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A new species of *Catocala* Schrank, 1802 (Lepidoptera: Noctuidae) from Primorsky Krai, Russia

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Here we describe *Catocala didenko* **sp. n.** as new for the noctuid genus *Catocala* Shrank, differing from *Catocala duplicata* Butler, 1885 and *Catocala gansan* Ishizuka & Wang, 2013 on wing pattern, male genitalia, and COI 5' mitochondrial DNA. These three species, along with *Catocala dissimilis* Bremer, 1861, comprise a small and distinctive species group within the genus. Exemplary uncommon morphological characters for this group include: extensive area of ventral side of claspers unsclerotized (Fig. 17); claspers with a subapical ventral bulging projection (Fig. 17); sclerotized apex of claspers greatly expanded laterally (Fig. 17); diaphragma posterior to anellus lightly pigmented (Fig. 22); distinctive anellus shape (Fig. 22); uncus setae longest and densest at base (Fig. 21); and approximately 17-20 coils on the receptacle duct (Fig. 56).

Methods for data analysis, genitalic dissection, and terminology follow Kons and Borth (2015) and as explicated at http://www.lepidopterabiodiversity.com. The vesica images are the natural three dimensional structure of fully everted and unruptured vesicas, with no slide mounting preparation artifacts. The 5' region of COI was sequenced by Paul Hebert's lab at the University of Guelph as described in Hebert *et al.* (2003). Collection acronyms are as follows: ASV, Aidas Saldaitis (Vilnius, Lithuania); GG, Grigory Grigoriev (St. Petersburg, Russia); KI, Katsumi Ishizuka, (Nagano, Japan); ME, Mikhail Elistratov (Zheleznodorozhny, Moscow region, Russia); RJB, Robert J. Borth, (Milwaukee, USA); SD, Sergey Didenko, (Moscow, Russia); VG, Viktor Gazanchidis (Moscow, Russia); VGK, Vadim Golovizin (Krasnoyarsk, Russia); WIGJ, World Insect Gallery (Joniškis, Lithuania).

We delimit *Catocala* species using the phylogenetic species concept of Nixon and Wheeler (1990), requiring recognized species are diagnosable by a unique combination of discrete/diagnosable character states, but avoiding subjective judgments on degree of divergence for either morphological or genetic data. We also require that such combinations of character states include corresponding discrete character state differences from at least two presumably independent character systems, such as pattern morphology, genitalia, and mitochondrial DNA.

Catocala didenko Kons, Borth & Saldaitis, sp. n.

(Figs 1–3, 13–29, 33–37, 45–46, 49–57)

Type material. Holotype: male (Figs 1–2), Russia, Primorie [Primorsky Krai], Hasan dist. [district], Andreevka vil. [village], 31.vii. 2013, Sergey Didenko leg., ASV collection, later to be deposited in the WIGJ; (Dissection No. 2124HLK:2015, DNA Voucher No. 20418-310713-RU).

Paratypes: 1 male, same data as holotype, SD collection, (DNA voucher No. 20419-030814-RU); 1 female, same locality as holotype, 02. viii. 2014, SD collection; 2 males, same data as holotype, ME and GG collections; 1 female (Fig. 3), Russia, Primorie [Primorsky Krai] Hasan dist. [district], near Vityaz vil. [village], 3 viii. 2014, Sergey Didenko leg., RJB collection, (Dissection No. 2141 HLK: 2015, DNA voucher No. 2141); 1 male, same locality as holotype, 7.viii.2013, Vadim Golovizin leg., (DNA voucher No. 20416-070813-RU), VGK collection; 1 male, same locality as holotype, 30.vii.2013, V. Golovizin leg., (DNA voucher No. 20417-070813-RU), VGK collection; 1 male, same locality as holotype, 01.viii.2013, Vadim Golovizin leg., VG collection; 2 males, same locality as holotype, 02.viii.2014, V. Golovizin leg., VGK collection; 1 male, Russia, Primorsky Krai, Skotovsky district, Anisimovka village, 04.viii.2015, leg. V. Golovizin, VGK collection.

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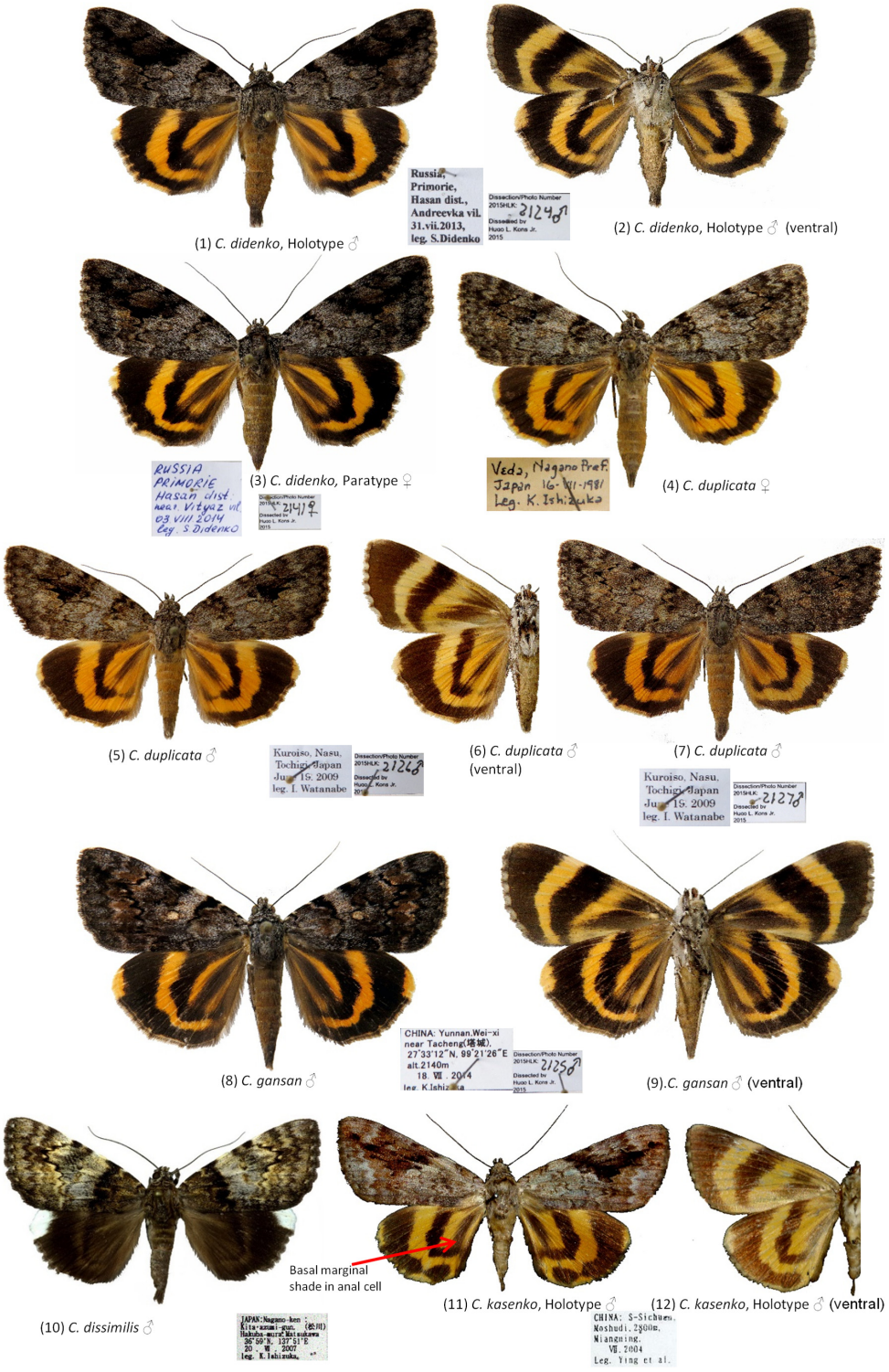
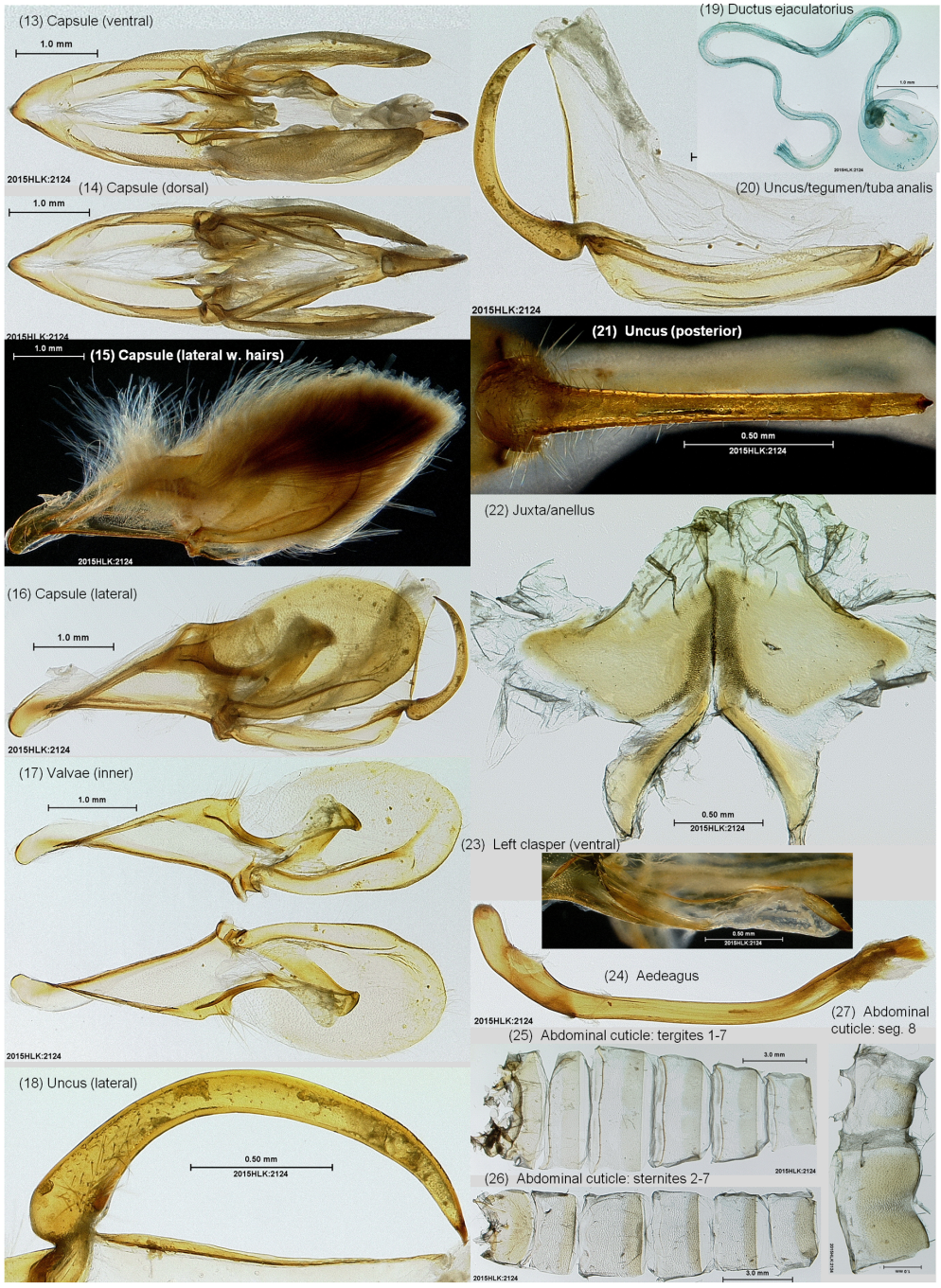


FIGURES 1–12. Imagos of *Catocala didenko, C. duplicata, C. gansan, C. dissimilis & C. kasenko*.



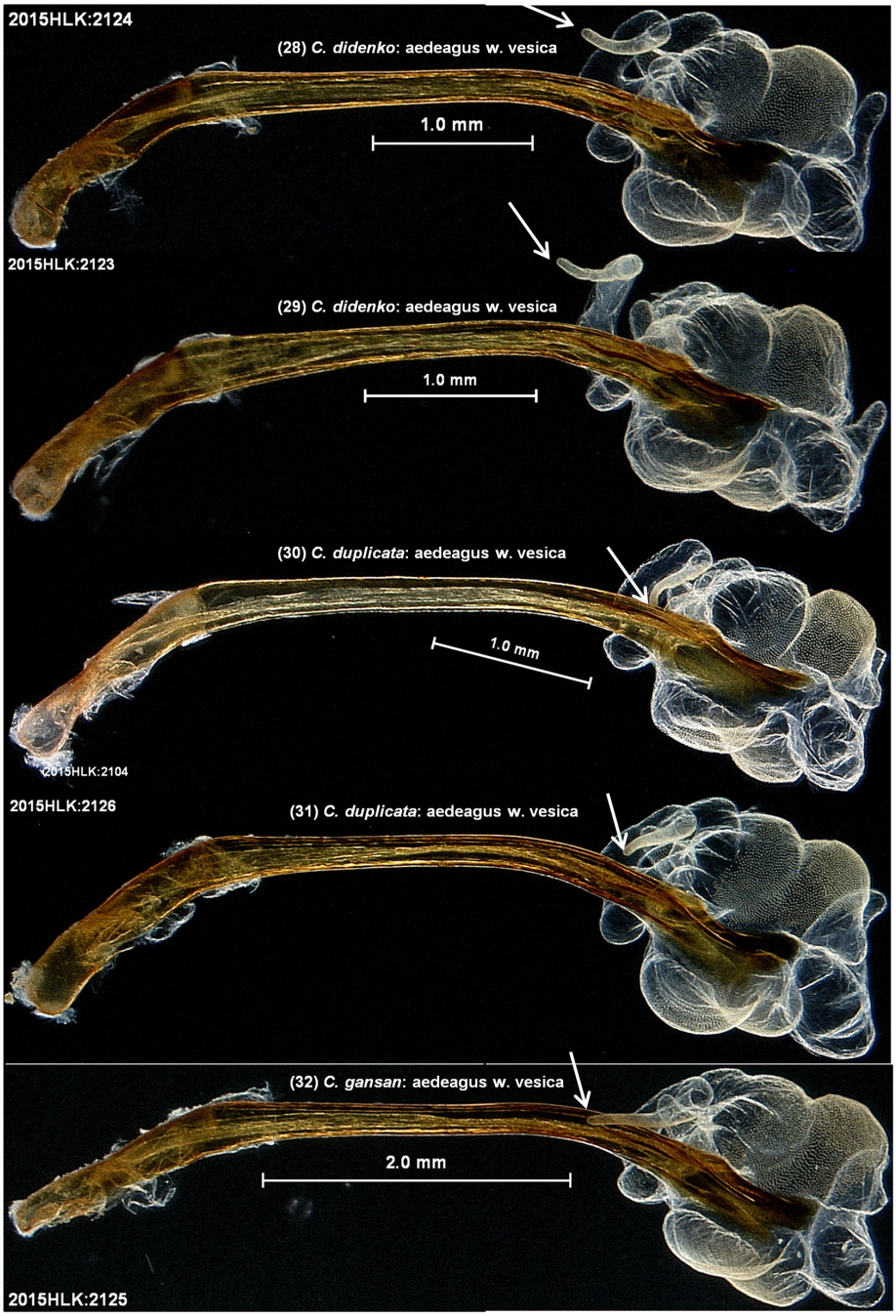
FIGURES 13–27. Male genitalic structures of *Catocala didenko* (HOLOTYPE).

Diagnosis. Wing Pattern: The wing pattern of *C. didenko* (Figs. 1–3) most closely resembles allopatric *C. duplicata* (Figs. 4–7) and *C. gansan* (Figs. 8–9). Relative to *C. duplicata, C. didenko* has a distinctly darker grey forewing (Figs. 1–9 taken at the same camera settings/lighting). *Catocala duplicata* is infraspecifically variable for the presence of a dorsal forewing apical arch whereas *C. didenko* consistently has a prominent apical arch, but *C. didenko* has more extensive black in the arch anterior to the reniform and distal to the postmedial line than specimens of *C. duplicata* with the arch. In cell CuA2 the black dorsal hindwing median band is more expanded and the basal marginal shade is more broadly fused with the median band in *C. didenko* relative to *C. duplicata.* Like *C. didenko, C. gansan* has dark grey

forewings and an expanded hindwing medial band broadly fused with the basal marginal shade in cell CuA2. However, on the dorsal forewing *C. gansan* has extensive dense, rich brown scaling between the postmedial and subterminal lines and on the basal side of the antemedial line, as well as some diffused brown scaling in the medial area distal to the reniform. *C. didenko* only has sparse, diffused brown scaling in these areas. *Catocala gansan* also has a more diffused forewing apical arch relative to *C. didenko* and has a contrasting lighter whitish band (due to a greater density of whitish scales) in the medial area between the reniform and subreniform distally and the antemedial line basally. The remainder of the medial area is distinctly darker except for another thin whitish band along the basal side of the postmedial area anterior to vein M1. In *C. didenko* and *C. duplicata* the medial area is of similar coloration throughout except for the blackish apical arch and a darker grey area anterior to the apical arch in *C. didenko. Catocala dissimilis* is separable from *C. didenko, C. gansan,* and *C. duplicata* by its black hindwings lacking orange-yellow bands and its pure white hindwing apical patch. *Catocala kasenko* Ishizuka, 2007 (Figs. 11–12) has male genitalia highly divergent from *C. didenko* and its relatives (Ishizuka 2007, Fig. 7) and is not closely related, although the forewing pattern is similar enough to potentially cause confusion. *Catocala kasenko* can be separated from *C. didenko, C. gansan,* and *C. duplicata* by having the dorsal hindwing marginal shade in the anal cell rather than in cell CuA2. Male Genitalia: The curvature and orientation of vesica diverticulum 2 differs among *C. didenko* (n=2)*, C. duplicata* (n=5) and *C. gansan* (n=1) (Figs. 28–32). These figures show the three dimensional aedeagus and everted vesica at comparable angles, with the aedeagus resting on the bottom of a flat petri dish with the ventral extension over the vesica facing up. From this angle the apex of diverticulum 2 is orientated anteriorly and curving outward in *C. didenko* (Figs. 28–29). In *C. duplicata* the apex is orientated roughly perpendicular to the aedeagus shaft (Figs. 31–32). In *C. gansan* (Fig. 32) the apex of diverticulum 2 is orientated anteriorly but not curving outward, and it overlaps with the aedeagus at this angle versus being well separated from it in *C. didenko*. In *C. didenko* and *C. duplicata* the minute inverted teeth at the apex of diverticulum 2 extend as far basally as the sharp bend in diverticulum 2 (Figs. 37 & 40), whereas in *C. gansan* the minute inverted teeth terminate distinctly distal of the sharp bend (Figs. 38–39). In *C. didenko* and *C. duplicata* the sclerotized expansion at the apex of the clasper does not curve back basally at the terminus (Figs. 41–46) whereas in *C. gansan* this apex is distinctly curved basally (Figs. 47–48). Ishizuka and Wang (2013) reported clasper thickness and uncus shape separated *C. duplicata* and *C. gansan*. However, we have found no evidence that either *C. gansan* or *C. didenko* are outside the range of variation exhibited by *C. duplicata* for these features. Female Genitalia: One female *C. didenko* was compared with one female *C. duplicata*, and no apparent differences were found. No female *C. gansan* were available for study. COI 5': *Catocala didenko* may be separated from all other sequenced *Catocala* species by the following unique combination of six character states: 5(C), 358(C), 613(C), 235(C), 238(C), and 541(T). The former three character states are unique to *C. didenko* within its species group. The latter three character states are shared with *C. dissimilis.* There are an additional eight character state differences between *C. didenko* and *C. gansan,* and an additional seven character state differences between *C. didenko* and *C. duplicata* (see Table 1; boldfaced letters indicate character states unique to one species in this species group).

Table 1: COI 5' character state differences among *Catocala duplicata, C. gansan,* & *C. didenko*

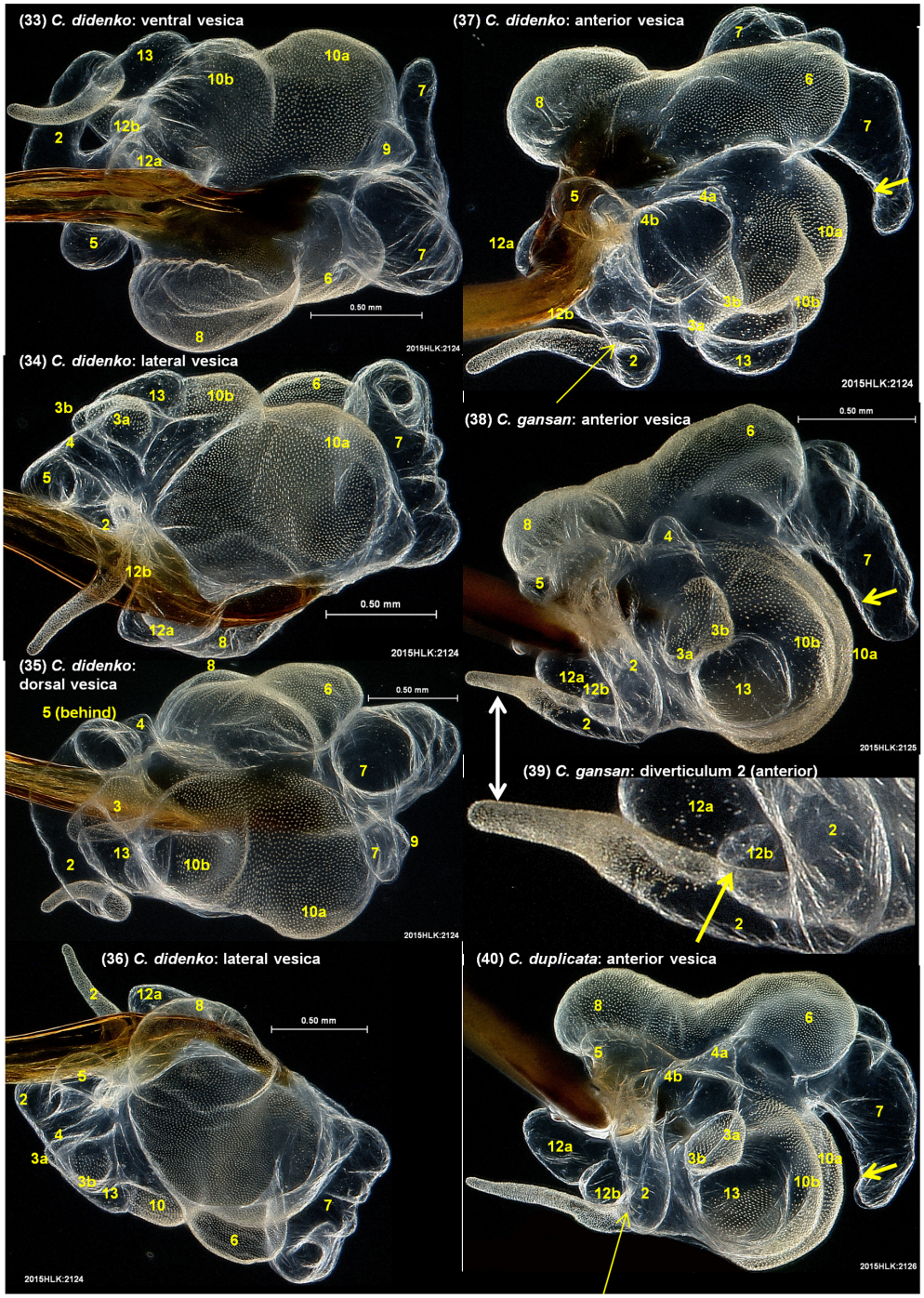
	5	34	49	82	85	97	166	206	220	235	238	247	268	283	346	358	386	427	541	544	565	613	628
Catocala duplicata 2098 Japan	T	A	**T**	**T**	**A**	**C**	A	T	**C**	T	T	**C**	T	T	T	T	**C**	T	C	T	A	T	A
Catocala duplicata 476 Japan			**T**	**T**	**A**	**C**	A	T	**C**	T	T	**C**	T	T	T	T	**C**	T	C	T	A	T	A
Catocala gansan 20276 China	T	A	A	C	T	T	**G**	**C**	T	T	T	T	**C**	**C**	**C**	T	T	**C**	C	**C**	A	T	A
Catocala gansan 2125 China		A	A	C	T	T	**G**	**C**	T	T	T	T	**C**	**C**	**C**	T	T	**C**	C	**C**	A		
Catocala didenko 20416 Russia	**C**	A	A	C	C	T	A	T	T	C	C	T	T	T	T	**C**	T	T	T	T	G	**C**	G
Catocala didenko 20417 Russia	**C**	A	A	C	C	T	A	T	T	C	C	T	T	T	T	**C**	T	T	T	T	G	**C**	G
Catocala didenko 20418 Russia	**C**	A	A	C	C	T	A	T	T	C	C	T	T	T	T	**C**	T	T	T	T	A	**C**	G
Catocala didenko 20419 Russia	**C**	G	A	C	T	T	A	T	T	C	C	T	T	T	T	**C**	T	T	T	T	A	**C**	A
Catocala didenko 2141 Russia	**C**	A	A	C	C	T	A	T	T	C	C	T	T	T	T	**C**	T	T	T	T	G		



FIGURES 28–32. Differences in the orientation of diverticulum 2 at a comparable ventral angle for *Catocala didenko, C. duplicata & C. gansan*.

Description. **Head.** Vertex and frons with mixed grey, tannish-white, blackish-grey, and white scales. Labial palp basal segment almost exclusively white, with sparse grey scales on the lateral side; middle segment predominately white basally and on inner side except near apex, laterally and dorsally blending to mostly solid dark grey except at apex, which contains a narrow band of white scales bordered by lighter grey mixed with white; terminal segment predominately dark blackish-grey, with scattered light grey and white scales. Antennae dorsally and laterally covered by grey scales, except for pedicel which is covered with white scales. Ventrally with dense clusters of setae, basal segments lacking spines, distal segments with two or three long spines, terminal segment with seven long spines. **Thorax**. Patagia predominantly grey with a scattering of white and tan scales. Tegulae with mixed blackish-grey, tan, and white scales.

Elsewhere a mix of grey and tan scales and hairs with scattered white. Paired tufts of hair on posterior mesothorax predominately tan with some grey and white. Ventrally with dense white hairs. **Wings** (Figs 1–3). Wingspan male (n=1, holotype, 2015HLK:2147): 46 mm; length of anterior forewing base to apex: 22 mm; ratio of (anterior forewing base to apex)/ (anterior forewing base to tornal angle): 1.1. Wingspan female (n=1, paratype 2015HLK:2141): 47 mm; length of anterior forewing base to apex: 24 mm; ratio of (anterior forewing base to apex)/(anterior forewing base to tornal angle): 1.2. Forewing upperside: Background color predominantly dark grey with variable peppering of light grey and whitish scales. Extensive dark brown scaling between postmedial and subterminal lines, and between basal side of apical arch and postmedial line. Prominent black apical arch slanting from apex to postmedian line at veinlet between veins M3 and Cu1, then changing directing and slanting to costa along distal side of reniform. Basal dash short, not extending distal of basal line, dark greyish-black, thick, spans most of the area between veins Cu2 and 2A. Basal line sharp and black above cell CuA2, comprised of two loops, anterior loop fused with a black patch. Antemedial line fairly thin and black, predominately single but with a diffuse broken trace of a second line on the basal side. Antemedial line comprised of five loops: posterior loop (below vein 2A) convex with a medial inverted triangular tooth, protruding basally on anterior side; second (medial) loop large and convex spanning between veins 2A and lower margin of discal cell, sometimes with a medial concave indentation (Fig. 3, left side); third loop convex, spanning posterior margin of discal cell to veinlet; fourth loop triangular and slightly longer than third, with apex near anterior margin of discal cell; fifth loop short and thick, convex, anterior to radial vein. Medial line limited to black patch between costa and the anterior margin of discal cell and black line along basal border of reniform spot, black and thickened and forming the basal side of the apical arch. Postmedial line thin, black; bordered distally by thin band of pale whitish grey posterior of vein CuA2. Postmedial line undulations black: below vein 2A convex; between Cu2 and 2A weakly doubly dentate at apex; subreniform closed, connected to postmedial line by a single thin line; triangular tooth between veins Cu1 and Cu2; obscured by apical arch between veins M3 and Cu1; two dentate distally protruding teeth between veins M1 and M3 with a shallow concave division between them across vein M2; straight and angling basally between veins R5 and M1, then sharply turned basally along vein R4, roughly perpendicular to costa and thickened as small black patch slightly distal to the outer border of the reniform. Reniform spot closed with thick black border, diffuse brown scaling inside. Subterminal line a series of diffuse, black, dentate, distally protruding chevrons; one chevron between each pair of veins between R4 and 2A, half chevron between R4 and the costa, indistinct or half chevron between 2A and the inner margin.Wing margin with series of thin, diffuse, black, concave bars between each pair of veins from R4 to 2A. Fringe peppered with variable shades of grey. Hindwing upperside: Background color orange-yellow. Black median band prominent, distal side sharply angled along vein M2, weakly bulged distally between veins M2 and Cu1, strongly curved distally in cell CuA2, then much thinner and diffuse beyond vein 2A, roughly perpendicular to but not reaching inner margin; basal side slightly concave between Rs and Cu2 with only a slight indentation at vein M2. Thick blackish grey basal marginal shade in cell CuA2, extending from basal most edge of wing and fusing with basal side of median band, basal marginal shade darkens where fused with basal side of median band in cell CuA2, creating the appearance of a convex basal bulge on median band. A second basal marginal shade fused with terminus of median band in anal cell, extending basally to a variable degree but terminating well distal of basal edge of wing. Marginal black band thickest anteriorly, progressively narrowing posteriorly as far as vein M3, of fairly uniform thickness between veins M3 and Cu2, abruptly thinner but of fairly uniform thickness in cell CuA2, slightly wider between vein 2A and inner margin. Fringe orange-yellow, with convex black patches at ends of veins M1-Cu2, patches may be fused together between M1 and M2-M3. Apical patch thin but conspicuous, with orange-yellow scales matching background color. Forewing underside: Background color pale yellow-orange. Marginal band thick and black. Termen with the same thin undulating line present dorsally. Medial and basal bands wide and black, not fused together but close together along vein Cu2. Basal band more diffuse anterior of vein M2, and separated by a thin band of scales matching background color along M2. Hindwing underside: Medial black band of similar shape as dorsally but slightly thinner. Marginal black band of similar shape as dorsally, but thicker in cell CuA2 such that band of similar thickness in cell CuA2 and anal cell. Background color pale orange-yellow like forewing, but paler anterior to vein Rs. Fringe similar to upperside. **Legs** (Figs. 52–55 (male)). Male and female legs similar with two exceptions: (1) male profemur with laterally flattened apical spine on dorsal corner (Fig. 52), (2) male mesotibia wider than female and with hair pencil groove on inner side. Foreleg: Protibia unspined, but with small convex sulcus with radiating spines near basal extremity on the inner side. Protibial flange in shallow ovuloid pit, ventral margin of flange with conspicuous row of setae, becoming progressively shorter distally (Fig. 53). Protarsomeres 1–4 with three ventral rows of large triangular spines, and two rows of minute hair-like curved spines between them; protarsomere 5 with four rows of large triangular spines, with two rows of minute hair-like spines in-between. Minute hair-like spines present on lateral sides of tarsomeres and along dorsal midline. Protarsomere 5 with pair of elongate, narrow, tubular spines dorsally at apex, then curving ventrally at apex. Pretarsus simple, arolium translucent greyish and ovuloid.



FIGURES 33–40. Three dimensional vesica structure for *Catocala didenko, C. gansan & C. duplicata*.

Midleg: Mesotibia with a single row of seven heavily sclerotized large spines (Fig. 54). Tarsal spination like foreleg. Hindleg (Fig. 55): Sclerotization pattern typical for *Catocala*, with femur sclerotized throughout, metatibia translucent white except at base, metatarsomere 1 translucent white except at apex, remaining tarsomeres sclerotized throughout. Metafemur and metatibia unspined, metatarsal spination like foreleg. **Abdominal Scale Pattern** (Figs 1–3). Dense orange-yellow hindwing background colored scales dorsally over grey background, white and pale tan ventrally. **Abdominal cuticle.** Male as shown in Figs 25–27. Female: Segments 1–6 similar to male, tergite 7 as shown in Fig. 51. **Male genitalia** (Figs 13–24, 28–37, 45–46). Capsule (Figs 13–16): Juxta and vinculum strongly fused with valvae,

vinculum weakly fused with tegumen, vinculum arms prominently expanded and weakly fused midventrally. Diaphragma membranous except for juxta/anellus, but weakly pigmented posterior of anellus. Valvae (Figs 17, 45–46): Outer surfaces densely covered with elongate tan hairs and scales except for anterior portion of sacculus, ventral half of "cucullus" (or the membranous valvae structure in the equivalent position) with dense contrasting darker brown hairs/scales (Fig. 15); inner surface of "cucullus" with shorter scales and hairs along ventral margin. No saccular process. Inner side of sacculus with about 20 elongate setae near fusion with cucullus (Fig. 17). Additional shorter setae scattered along posterior margin of sacculus on inner side. Ventral inner sides of sacculus with concave indentation along margin of clasper base (Fig. 13). Left and right cucullus extensively pigmented, clear only for a narrow band along the anterior edge. (Fig 17). Cucullus with scattered elongate setae on inner surface along ventral margin, densest anteriorly. Left costa heavily sclerotized and gradually widening posteriorly, posterior edge indistinct, appearing to blend into the cucullus (Fig. 17). Right costa similar but slightly narrower, with distinct posterior edge terminating well anterior of cucullus (Fig. 17). Dorsally both costae smooth and narrow. Claspers similar, dorsoventrally flattened basally, laterally flattened distally, slightly S-curved and with inward curve at apices. Clasper apices with five to ten scattered, minute, short setae. Sclerotized clasper apices prominently expanded to over twice the width of subapical area. Ventral side of clasper with a prominent membranous flap extending almost as far distally as sclerotized apex, ventral apex of membranous flap broadly rounded (Figs 17, 45–46). Clasper base and shaft lacking patches of elongate setae present in many *Catocala*, with only widely scattered short setae. Ventral and dorsal margins of sclerotized area of claspers concave; membranous flap concave basally, convex distally. Viewed from ventral side, both claspers with outer margins of sclerotized area (bordering the valvae) strongly concave basally, strongly convex distally, inner margins (opposite the valvae) convex basally, concave distally. Juxta (Fig. 22): Two elongate nearly symmetrical lobes, narrowest posteriorly, progressively widening anteriorly. Lobes narrowly fused to anellus at posterior apex, touching at posterior end but not fused together. Pitted pattern of anellus barely extending to juxta lobes at extreme posterior and posterior-outer edges. Anellus (Fig. 22): Lobes fused together throughout and appearing as a single sclerotized plate, asymmetrical with elongate concave posterior indentation on the outer margin of left lobe. Remainder of outer margin of left lobe weakly concave; outer margin of right lobe weakly concave posteriorly, weakly convex medially, weakly concave anteriorly. Posterior apex bluntly triangular, anterior edges of both lobes strongly convex. Band of sclerotized dense shallow depressions (pits) throughout medial area, extending in narrow bands along the anterior and posterior sides. Uncus (Figs 18, 21): Tubular, progressively narrowing distal of swollen base and again distal of midpoint, posterior margin strongly convex, anterior margin strongly concave; terminating in heavily sclerotized curved spine, laterally appearing pointed apically but narrowly rounded in dorsoventral view. Setae densest and longest at swollen base, longest basal setae about equal to width of uncus, scattered short setae distal of base, becoming progressively shorter distally. Tuba analis (Fig. 20): Membranous except for scaphium. Scaphium an elongate rectangular plate terminating slightly dorsally to the uncus apex. Aedeagus (Fig. 24): Translucent throughout. Coecum wider than shaft, distinctly bent. Aedeagus bent at posterior margin of coecum, and before ventral extension over vesica, weakly curved in-between. Left flank of posterior ventral extension ("hood" over everted vesica) (Fig. 33) with a deep basal concave gouge and a convex posterior expansion, right flank weakly convex, apex concave. Four sclerotized chords present on the ventral hood; inner chords converge and nearly merge subapically; right outer chord becoming progressively less distinct distally along ventral hood, but extending to apex; left outer chord prominent until convex posterior expansion. Ductus ejaculatorius (Fig. 19): Slender region with distinct bend just before scoop-shaped region, scoop shaped region projecting from slender region at about a 90 degree angle after the bend. Scoop-shaped region strongly convex on outer side, inner side strongly concave. Vesica (Figs. 33–37): Vesica diverticulum 1 trilobed (underneath diverticulum 12 in Fig. 33), 1a about twice as long as 1b and 1c, 1a bluntly triangular, 2b somewhat quadrate, 1c a convex lobe. Diverticulum 2 lacking subdiverticulum on the left side (Fig. 37), elongate and gradually tapering to a narrowly rounded apex (Figs 33–35, 37), with a strong medial bend (Figs 34, 37); in ventral aspect apex projects anteriorly and curves away from the aedeagus (Figs 28–29, 33), apex covered with minute inverted teeth extending basally as far as medial bend (Fig. 37). Diverticulum 3 distinctly bilobed, 3a more elongate than 3b (Fig. 37). Diverticulum 4 distinctly bilobed, corners projecting as two small lobes, fairly straight in-between (Fig. 37). Diverticulum 5 a single lobe, projecting distinctly farther than 3 or 4 (Fig. 37). Diverticulum 6 large and broad, wider than high (Fig. 36). Diverticulum 7 larger than 6, with three distinct lateral lobes (Fig. 34, 36–37). Diverticulum 8 a broad convex bulge about the width of the right flank of the ventral aedeagus (Fig. 33). Diverticulum 9 a small simple lobe (Fig. 33). Diverticulum 10 distinctly bilobed, each lobe very broad, 10a larger than 10b (Figs. 33–35). Diverticulum 11 not discernible. Diverticulum 12 distinctly bilobed, 12a distinctly larger than 12b, extending about half way across aedeagus in ventral aspect (Fig. 33). Diverticulum 13 a simple convex bulge wider than high (Fig. 35). Much of vesica covered with minute inward projecting triangular teeth. Vesica membranous throughout. **Female genitalia** (Figs. 49–50) (n=1): Papillae analis (Fig. 50): Transparent except for a thin band of dorsal

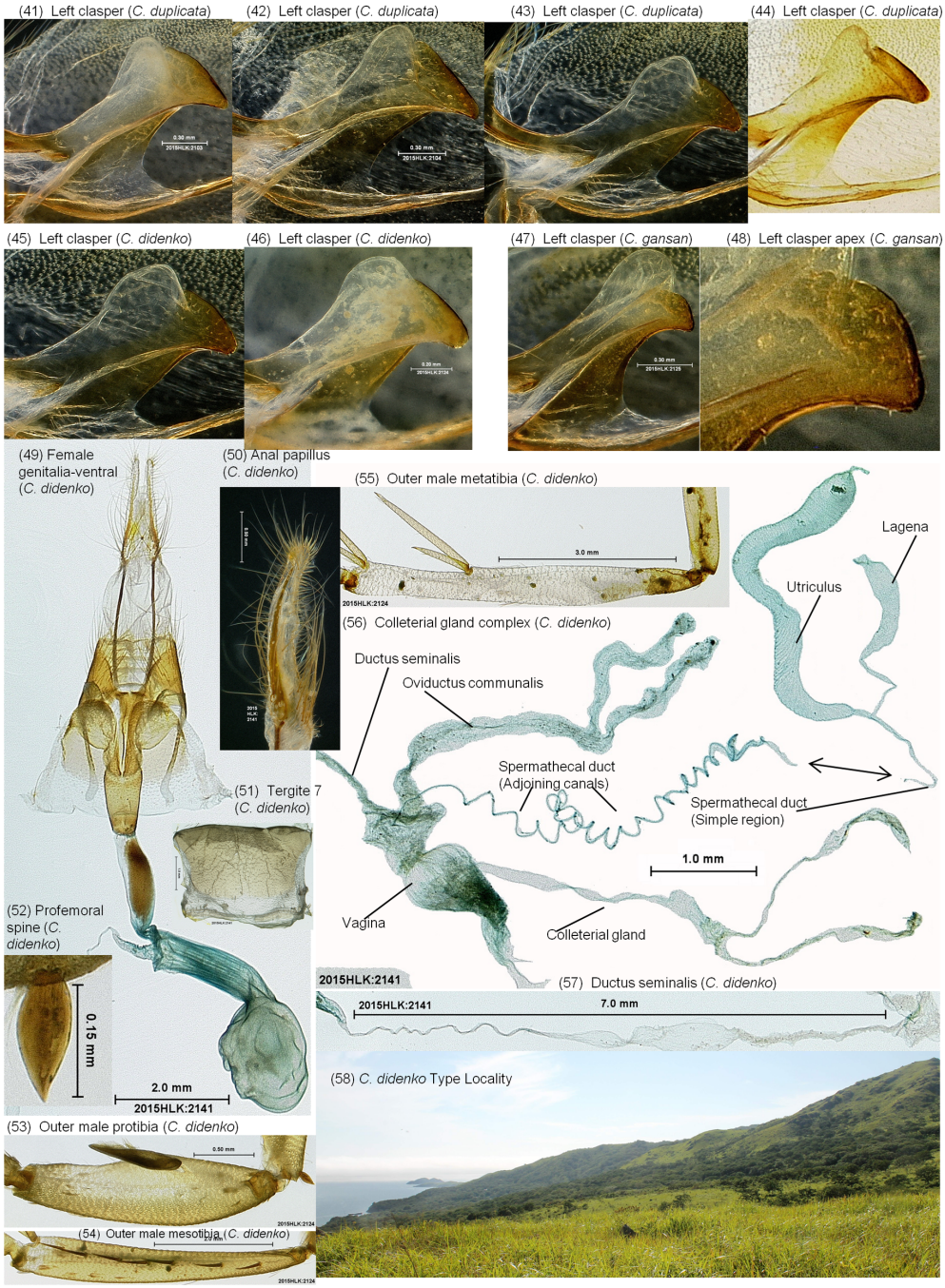
sclerotization on each papilla, terminating subapically. Longest setae at base, projecting posterior/outward. Shorter setae throughout papillae project posterior/outward. Apices densely covered with setae of highly variable lengths. Papillae curved such that dorsal side strongly convex and ventral side doubly concave, but with small convex area at base. Papillae widest at base and gradually tapering, narrowest subapically with a slight apical widening. Intersegmental membrane between papillae and segment 8: Narrowing anterior to posterior, posterior end approximately 0.57 times width of anterior end. Length/width at anterior end = 1.1. Segment A8: Anterior edge slightly overlapping with posterior edge of lamella antevaginalis. Shape as shown in Figure 49. Elongate, posteriorly projecting setae scattered throughout sclerotized surfaces, greatest density posteriorly along edge. Intersegmental membrane between lamella and segment 8 on ventral side: Heavily sclerotized; posterior edge U-shaped with darker sclerotization along edge disjuct at midpoint; sclerotized area with a posterior bulge and then progressively narrowing anteriorly; paired dorsal shallow ridges roughly paralell anteriorly, diverging posteriorly; dense minute spiculations along midline extending from posterior edge anteriorly almost to the anterior end of the lamella antevaginalis slit. Lamella antevaginalis: Posterior margins broadly convex, anterior margins convex on inner side, deeply concave on outer side , curving anteriorly-outward from the midline, extreme outer edges triangular and tapering. Slit in LAV along ventral midline narrow with a narrow ovuloid expansion at anterior end of slit; sides sclerotized and thickened anteriorly. Antrum: Sclerotized throughout. Sides convex, widest at anterior end of slit in LAV, gradually tapering anterior to this position and more strongly tapering posteriorly. Ductus bursae: Rectangular and strongly dorso-ventrally flattened with a sclerotized plate on each side, bent and twisted between roughly the midpoint and the antrum, fairly straight posterior of midpoint. Corpus bursae: Posterior section with longitudinal wrinkles elongate, about 3.5 times as long as wide at anterior base (ventral aspect). Anterior section densely covered with minute inverted teeth, ovoid. Ductus seminalis (Fig. 57): Total length approximately 7 mm. Coiled basal section about 2.4 mm with about fourteen inflexion points. Oblong bulla seminalis about 2.6 mm. Thicker fairly straight section distal to bulla seminalis about 2.0 mm. Colleterial gland complex (Fig. 56): Terminology follows Mitter (1987). Adjoining differentiated canals of receptacle duct with approximately nineteen coils basal to the vesicle; abrupt transition to undifferentiated section at base of vesicle; vesicle unsclerotized, slightly thickened relative to preceding coils. Utriculus and lagena elongate, utriculus with many narrow longitudinal grooves throughout. Colleterial gland elongate and tubular with two distal bulges, the most basal bulging to the left, the sack from which the paired glands arise bulging to both sides. Oviductus communalis with simple section about 1.4 times as long as paired section. Vagina roughly pear-shaped. **Rectum/Intestine.** Rectum sculptured throughout with small ovuloid shapes with slightly raised walls. Male intestine approximately 13.5 mm, female intestine approximately 12.6 mm.

Etymology. The new species is named after Sergey Didenko for his contributions to entomology, including *Catocala*.

Biology and distribution. Eleven males and two females have been collected at mercury vapor and ultraviolet lights from the end of July through the beginning of August 1980–2015 in southeast Russia, Primorsky Krai. Collection sites are flat hills near the coast of the Sea of Japan. Habitats are high grassy meadows and rare oak forest dominated by Manchurian and Mongolian oaks (Fig. 57). Single specimens were attracted to lights after midnight and were rare compared to the numbers of other *Catocala* species taken at the same times.

COI 5' Mitochondrial DNA: Published GenBank numbers include KT875124 for *C. gansan* 20276 (from China), and KT875127, KT875126, and KT875125 for sequence vouchers 20416, 020418, 020419, respectively, which represent three different haplotypes of *C. didenko* from Russia. The holotype of *C. didenko* has the following sequence for COI 5' positions 1–658. Three haplotypes are represented with a sample size of five specimens due to four polymorphic characters: 34(A&G), 85(C&T), 565(A&G), and 628(A&G).

AACTCTATATTTTATTTTTGGAATTTGAGCAGGAATAGTAGGAACTTCACTAAGATTATT
AATTCGAGCTGAATTAGGTAACCCCGGATCTTTAATTGGTGATGATCAAATTTATAATAC
TATTGTAACAGCTCATGCTTTTATTATAATTTTTTTTATAGTTATACCAATTATAATTGG
AGGATTTGGTAATTGATTAGTACCTTTAATATTAGGAGCTCCTGATATAGCTTTCCCCCG
TATAAATAATATAAGTTTTTGACTTCTTCCCCCATCATTAACTTTATTAATTTCAAGAAG
AATTGTAGAAAATGGAGCAGGAACTGGATGAACAGTTTACCCCCCTCTCTCCTCTAACAT
TGCCCATAGAGGTAGTTCTGTAGATTTAGCTATTTTTTCACTACATTTAGCTGGAATTTC
TTCAATTTTAGGAGCTATTAATTTTATTACTACAATTATTAATATACGATTAAATAATTT
AATATTTGATCAAATACCTTTATTTATTTGAGCTGTAGGAATTACTGCTTTCCTTCTTCT
TCTTTCTTTACCAGTTTTAGCTGGAGCTATTACTATACTTTTAACTGATCGAAATTTAAA
TACTTCTTTCTTCGACCCTGCTGGAGGGGGAGATCCTATTTTATACCAACATTTATTT



FIGURES 41–48. Left claspers of *Catocala duplicata, C. didenko & C. gansan*. **49–51.** Female genitalia of *C. didenko.* **52–55**. Male leg structures of *C. didenko*. **56–57**. Colleterial gland complex and ductus seminalis of *C. didenko*. **58.** *C. didenko* type locality.

Remarks. The male specimen pictured in Matov & Lastukhin (2010) as *C. duplicata* is *C. didenko.* Kononenko (2010) included *C. duplicata* as a Russian species, citing Matov & Lastukhin (2010), but pictured only typical *C. duplicata* from North Korea. Extensive collecting by Sergey Didenko and Vadim Golovizin in southeast Russia in suitable habitat for *C. didenko* has failed to confirm the presence of *C. duplicata* in Russian territory. Thus, as far as is known, *C. didenko* is allopatric with *C. duplicata* and *C. gansan.* Supplemental plates with additional images are available at http://www.lepidopterabiodiversity.com/home.htm.

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