



A new species of *Nemoura* (Plecoptera: Nemouridae) from South of the Russian Far East

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Abstract. A new species of Plecoptera from the *Nemoura ovocercia* group, *Nemoura khasanensis* **sp. n.** from the Primorsky Region, south of the Russian Far East, is described and illustrated. The diagnostic characters for separation from other members of the *oviocercia* group are provided.

Key words: Plecoptera, *Nemoura*, Primorsky Region, Russia

Introduction

Nemoura Latreille, 1796 is the largest genus of the family Nemouridae with at least 204 species recognized from the Oriental and Holarctic regions (DeWalt *et al.* 2014). *Nemoura* is represented by seventeen species in the Russian Far East (RFE). Two species, *N. arctica* Esben-Petersen, 1910 and *N. sahlbergi* Morton, 1896 are Circumpolar; *N. despinosa* Zhiltzova, 1977, *N. lazoensis* Zwick 2010, *N. manchuriana* Ueno, 1941, *N. nigrodentata* Zhiltzova, 1980, and *N. ussuriensis* Zhiltzova, 1997 occur on the East Asian mainland, whereas *N. geei* Wu, 1929, *N. fulva* (Šámal, 1921), *N. jezoensis* (Okamoto, 1922), *N. papilla* Okamoto, 1922, and *N. sachalinensis* Matsumura, 1911 are East Asian mainland-insular species known from the Southern Kuril Islands, Sakhalin Island, Japan, mainland RFE, China, and Korea; *N. kuwayamai* Kawai, 1966, *N. longicercia* (Okamoto, 1922), *N. parafulva* Zhiltzova, 1981, *N. transversospinosa* Zhiltzova, 1979, and *N. uenoi* Kawai, 1954 have an insular distribution limited to the Southern Kuril Islands, Sakhalin Island, and Japan (Teslenko & Zhiltzova 2009, Zwick 2010, Teslenko 2011). This study provides descriptions and illustrations of the adult stage of a new species of *Nemoura*, *N. khasanensis* **sp. n.**, collected from a foothill stream, the Ryazanovka River that flows from the East-Manchurian Range into the Peter the Great Bay of the Sea of Japan.

Material and methods

Specimens were examined with the aid of a MBS-10 binocular and Labor microscope, the illustrations were produced using digital cameras Nikon Coolpix 995 and Toup View 3.7. Abdomens were removed and soaked in 10% NaOH overnight and rinsed with distilled water. The morphological terminology follows that of Baumann (1975) and Shimizu (1997).

The holotype and all paratypes are deposited in the Institute of Biology and Soil Science, Far Eastern Branch, Russian Academy of Sciences, Vladivostok, Russia.

Results and discussion

Nemoura khasanensis Teslenko **sp. n.**

(Figs. 1–6)

Description. Adult habitus. Body length from tip of the head to the apex of abdomen, males, 4.9–6.4 mm; females, 6.2–7.5 mm. Macropterous, wings subhyaline, pale-brownish; veins dark brown; forewing length, males, 6.4–7.2 mm;

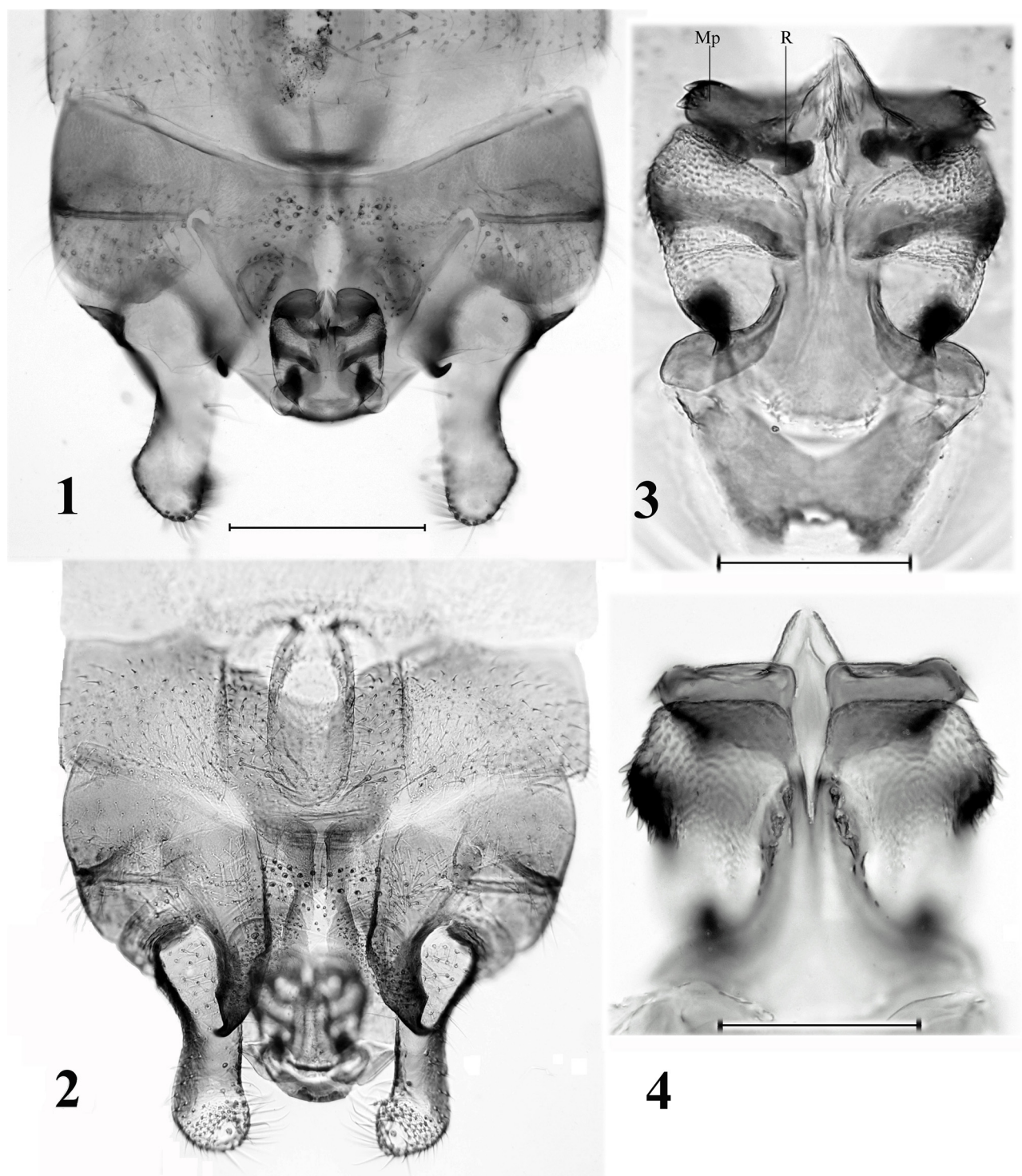
females, 8.5–9.5 mm; wingspan, males, 13.3–15.4 mm; females, 18.1–20.2 mm. General body color brownish, antennae light brown. Head brown, sometimes with a large dark brown trapezoid spot behind the posterior ocelli extending onto occiput, small oval dark brown spot present on each inner side at the top of the epicranial suture in the antennal area. Ocelli pale. Head wider than the pronotum. Pronotum light brown, pale medially, with an X-shaped pattern consisting of small dark brown spots that form a figure with rounded anterior and posterior branches connected by a U-shaped bridge in the middle, four small dark brown spots located posteromedially, posterior branches of the pronotal pattern more pronounced than the anterior branches. Legs pale.

Male. Posterior margin of tergum 9 medially with a fringe of strong inwardly curved setae (Fig. 1). Subgenital plate of sternum 9 moderate in size, with parallel sides, narrowed distally to a short rounded tongue-shaped tip, delimited basally by a transverse fold. Vesicle broad apically, width equal to $\frac{1}{2}$ width of subgenital plate (Fig. 2). Tip of the subgenital plate lies between long narrow finger-like inner paraproctal lobes of sternum 10. Outer paraproctal lobe triangular in the ventral aspect, broad at the base, tapering to a pointed tip, bent outward and upward, with an obtuse notch on the outer margin, apex claw-like, strongly sclerotized (Figs. 1, 2). Cerci slightly prolonged, extended inward then upward with a roundly swollen apex; the vestigial terminal segment modified into an 'eye-spot mark' near the inner edge, covered with long hairs (Fig. 2) apically. Tergum 10 with a triangular sclerite plate, medially with a pair of round shallow concavities below the epiproct; a few short setae and hairs scattered anteriorly and on an elevation encircling the concavities. Epiproct in dorsal view rounded with pointed apex, projecting anterolaterally, slightly constricted posteriorly from midlength, becoming narrow basolaterally (Figs. 1, 3). Basal sclerite consisting of two triangular patches located near the basolateral corners (Fig. 3). Pair of the lateral arms of the dorsal sclerite fingerlike with rounded tip, directed obliquely down towards the middle, and nearly touching, darkly sclerotized on the posterior and lateral margins; the pair of the dorsal folds shallow and covered with comb-like scales, larger on the lateral edges (Fig. 3). Ventral sclerite lanceolate, basal plate wide basally with 3–5 pairs of the strong ventral spines arranged in two longitudinal rows anteriorly (Figs. 3, 4), apically developed into a pair of heavy sclerotized moveable prongs extending forward from the dorsal sclerite and anterolaterally with three stout outward directed spines on the edge (Figs. 3, 4). In ventral view, each prong flat with a smooth edge anteriorly, and a rectangular rounded interior angle (Fig. 4). Ventral sclerite below moveable prong bearing posteriorly a pair of rounded, heavily sclerotized sclerites, forming a ring in dorsal view, ring interrupted dorsomedially, each apex bends downward resembling a hook (Fig. 3). Moveable prongs and ring surrounding apical sclerite, cone-shaped projection of the ventral sclerite short and triangular, extending forward and delicately sclerotized at the basolateral edges (Figs. 3, 4).

Female. Sternum 7 enlarged with broadly rounded pregenital plate, that covers the middle of sternum 8 almost completely (Fig. 5). Posterior margin of the pregenital plate strongly sclerotized. Sternum 8 mostly membranous, the subgenital plate similar to an inverted letter "T" and heavy sclerotized (Fig. 6). Above the subgenital plate a pair of the rectangular rounded weakly sclerotized vaginal sclerites separated by a fine median slot (Fig. 6). Posterior edges of sclerites concave and wavy, appearing as one single, narrow, and sclerotized transverse stripe. In cleared slide mounted genitalia the anterior edges of the vaginal sclerites dorsally, hidden under the bean-shaped pouch with a pair of sclerotized internally roughened pockets finger-shaped and curved inward (Fig. 6). A pair of strongly sclerotized dorsally cap-shaped vaginal sclerites covers the bean-shaped pouch anterolaterally; their bases with brown knobs anteroventrally, to which the bases of the pockets are attached. To these knobs, the bases of the paired prolonged finger like vaginal lobes also attached anteroventrally, and each distal apex reaches the lateral edge of the subgenital plate and sclerotized transversal stripe, supporting entire genital armature at the sides. Dorsal face of the bean-shaped pouch anteriorly covered by a large round collar-like shield with a wavy margin; shield with a median tube connecting membranous receptacles, oviduct, and pouch with the genital opening (Fig. 6).

Affinities. *Nemoura khasanensis* sp. n. belongs to the *N. ovocercia* group (Baumann 1975, Shimizu 1997) including currently twenty-two species, *N. anguiculus* Shimizu, 1997, *N. babai* Kawai, 1966, *N. dentata* Shimizu, 1997, *N. dentigera* Shimizu, 1997, *N. formosana* Shimizu, 1997, *N. geei* Wu 1929, *N. kuwayamai* Kawai, 1966, *N. longicercia* Okamoto, 1922, *N. longilobata* Shimizu, 1997, *N. quadrituberata* Shimizu, 1997, *N. ovocercia* Kawai, 1960, *N. redimiculum* Kawai, 1966, *N. sachalinensis* Matsumura, 1911, *N. saetifera* Shimizu, 1997, *N. trivittata* Shimizu, 1997, *N. zaohensis* Shimizu, 1997, *N. jijudoensis* Zwick & Baumann, 2011, and *N. securigera* Klapálek, 1907) inhabiting East Asia, including Russia, China, Korea, Japan, and Taiwan (Shimizu 1997, Bae *et al.* 2011, Zwick & Baumann 2011, Li *et al.* 2013). In the RFE there are four representatives of the group, *N. geei*, *N. kuwayamai*, *N. longicercia*, and *N. sachalinensis*. The members of the *ovocercia* group can be separated from the species of other *Nemoura* groups by the male epiproct, which extends anteromesally. The ventral sclerite has a pair of highly developed prongs at the lateral sides of the apico-mesal projection. The prongs are spiny, conical or dorsoventrally flattened and the apex sometimes with several teeth (Shimizu 1997). Probably, males of some of the Chinese species have a pair of highly developed prongs.

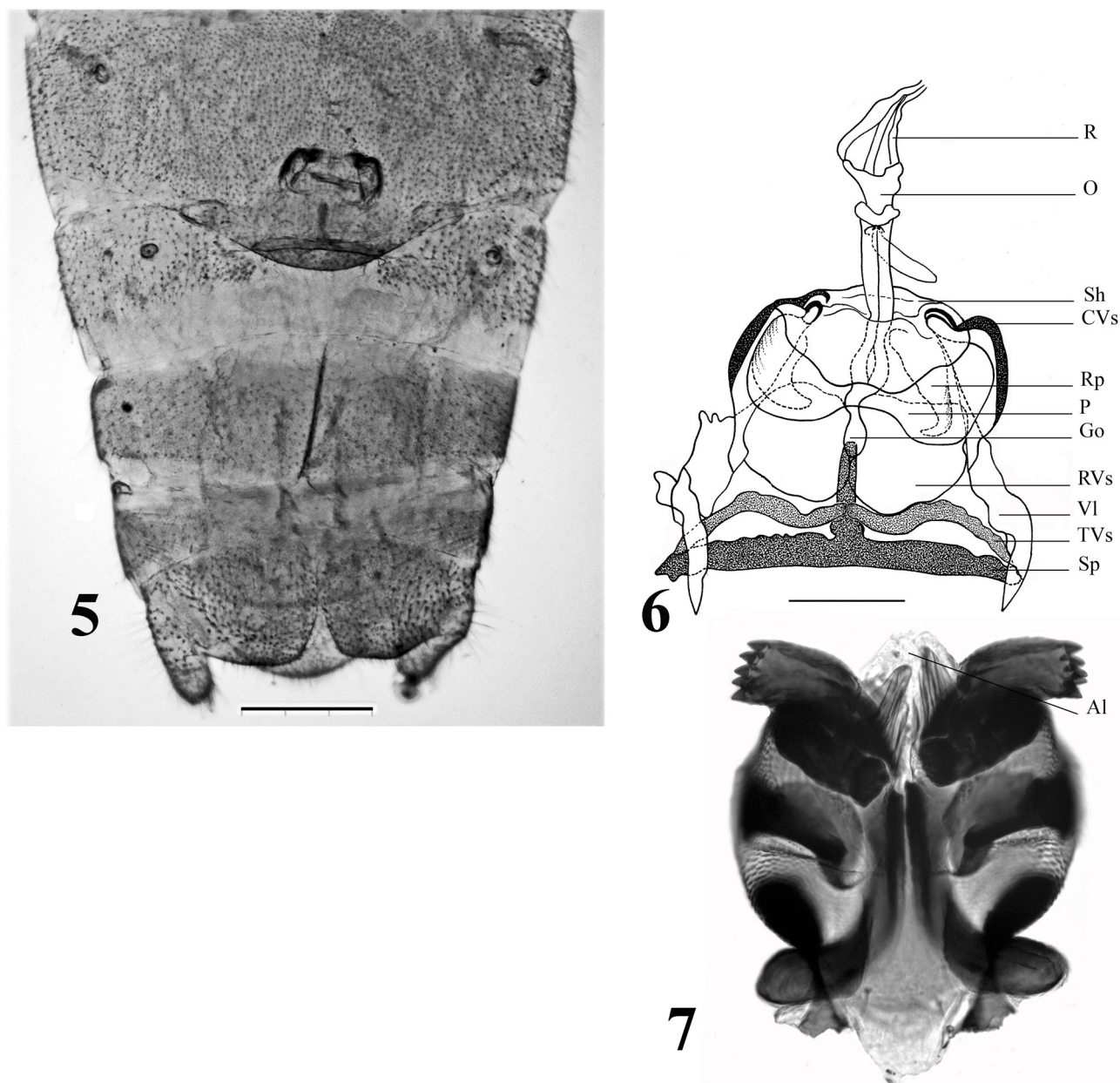
These structures have not yet been described in these species, and at least four of them are likely belong to this group on the basis of the available figures: *N. atristrigata* Li & Yang, 2007, *N. arlingtoni* Wu, 1940, *N. needhamia* Wu, 1927 and *N. rotundoprojecta* Du & Zhou, 2008 (Li *et al.* 2012, Yang *et al.* 2014).



FIGURES 1–4. *Nemoura khasanensis* sp. n.: 1. Male abdominal tip, dorsal. 2. Male abdominal tip, ventral. 3. Epiproct, dorsal. Mp—moveable prong, R—apex of the ring of the ventral sclerite. 4. Epiproct, ventral. Scale (mm): 1, 2 = 0.3; 3, 4 = 0.1.

The closest congener of *N. khasanensis* is *N. longicercia* known from South Sakhalin, South Kuril Islands, Hokkaido, Honshu, and Shikoku. Both species share a paired sclerotized moveable prong with stout spines on the anterolateral edge of the epiproct in combination with distinct ring, short apical sclerite, a paired longitudinal row of strong ventral spines on ventral sclerite, a triangular outer paraproctal lobe with pointed tip and strongly sclerotized apex. *N. khasanensis* can easily be separated from *N. longicercia* on the basis of a specific shape of prong with three stout

spines on the edge anterolaterally (Fig. 3); prong extends forward from the dorsal sclerite horizontally, and has a flat, smooth edge anteriorly (Figs. 3, 4). The prong of *N. longicercia* is directed forward and outward with five spines at anterolateral edge (Fig. 7). The shape of ring apex is also different with the apex of *N. khasanensis* bending downward resembling a hook, whereas in *N. longicercia*, the ring appears as a broad strongly sclerotized band interrupted dorsomedially, each apex with rounded angles (Fig. 7). *Nemoura khasanensis* also differs from *N. longicercia* by shape of apical sclerite where the apical lobes are not defined. In contrast, the apical sclerite of *N. longicercia* bears a paired relatively large membranous apical lobe rounded dorsoapically (Fig. 7). Details of paraproctal structures provide additional differences to distinguish the new species. The outer paraproctal lobe of *N. khasanensis* tapers to a pointed tip with an obtuse notch on the outer margin, which forms the apex into a claw-like structure (Fig. 2); such a notch in *N. longicercia* is absent, the apex lightly sclerotized, bent upward, tapering to pointed tip (Shimizu, 1994). The cerci of *N. khasanensis* are slightly prolonged, shorter than *N. longicercia*.



FIGURES 5–7. 5–6. *Nemoura khasanensis* sp. n.: 5. Female, terminalia, cleared, ventral. 6. Vaginal complex, cleared, dorsal. R—receptacle, O—oviduct, Sh—collar-like shield, CVs—cap-shaped vaginal sclerite, Rp—finger-shaped roughened pocket, P—bean-shaped pouch, Go—genital opening, RVs—rounded vaginal sclerite, VI—finger like vaginal lobe, TVs—transverse vaginal sclerite, Sp—subgenital plate as an inverted letter “T”. 7. *Nemora longicercia*. Epiproct, dorsal. Al—apical membranous lobe. Scale (mm): 5 = 0.3; 6 = 0.1.

The female of *N. hasanensis* has a distinctive heavily sclerotized subgenital plate which is similar to an inverted letter “T” (Fig. 6). The vagina of *N. khasanensis* is characterized by a bean-shaped pouch with a pair of finger-shaped and curved inward roughened pockets (Fig. 6); a pair of strongly sclerotized dorsally cap-shaped sclerites covers the bean-shaped pouch anterolaterally; dorsoanteriorly, the bean-shaped pouch is covered by a large round collar-like shield (Fig. 6). The inner structures of *N. longicercia* female are poorly described as well as females of other species from *N. ovocercia* group, with exception of cleared female genitalia of *N. jejudoensis*, where similar to *N. khasanensis* cap-shaped vaginal sclerites that are visible (Zwick & Baumann 2011).

Material examined. Holotype male. Russian Far East, Primorsky Region, the Ryazanovka River, near the hunting farm, 42.82.37'N 131.23.49'E, 13-19.05.2004, coll. Teslenko V. Paratypes: 10 males, 7 females, 15 nymphs, the same locality and data as holotype, coll. V. Teslenko. All types deposited in the Institute of Biology and Soil Science, Far Eastern Branch, Russian Academy of Sciences, Vladivostok, Russia.

One male of *N. longicercia* was examined from S-W of the Kunashir Island, Ivanovsky Cape, unnamed small stream, 19-22. 09. 2014, coll. Yu. Sundukov, for comparison.

Etymology. The name refers to the type locality in the Khasansky region, where the types were collected.

Distribution. The new species is known from the foothill Ryazanovka River that flows from the East-Manchurian Range into the Peter the Great Bay of the Sea of Japan near the border with China and Korea.

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