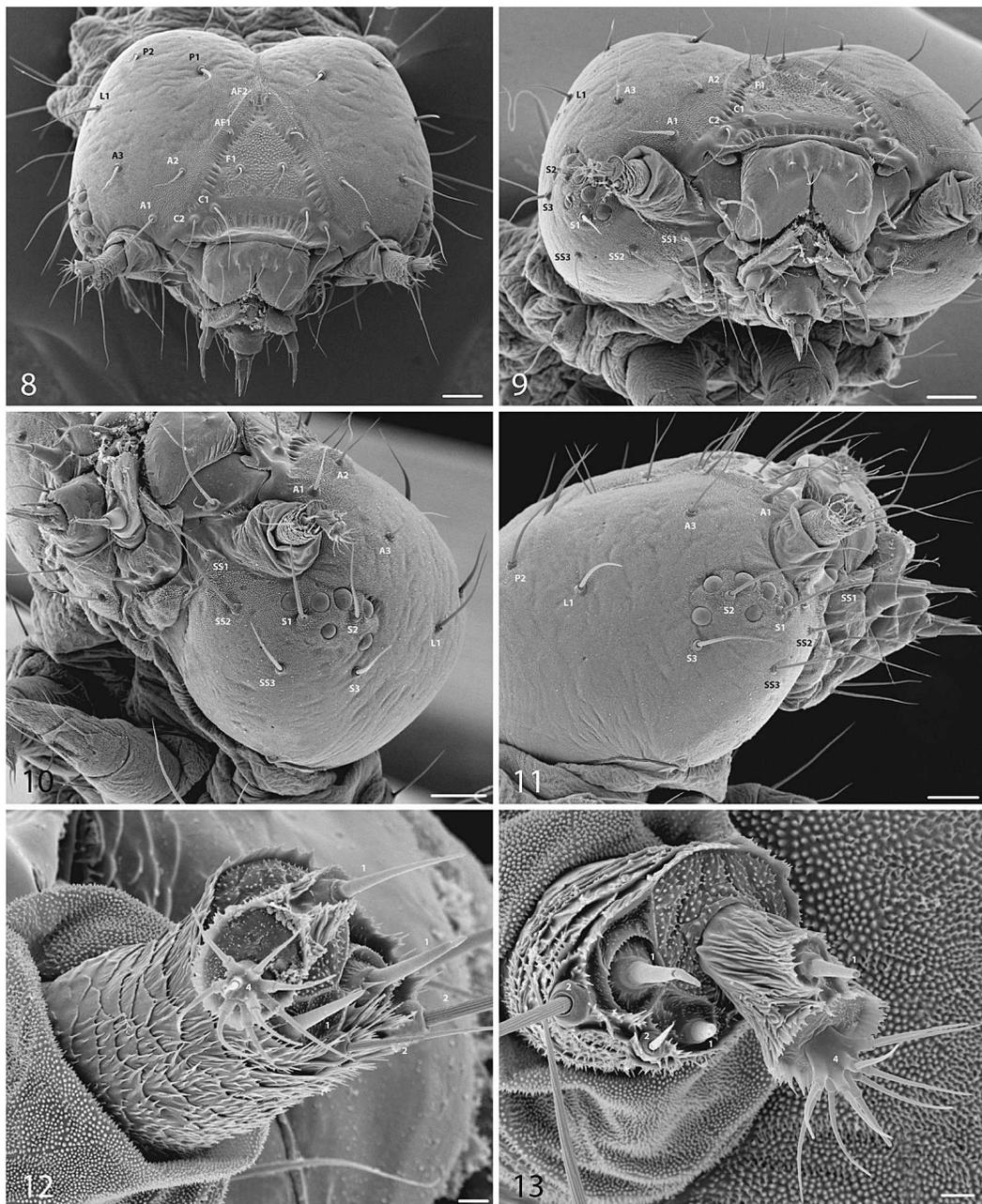


Figs. 4–7. Host plant, *Casearia nitida*, larva, and pupa within cocoon of *Wockia chewbacca*. 4, *Casearia nitida* (Salicaceae), note arrow. 5–6, Larva. 7, Pupa within cocoon.

base of lobe, hairlike, about 3 times longer than XD2, SD2, and D1; XD1 about equal in length to D2 but straight, on apical part of dorsomedian lobe; D1 about equal in length to XD2 and SD2, on posterior margin of lobe. T2–T3 (Figs. 16, 20–21): D2 on apex of lobe, about 2 1/2–3 times length of D1; D1 subapical; SD1 on apex of lobe, about 2–2 1/2 times length of SD2; MD1 and MD2 anteroventral to base of lobe bearing SD-setae; L1 dorsoposterior to L2, about twice length of L2–L3; L3

dorsoposterior to L1, and anterior to, in vertical line with, or slightly posterior to SV1; SV1 pinaculum dark brown; MV1 anteroventral to L2; V1s at least twice distance apart as V1s on T1, slightly farther apart on T2 than on T3 (not shown). Tarsal claw is simple (Fig. 16).

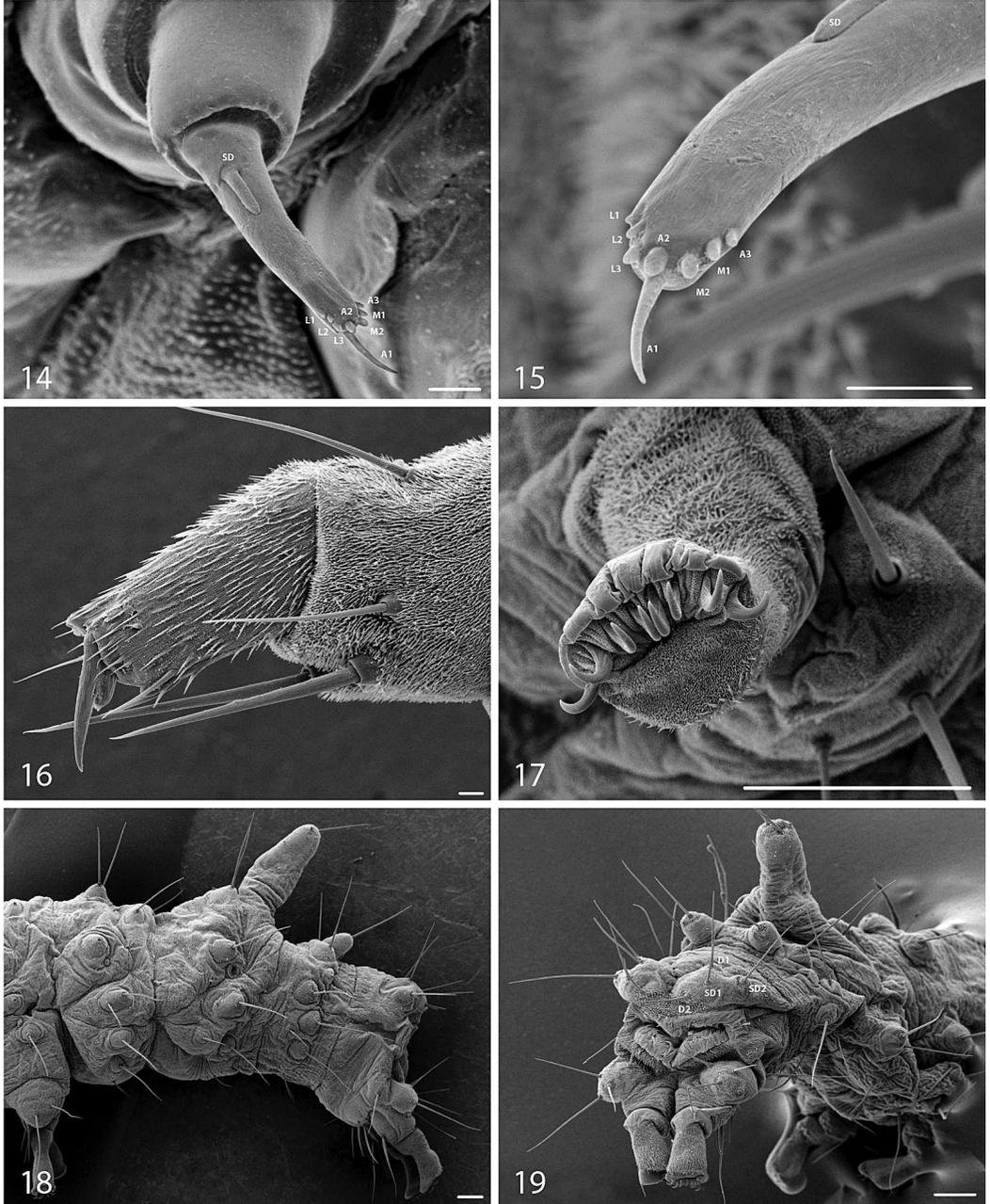
*Abdomen* (Figs. 18–20, 22–23): A1–A2 with D1 and D2 about equal in lengths; lobe bearing D1 slightly smaller and posterolateral to lobe bearing D2; MD1 anteroventral to lobe bearing D2; SD1 slightly dorsoanterior to or directly



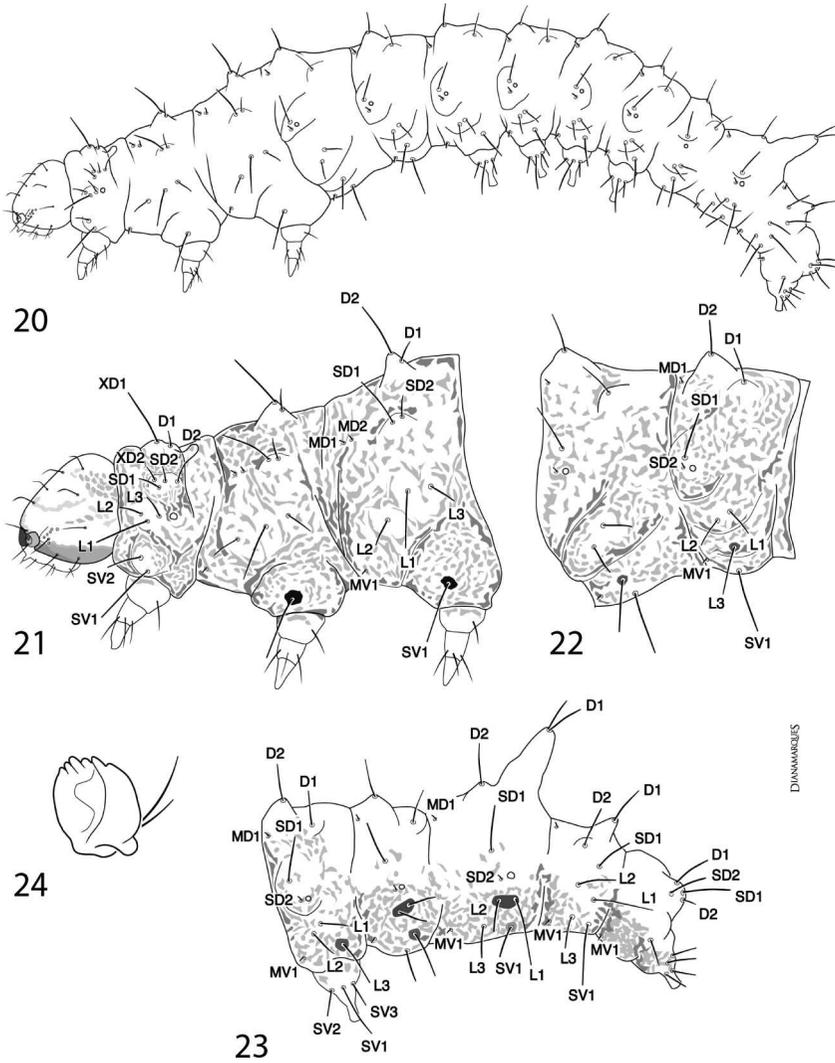
Figs. 8–13. Scanning electron micrographs of head and antenna of *Wockia chewbacca*. 8, Frontal view. Scale = 100  $\mu$ m. 9, Frontal view. Scale = 100  $\mu$ m. 10, Ventrolateral view. Scale = 100  $\mu$ m. 11, Lateral view. Scale = 100  $\mu$ m. 12, Right antenna (lateral view). 1 = sensilla basiconica; 2 = sensilla chaetica; 3 = hydroid “bush” of multiple sensilla trichoidea on the apical turret. Scale = 10  $\mu$ m. 13, Right antenna (dorsal view of inner surface). Sensillar nomenclature as above. Scale = 10  $\mu$ m.

above spiracle on A1, dorsoanterior to spiracle on A2; SD2 minute, anterior to spiracle; L1 and L2 on same lobe, posterior to spiracle, about equal in

lengths; L3 about 1/3 longer than L1–L2, slightly posterior to L1 and usually in vertical line with SV1; MV1 anteroventral to L3; V1s about equidistant as



Figs. 14–19. Maxillary palpus, tarsal claw, proleg, and abdomen of *Wockia chewbacca*. 14, Sensilla of right maxillary palpus (dorsal view). A2 = sensillum styloconicum; A1, A3, M1, M2, L1, L2, and L3 = sensilla basiconica; SD = sensillum digitiforma. Scale = 10  $\mu$ m. 15, Sensilla of right maxillary palpus (dorsoapical view). Sensillar nomenclature as above. Scale = 10  $\mu$ m. 16, Left meta thoracic tarsal claw (inner surface). Scale = 10  $\mu$ m. 17, Left proleg on A1 (ventral view). Scale = 100  $\mu$ m. 18, A6–A10 (lateral view). Scale = 100  $\mu$ m. 19, A6–A10 showing setae on anal plate (posterolateral view). Scale = 100  $\mu$ m.



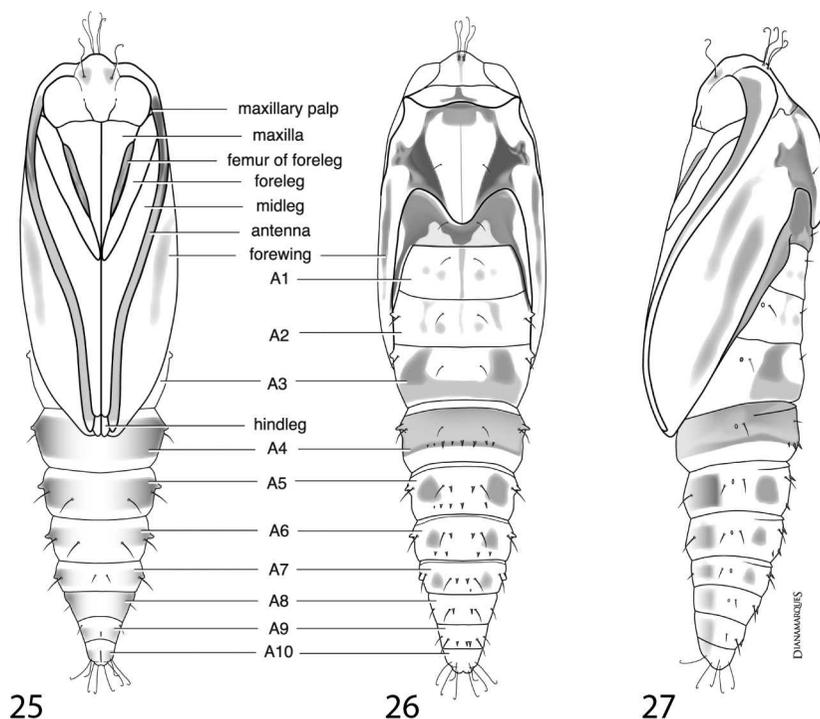
D. J. HANNA

Figs. 20–24. Chaetotaxal maps and mandible of larva of *Wockia chewbacca*. 20, Entire larva (lateral view). 21, Head and thorax (lateral view). 22, A1–A2 (lateral view). 23, A6–A10 (lateral view). 24, Right mandible (ventral view).

V1s on T1 (not shown); A3–A6 with 4 pairs of narrowly elongate prolegs, crochets uniordinal, in a mesoseries; setae as above except, SD2 anteroventral to spiracle, SV-group trisetose; A7 as above except, SV-group unisetose; A8 with setae as above except; with an elongate lobe on posterior part, bearing both D1 setae, and L3 anterior to all setae; A9 with D1 on apex of lobe, D2 on anterior part of lobe at base; SD1 in near vertical line with D1, L1 and SV1; L3 slightly

anterior to all setae; A10 (Figs. 18–20, 23): anal plate with SD1 slightly longer than SD2 and D1, D2 about 1/4 length of SD2 and D1; prolegs extended nearly horizontally, bearing 8–10 uniordinal crochets in an arc.

Pupa (Figs. 25–28).—Length 7.3–9.2 (n = 2). Smooth, pale amber with distinct darker, blotched pattern. Sclerites of maxillae and foreleg fused distally; sclerites of antennae and midlegs parallel from proximal end of sclerite of femur of



Figs. 25–27. Pupa of *Wockia chewbacca*. 25, Ventral view. 26, Dorsal view. 27, Lateral view.

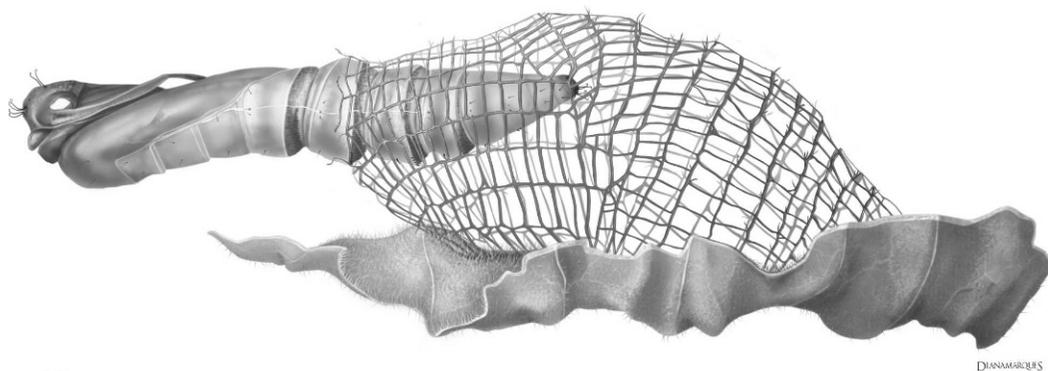
foreleg, extending distally, with sclerites of midleg abruptly shortened, exposing the apical part of hindlegs; sclerites of antennae nearly extending to the tips of the forewing. Spiracles protuberant; dorsally protuberant on A4–A9; A4–A10 mobile as unit; a pair of distally hooked setae on upper frons, two pair of such setae on vertex; several pairs of hooked setae on cremaster.

Types.—Holotype, ♂, “México: Jalisco: Estación de Biología Chamela, Universidad Nacional Autónoma de México, 19°31’N, 105°03’W, 4–11 July 2006, r.f. *Casearia nitida*, Col. Karina Boege”; “USNM ♂ Genitalia Slide by D. Adamski, No. 83284” [green label]. Deposited in USNM.

Paratypes (5 ♂, 6 ♀): 4 ♂, 2 ♀: Same label data as above except, 1 ♂, “USNM ♂ Genitalia Slide by D. Adamski, No. 83286” [green label]; 1 ♀, “USNM ♀ Genitalia Slide by D. Adamski, No. 83285” [green label]; 1 ♂, “CNC

LEP Database # 00024615”; “Barcodes of life project, DNA extracted” [blue label]; 1 ♂, 1 ♀: “Mexico: Jalisco, Chamela Biol. Station, K. Boege, 09 [Sept.] 2002”; “Host plant, *Case[a]ria corymbosa* (= *Casearia nitida*), Code: C-3N”; “R[efere]nce N[umber] = 41”; “USNM ♂ Genitalia Slide by D. Adamski, No. 83287” [green label], and “R[efere]nce N[umber] = 45”; “USNM ♀ Genitalia Slide by D. Adamski, No. 83288” [green label]; 3 ♀, “Col. Karina Boege, Loc[ation] Chamela, Jal[isco], Mex[ico], Host, *Casearia nitida*, R[efere]nce N[umber] = 3, R[efere]nce N[umber] = 6, R[efere]nce N[umber] = 7, Group 1, 1 Jul[y], 2004, Feeding free on leaves”; “CNCLEP Database # 00024616”; “Barcodes of life project, DNA extracted” [blue label]. [6 in USNM, 5 in UNAM].

DNA barcode of paratype CNCLEP 00024615 (process # LNEL187-06) (657 bp):



28

Fig. 28. Protuberant pupal exuvium of an emerged adult and cocoon of *Wockia chewbacca* (lateral view).

ACATTATATTTTATTTTTGGAA  
 TTTGAGCAGGAATAATTGGAAC  
 TCTTTAAGTTTATTAATTTCGAGC  
 AGAATTAGGTAATCCAGGCTCTT  
 TAATTGGCAGAGATCAAATTTAT  
 AATACTATTGTTACAGCTCATGC  
 TTTTATTATAATTTTTTTTATAG  
 TTATACCTATTATAATTGGTGA  
 TTTGGTAATTGATTAGTTCCTTT  
 AATACTAGGTGCCCTGATATAG  
 CTTTCCCTCGTATAAATAATATA  
 AGATTTTGATTATTACCTCCTTC  
 TTTATTACTTTTAATTTCTAGAA  
 GAATTGTAGATAATGGAGCAGGT  
 ACTGGATGAACAGTTTACCCCC  
 TTTATCTTCCAATATTGCTCATG  
 GAGGTAGTTCGTTGATTTAGCT  
 ATTTTTTCCCTTCACTTAGCTGG  
 TATCTCATCTATTTTAGGAGCCG  
 TAAATTTCAATTTCAACAATTATT  
 AATATACGACCTATAAACCTAAA  
 TTTCAATCAAATACCCCTATTTG  
 TTTGAGCTGTAGGTATTACAGCT  
 TTACTACTTTTATTATCATTACC  
 TGTTTTAGCTGGAGCAATTACTA  
 TATTATTAACAGATCGAAATTTA  
 AATACTTCATTTTTTTGACCCTGC  
 AGGAGGAGGAGACCCTATTTTTAT  
 ATCAACATTTATTC

Etymology.—The species epithet, *chewbacca*, is named after the very large and hairy Wookiee character in the Star Wars movie series.

Host and biology.—Larvae of *Wockia chewbacca* are exposed feeders on leaves of *Casearia nitida* (L.) Jacq. (Salicaceae) (Figs. 4–6). While feeding, larvae avoid the main and secondary veins of leaves, probably to minimize the ingestion of secondary plant defense chemicals. If disturbed, the larva will wag its body violently from side-to-side until it falls off the leaf, only hanging by a strand of silk from which it uses to climb back to the leaf or branch near the location from which it had fallen. Development from egg to pupa takes about two weeks. The last-instar larva pupates within a finely woven cocoon, which hangs from a branch or leaf from the host tree (Fig. 7). It takes about ten days for the adult to emerge. Emergence takes place from a pupa, which protrudes from its cocoon. The short developmental time allows for multiple generations to occur.

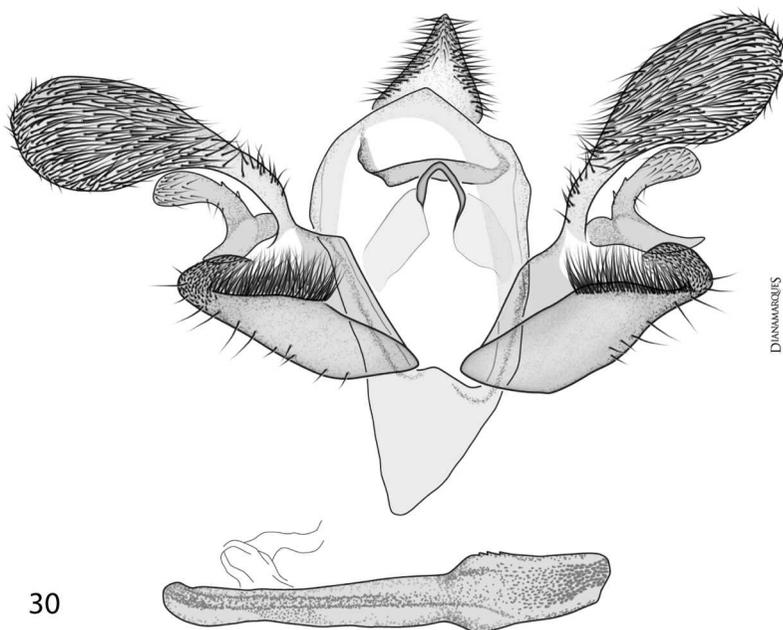
Parasitoids.—*Cardiochiles* sp. (Hymenoptera: Braconidae).

***Wockia mexicana* Adamski, new species**  
 (Figs. 29–30)

Diagnosis.—*Wockia mexicana* is similar to *W. chewbacca* in size and color pattern, however, the former species can be distinguished from the latter by having a slightly less arched costal margin of the forewing, a lobelike apical half of the costal part of the valva, a larger saccular lobe of the valva, a



29



30

Figs. 29–30. Adult and male genitalia of *Wockia mexicana*. 29, Holotype. 30, Genital capsule and aedeagus.

ventrally produced vinculum, and a shorter aedeagus.

Adult description.—*Head*: Scales on vertex and frontoclypeus gray tipped with white; scape with scales gray tipped with white, flagellum gray; inner and outer surfaces of labial palpus dark gray intermixed with dark-gray scales on

basal and apical area of all segments; proboscis naked.

*Thorax*: Tegula and mesonotum with scales gray tipped with white. Legs as in *W. chewbacca*. Forewing (Fig. 29): length 5.6 mm ( $n = 2$ ), gray and dark-gray scales tipped with white intermixed with dark gray; basal area with two

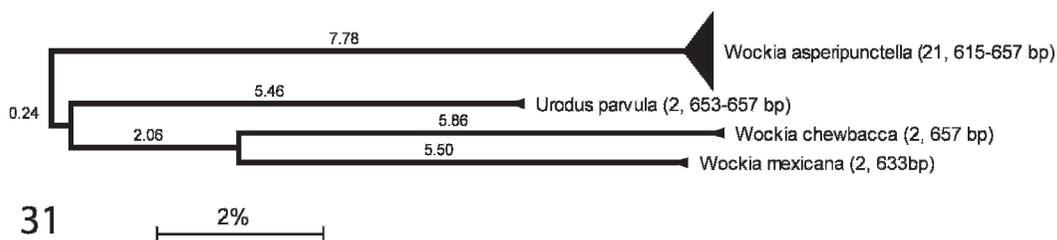


Fig. 31. Neighbor-joining (NJ) tree based on Kimura-2-Parameter (K2P) distances for cytochrome *c* oxidase I (COI) of 4 species (27 specimens) of Urodidae. Numbers above branches indicate branch length. Numbers in parentheses after species names indicate the number of specimens analyzed and the range of sequence lengths obtained. Individual species branch clusters were collapsed.

brown spots of raised scales, one anterior to CuP and slightly closer to base than second spot, second spot posterior to CuP; a narrow, oblique, brown band of raised scales near basal 1/3. Under-surface gray. Hindwing: gray, basally translucent, gradually darkening to margin.

*Abdomen: Male genitalia* (Fig. 30): Uncus conical; gnathos a thin band; transtilla with broad basilateral lobes, each connected by a thin, posteriorly-rounded, median band; tegumen ovoid; vinculum ventrally produced; valva deeply dissected, forming an elongate costal lobe and a shorter, broad, saccular lobe; costal lobe setose, abruptly widened distally from 1/4, forming a broadly rounded ellipsoid; distal saccular lobe with inner wall curved inwardly with a row of hairlike setae on a slightly inclined distal margin, adjacent to a recurved, spinulate, inner wall; saccular lobe with an elongate, acutely curved, distally setose process; process with a widened bifurcate base; aedeagus elongate, abruptly widened on distal 1/4, with an internal rod from base to apex; vesica spiculate, cornuti absent.

*Female genitalia*: Unknown.

*Types*.—Holotype, ♂, “México: Jalisco: Estación de Biología Chamela, Universidad Nacional Autónoma de México, 19°31'N, 105°03'W, 4–11 July 2006, Col. D. Adamski, blacklight”; “USNM ♂ Genitalia Slide by D.

Adamski, No. 83231” [green label]; “USNMENT 00656001”. Deposited in USNM.

DNA barcode of holotype USNMENT 00656001 (process # MNAE282-07) (633 bp):

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ACATTATATTTTATTTTGGAA
TTTGAGCAGGAATAGTTGGTACT
TCCTTTAAGTTTATTAATTCGAG
CAGAATTAGGAAATCCTGGATCA
TTAATCGGAAGTGATCAAATTTA
TAATACTATTGTTACTGCTCATG
CTTTTATTATAATTTTTTTTATA
GTAATACCTATTATAATTTGGAGG
ATTTGGTAACTGATTAGTTCCTT
TAATATTAGGAGCCCCTGATATA
GCTTTC CCCCGTATAAATAACAT
AAGATTTTGATTATTACCCCTT
CCCTACTTTTATTAATTTTCATCA
AGAATTGTTGACAACGGAGCAGG
TACTGGATGAACAGTATACCCAC
CCTTATCTTCTAACATTGCTCAT
GGAGGAAGATCAGTTGACTTAGC
TATTTTCTCCTTACATTTAGCCG
GTATTTTCATCAATTTTAGGAGCT
GTAAATTTTATTTCTACAATTAT
TAATATAACGACCTATAAATATAT
CTTTTAATCAAATACCTTTATTT
GTGTGAGCTGTTGGTATTACAGC
TTTACTTCTTTTATTATCCCTTC
CTGTCTTAGCTGGAGCTATTACT
ATATTATTAACAGATCGAAATTT
AAATACTTCATTTTTTTGACCCAG
CAGGAGGAGGAGAC-----
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Table 1. Mitochondrial DNA (COI) sequence divergence (%) among Urodidae species. Uncorrected average pairwise distances are shown for cytochrome oxidase I (COI). There were 590 positions in the final dataset. Shaded cells = mean within-species distances. Cells below diagonal = mean between-species distances. Species abbreviations are as follows: *asp*, *Wockia asperipunctella*; *che*, *W. chewbacca*; *mex*, *W. mexicana*; *par*, *Urodus parvula*.

	<i>par</i>	<i>asp</i>	<i>che</i>	<i>mex</i>
<i>Urodus parvula</i>	0.17			
<i>Wockia asperipunctella</i>	13.88	0.37		
<i>Wockia chewbacca</i>	13.02	16.36	0.00	
<i>Wockia mexicana</i>	13.63	15.86	11.44	0.17

Paratype (1 ♂): Same label data as above except, “USNM ♂ Genitalia Slide by D. Adamski, No. 83230” [green label]; “USNMENT 00656000”. Deposited in USNM.

Host.—Unknown.

Etymology.—The species epithet, *mexicana*, is named after the country of collection.

#### DISCUSSION

Larval and pupal characters appear to support our placement of *Wockia chewbacca* into Urodidae. The larva of *Wockia chewbacca* agrees with autapomorphies for Urodidae given by Dugdale et al. (1998) including; the prothorax is lacking MXD1, A8 with L3 anteroventral of L1 and L2, with SD1 is moved dorsally almost to the groundplan level of L3. The pupal characters of *Wockia asperipunctella*, as illustrated by Kyrki (1988) are similar to *Wockia chewbacca* (Figs. 7, 25–28). They share a meshlike cocoon, sparse abdominal tergal spines, a blotched pattern, and several pairs of apically hooked setae on the frons, vertex, and the cremaster.

Kyrki (1988) states the, “the absence of MXD1 on the prothorax and the single MD seta on the metathorax are good diagnostic characters for the family.” Although, we find that larvae of *Wockia chewbacca* lack the MXD1 seta on the prothorax, it possesses an MD-group that is bisetose on the metathorax. Without access to the specimens that

Kyrki (1988) examined, it is difficult to say whether Kyrki assessment was accurate, in error, or if the specimens were aberrant in nature.

We provisionally place the Mexican species within *Wockia* as a “best fit” based on the following apomorphies; adult having transverse band of raised dark scales over the gray ground color of the forewing, hosts within the Salicaceae, and larva with a bisetose AF-group and lacking a puncture on the adfrontal sclerite. There are, however, notable differences in genitalia, as well as pronounced barcode divergence (> 15%, Table 1, Fig. 31) between this pair of species and the type species, *Wockia asperipunctella*.

A list of features that both Mexican species share include: a narrow, oblique, brown band of raised scales near the basal third of the forewing; a deeply dissected valva (similar to *W. asperipunctella*), forming an elongate costal lobe and a shorter saccular lobe; a row of hairlike setae on a slightly inclined distal margin of the saccular lobe; and an elongate, acutely curved, setose process on the distal part of the saccular lobe. There are, however, significant differences in genitalia: the aedeagus lacks cornuti (present in other *Wockia* as well as in *Urodus*; *U. parvula* examined, genitalia not shown here) and has a long and narrow anterior ‘supporting’ rod (lacking in other *Wockia* and *U. parvula*), the corpus bursae has no lateral accessory

pouch (present in both *W. asperipunctella* and *U. parvula*), a single signum (two in other *Wockia* species and *Urodus*), and the ostium and antrum are wide (very narrow, constricted and recessed in *W. asperipunctella* and *U. parvula*). The overall aspect of their genitalia appears somewhat between *W. asperipunctella* and *Urodus*. However, there are over 50 species of *Urodus* in the Neotropics (Heppner 1984); only *U. parvula* specimens were examined here and incomplete information about a few others was obtained in Clarke (1965). Thus extent of genital character states in that genus was not comprehensively assessed. In addition, we have not assessed the monotypic *Spiladarcha* Meyrick, 1913 (type species *S. derelicta* Meyrick, 1913 known from a single female from Guyana), another genus also included in the Urodidae by Kyrki (1988), but illustrations provided in Clarke (1965), though not very clear, suggest a closer superficial similarity to *Urodus* than to the Mexican species of *Wockia*.

*Anchimacheta* Walsingham, 1914, with three nominal species all described from Amula, Guerrero, Mexico at high elevation (> 1800 m) was synonymized under *Spiladarcha* by Meyrick (1931) but listed as valid by Heppner (1984). The wing venation as described by Walsingham superficially corresponds to that of *Wockia* in *A. capnodes* and *A. iodes*, but there is no mention of hair pencils in the male hindwing and the male genitalia differ by having a shallowly dissected upper and lower part of the valva. Similarly, *A. tolmetes* illustrated in Walsingham (1914) is quite different from the typical *Wockia* pattern and lacks the transverse band of raised scales.

Two paratypes of *W. chewbacca* yielded 657 bp sequences that were identical except for one bp difference (A/G) at position 627. The holotype of *W. chewbacca* could not be sequenced at the time. The two *W. mexicana* specimens yielded

identical but abbreviated barcode sequences of 633 bp, with the last 24 sites (positions 634–657) missing compared to the *W. chewbacca* sequences. The two species differ from each other in DNA barcodes by 65 bp (11.4%). The amount of genetic divergence among all Urodidae analyzed, which includes three species of *Wockia* and one species of *Urodus*, ranges between 11.4 and 16.4% (Table 1). The two new species cluster closer to *U. parvula* than to *W. asperipunctella* (Fig. 31), probably an effect of long-branch attraction in neighboring analysis. More significant, however, is the great amount of genetic distance among all taxa analyzed which suggests that current generic limits are inadequate to accommodate the new species.

The larval features for *Wockia chewbacca*, multi-lobed integument, recurved D2 seta on the shield of T1, and the “hydroid bush” of multiple sensilla trichoidea on the apical turret of the antenna, are not known to occur in Lepidoptera. No multi-lobed species of microlepidoptera is illustrated in Stehr (1987), and no larval antenna with multiple sensilla on the apical turret is found in Dethier (1941), or MacKay (1972).

This study also documents a new host record for the genus and an extended distribution into the Neotropics. Given the nondescript aspect of these micro-moths we surmise that more species await discovery in the Neotropics.

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