MEGASELIA (APHIOCHAETA) ARANEIVORA SP. NOV., AN EGG PREDATOR OF THE ORB-WEB SPIDER ARGIOPE AEMURA (WALCKENAER) IN JAPAN (DIPTERA, PHORIDAE)

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MEGASELIA (APHIOCHAETA) ARANEIVORA SP. NOV., AN EGG PREDATOR OF THE ORB-WEB SPIDER *ARGIOPE AEMURA* (WALCKENAER) IN JAPAN (DIPTERA, PHORIDAE)*

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Abstract

Megaselia (Aphiochaeta) araneivora is described and illustrated as new to science from the Ryukyus, Japan, based on the mature larvae, puparia and adults reared from an egg-sac of *Argiope aemura* (Walckenaer) (Arachnida, Araneidae). This is the first Japanese record of the phorid fly parasitic on the spider egg-sac.

Some phorid flies have been known to attack spider egg-sacs, in which their larvae feed on the eggs to develop. According to Disney and Evans (1980) and Disney (1982), the American *Phalacrotophora epeirae* (Brues) has been repeatedly confirmed to parasitize the egg-sacs of *Epeira* species and those of other spider genera (after Brues, 1902 ; Kaston & Jenks, 1937 ; Muma & Stone 1971), the European *Megaselia melanocephala* von Roser was reported to parasitize the egg-sac of *Meta menardi* (after Decou-Burghele, 1961) and the Afrotropical *Pericyclocera diptychogastra* Schmitz has the same habit (after Schmitz, 1940). In the same papers cited above, Disney and Evans reported several instances of the parasitization of the egg-sacs of *Enoplognatha* Pavesi and *Robertus 0.* P.-Cambridge by *Megaselia pulicaria* (Fallen) and *M. nasoni* (Malloch) in England and stated these species are regular parasites of spider egg-sac, and Disney described *Megaselia argiopephaga* which emerged from the egg-sac of *Argiope* species (either *A. picta* or *A. reinwardi*) in Papua New Guinea.

Through the courtesy of Mrs. M. Honda-Yafuso of the Entomological Laboratory, University of the Ryukyus, I was able to examine an egg-sac of the orb-web spider *Argiope aemura* (Japanese name : Nagamarukoganegumo) infested by a phorid fly. It was collected by Mr. K. Sasaki at the campus of University of the Ryukyus on October 28, 1983. When I accepted it, the sac had contained some 30 phorid puparia and 2 dead mature larvae, together with many living larvae and nymphs of the host spider. The phorid adults emerged from November 19 to 24, 1983 in the laboratory, and they were

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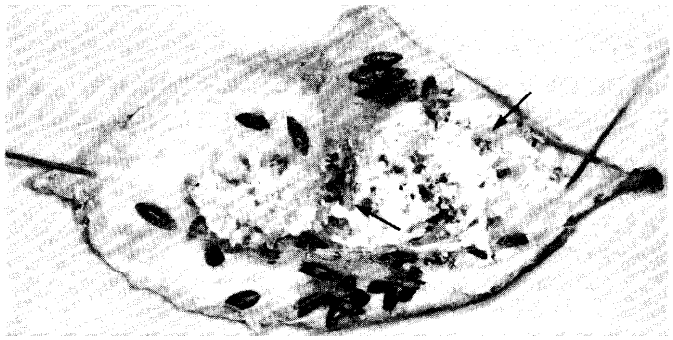

Fig. 1. Puparia and larvae (black arrows) of ***Megaselia (Aphiochaeta) araneivora*** sp. nov. within the egg-sac of *Argiope aemura.*

found to represent a distinct new species of the subgenus *Aphiochaeta* of the large genus ***Megaselia.*** In the present paper the new species is described and illustrated on the basis of the mature larvae, puparia and adults. This is the first instance of the phorid-spider relationship recorded from Japan.

Before going further I wish to express my hearty thanks to Prof. Y. Hirashima and Assoc. Prof. K. Morimoto of the Entomological Laboratory, Faculty of Agriculture, Kyushu University for their constant guidance. My sincere thanks are due to Mrs. M. Honda-Yafuso and Mr. K. Sasaki of the Entomological Laboratory, College of Agriculture, University of the Ryukyus for their kind donation of the spider egg-sac infested by a phorid fly. I am indebted to Miss C. Okuma of the Entomological Laboratory, Kyushu University for identification of the spider.

Megaselia (Aphiochaeta) araneivora sp. nov.

Male. Head width about 0.56 mm. Compound eye minutely haired. Ocellar triangle with anterior and lateral marginal portions dark brown, otherwise yellow. Frons yellow, sometimes partially very faintly darkened, 0.55-0.56 of head width, very slightly narrowed posteriorly. Chaetotaxy: Preocellar setae distant from one another by less than distance from eye margin, the seta slightly ventral to mediolateral and somewhat shorter than the latter ; anterolateral seta closer to antial than to mediolateral; antial seta inserted at ventral corner of frons, slightly inward to anterolateral ; 2 pairs of supra-antenna1 setae present, the outer seta longer than inner one ; frontal setulae rather dense. Upper postocular seta weak, lower one well differenciated. Parafacial to genal portion with a row of 5-7 short bristly hairs. Occiput yellow except either dorsolateral portion somewhat largely darkened. Antenna yellow, with 3rd antenna1 segment globose ; arista brownish yellow, subapical, shortly pubescent. Palpus yellow, widened distally in lateral view, 3 ***X as*** long as wide, with 5 robust short bristle on ventral margin. Proboscis with greatly

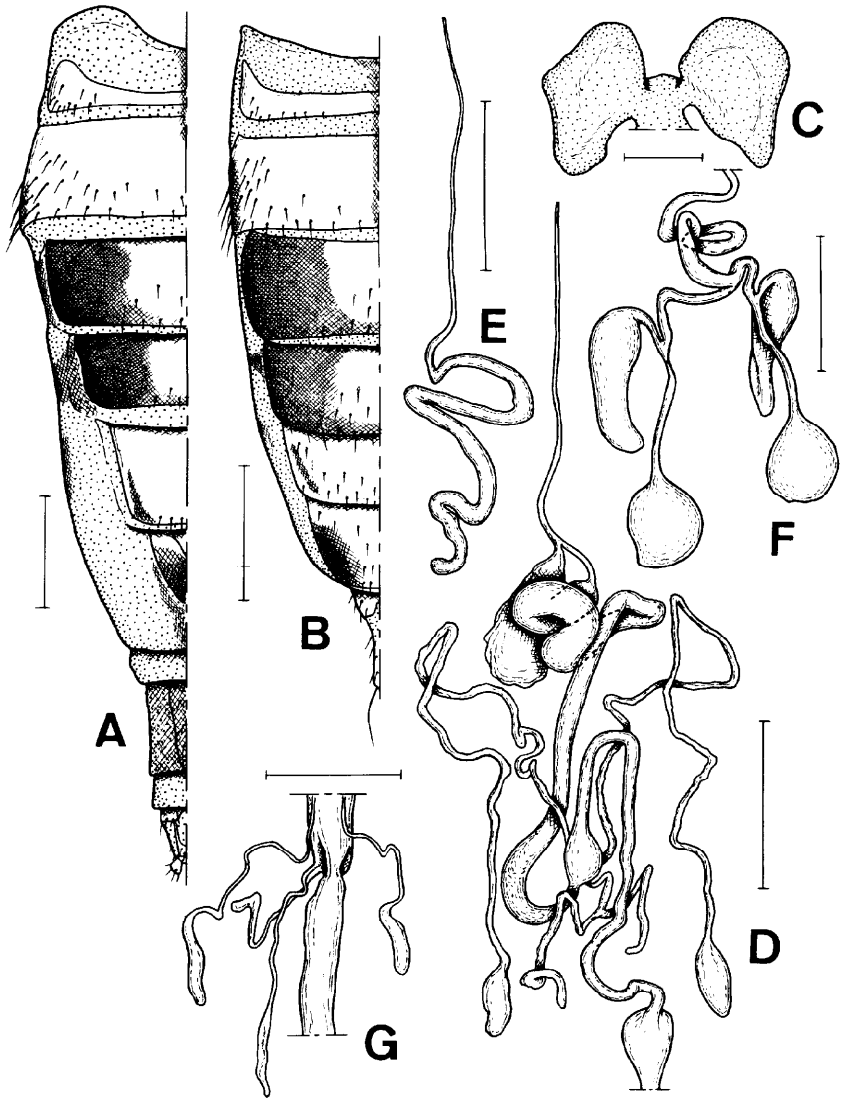

Fig. 2. *Megaselia (Aphiochaeta) araneivora sp.* nov.
A, C-E, G, female ; B, F, male. A, Abdomen in dorsal view ; B, ditto ; C, internal gland ; D, alimentary canal ; E, salivary gland ; F, internal reproductive organs ; G, ditto. Scales : A, B, D-G, 0.3 mm ; C, 0.1 mm.

enlarged labella, which is 1.2 x as wide as frons ; labellar lobe with largely sclerotized dorsal portion, which is brownish and entirly setulose.

Thorax yellow, more paler on pleuron. Postpronotal seta weak, shorter than notopleural. Scutum densely covered with black setulae, bearing 3 pairs of notopleural setae, each one pair of supra-alar, postalar and dorsocentral setae ; notopleural seta short, as long as supra-alar ; postalar seta strong, 1.6 x as long as dorsocentral.

Mesoanepisternum setulose on dorsal 1/3 and bearing one strong seta which is as long as postalar. Scutellum with a pair of long setae and a pair of basal minute hairs.

Wing pale yellow to yellow, rather narrow ; veins brownish yellow. Costa long, costal index 0.55-0.57 ; 1st costal sector 0.96 x as long as combined length of 2nd and 3rd ; 3rd costal sector 0.39-0.46 of 2nd in length ; 1st costal sector somewhat swollen on proximal 1/2. Vein M_1 weakly curved on proximal 2/7, then straight to tip ; vein M_2 very weakly curved for entire length, slightly diverged distally from M_1 ; vein M_{3+4} straight ; vein A_1 straight, complete to wing margin. Vein Rs without hair at base ; vein R_{4+5} with 4 annular organs at distal portion ; costal cilia 2.5-3.0 x as long as width of 2nd costal sector ; axillary margin with 2-3 hairs ; wing membrane entirely trichose. Halter yellow, slightly brownish. Wing length 1.95-2.05 mm, width 0.72-0.84 mm.

Legs yellow except posterior marginal portion of mid coxa, tips of hind femur and tibia brownish and dorsal portion of hind tibia slightly darkened. Fore tibia as long as 1st to 3rd tarsomeres together ; fore tarsus narrower than tip of fore tibia, all tarsomeres with same width, 5th tarsomere longer than either 3rd or 4th, relative lengths of fore tarsomeres approximately 18 : 7 : 5 : 5 : 4 : 6. Mid tibia with anterodorsal and posterodorsal rows of robut setulae, bearing a strong ventral end-bristle, which is 3.3 x as long as diameter of tibia. Hind tibia biserial, with a posterodorsal row of 9-10 spine-like bristles and an anterodorsal row of 8-10 ones, which are weaker than the former, the tibia bearing a ventral robust end-bristle, which is 1.5 × as long as diameter of tibia.

Abdomen with membrane yellow except faint dark markings around 3rd to 5th abdominal spiracles. First tergum yellow, slightly darkened on median portion, transversely narrow, with expanded lateral marginal portions, very sparsely short haired. Second tergum yellow, with slightly darkened median and brownish lateral portions, largest, rectangular in dorsal view, bearing bristly short hairs on dorsolateral portions. Third and 4th terga dark brown on lateral 1/2 and pale brown on posterior marginal portion, otherwise brownish yellow. Fifth tergum yellow, with small brownish marking on either lateral portion. Sixth tergum largely yellow on anterior 1/3 and median portion, remainder of the tergum dark brown. Second to 6th terga covered with sparse short hairs, reduced in size in order.

Male genitalia brownish yellow, small, entirely minutely haired. Epandrium with rather short bristles on posterolateral portions, bearing a small triangular process on right ventrodistal margin. Hypandrium with ventral plate semicircularly rounded, bearing a small triangular process on left posterolateral margin. Aedeagus simple in structure, composed of 5 sclerites as shown in Fig. 3D. Anal tube yellow large, longer than genitalia ; hypoproct distally with a pair of pennate long bristles. Internal reproductive organs creamy-white ; testis globose ; accessory gland large, elliptical.

Body length : 1.8-2.0 mm.

Female. Differing from male as follows : Frons 0.53-0.56 of head width, more wider than long. Labrum robust ; labellum smaller, of ordinary size. Costa1 index 0.57-0.59 ; 1st costal sector 0.86-0.88 of combined length of 2nd and 3rd ; 3rd costal

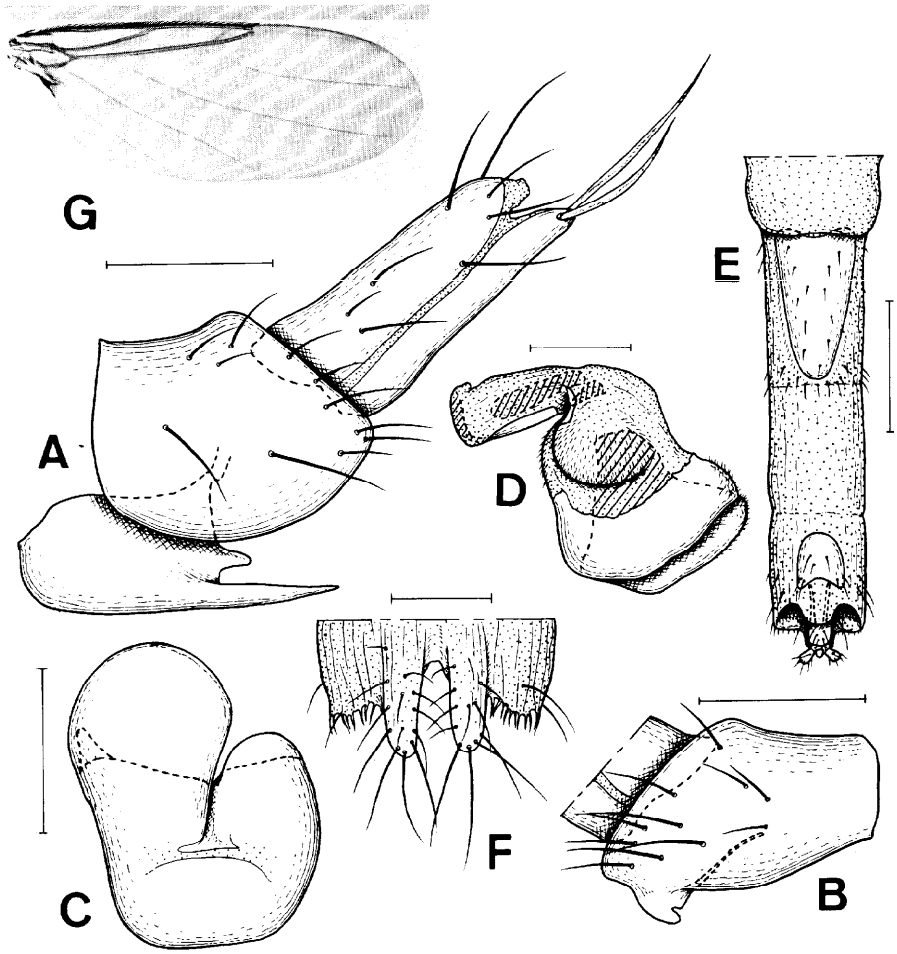

Fig. 3. *Megaselia* ***(Aphiochueta)*** *araneivora* ***sp.*** nov.
A-D, male ; E-G, female. A, Genitalia in left lateral view ; B, epandrium in right lateral view ; C, hypandrium in ventral view ; D, aedeagus in dorsal view; E, terminalia in dorsal view ; F, distal portion of 8th abdominal segment in ventral view ; G, wing. Scales : A-C, F, 0.1 mm ; D, 0.05 mm ; E, 0.3 mm.

sector 0.33-0.38 of 2nd ; wing length 2.33-2.46 mm, width 0.90-0.96 mm.

Abdomen with 1st to 4th terga much as in male. Fifth abdominal segment carrying a common orifice of a pair of internal glands (Fig. 2C) just behind its trapezoidal tergum. Sixth abdominal segment darkened on posterodorsal median portion ; tergum dark brown except proximal 1/4, tapered posteriorly and deeply emarginate on anterior margin, thus sagittate in shape. Terminalia : Seventh abdominal segment dark brown dorsally ; tergum brown except yellowish anterior 1/4, narrow, 2 X as long as wide, tapered posteriorly ; sternum brownish, narrow, 4 x as long as wide, gradually tapered posteriorly. Eighth abdominal segment yellow, with ventrodistal margin produced to form a pair of weakly membraneous processes, which

bear longish hairs and are slightly brownish ; tergum roughly quadrate, with anterior margin convex and posterior margin concave ; sternum absent. Nineth + tenth segment yellow, with tergum quadrate and sternum rounded on distal margin. Cercus yellow, considerably smaller than usual. Internal reproductive organs creamy-white : a pair of spermathecal ducts present, somewhat swollen on distal 1/3; accessory gland swollen on distal portion.

Alimentary canal creamy-white, probably of ordinary metopine type : salivary gland long and large, irregulary curved on distal swollen portion (shorter and much slenderer in male). Crop diverging near posterior end of oesophagus. Ventriculus and anterior intestine long, curved as shown in Fig. 2D (much shorter in male). Three malpighian tubules present, a lateral pair of which are much longer than median one and swollen at distal portions, median tubule diverged into two branches on distal 3/4 (tubules much shorter in male).

Body length : 2.4-2.5 mm.

Mature larva. Yellowish white, boat-shaped, length about 3 mm, maximum width about 1 mm. Pseudocephalic segment characteristic in losing interantennal processes ; antenna and maxilla as shown in Fig. 4A. Dorsum of larva bearing following segmental processes : First thoracic segment with 4 processes equidistantly arranged in transverse row on its anterior margin ; 2nd and 3rd thoracic segments bearing 6 processes, 1st to 7th abdominal segment with 1 process on either dorsolateral portion of 2nd segmental subdivision and with 4 ones on 3rd segmental subdivision, thus 6 segmental processes present, and less than basic number 8 (referred to in Die Fliegen (1938, p. 60)) ; 8th abdominal segment with 6 segmental processes arranged on posterior margin (Fig. 4D) and with each one pair of small processes above and below of posterior spiracular disc, the process (Fig. 4F) with a nipple-like minute papilla in deep excavation at tip, so that markedly different in structure from other segmental processes which circularly bear several spine-like small processes on subdistal portion (Fig. 4E), the segment losing process termed as *k* in Textfig. 57 of Die Fliegen. Anterior and posterior spiracles examined in pupal stage ; anterior spiracle with 2 spiracular slits as shown in Fig. 4G ; posterior spiracular disc with 4 spiracular slits arranged as shown in Fig. 41, bearing probably 4 interspiracular hairs which are bifid at tip. Cephalopharyngeal skeleton : Mandible relatively slender, with a few weak accessory teeth on ventroproximal margin ; hypopharynx long and narrow. Venter of larva not examined,

Puparium (Fig. 4 J). Reddish light brown, elliptical in dorsal view, tapering toward each end, entirely covered with rather longish hairs, length about 3.3 mm, maximum width about 1.3 mm. Pupal respiratory horn reddish brown, progressively lightened distally, straight and long, 0.7 mm in length, with many spiracular slits irregularly arranged on its entire surface (Fig. 4H).

HOLOTYPE : ♂ (Type No. 2537, Kyushu Univ.), University of the Ryukyus, Nishihara, Okinawa, Ryukyus, 28. x. 1983, K. Sasaki leg.

PARATYPES : 8♂♂ 8♀♀, same data as holotype. The eight paratypes (4 ♂♂ 4♀♀) will be deposited in the collection of the Entomological Laboratory, College of

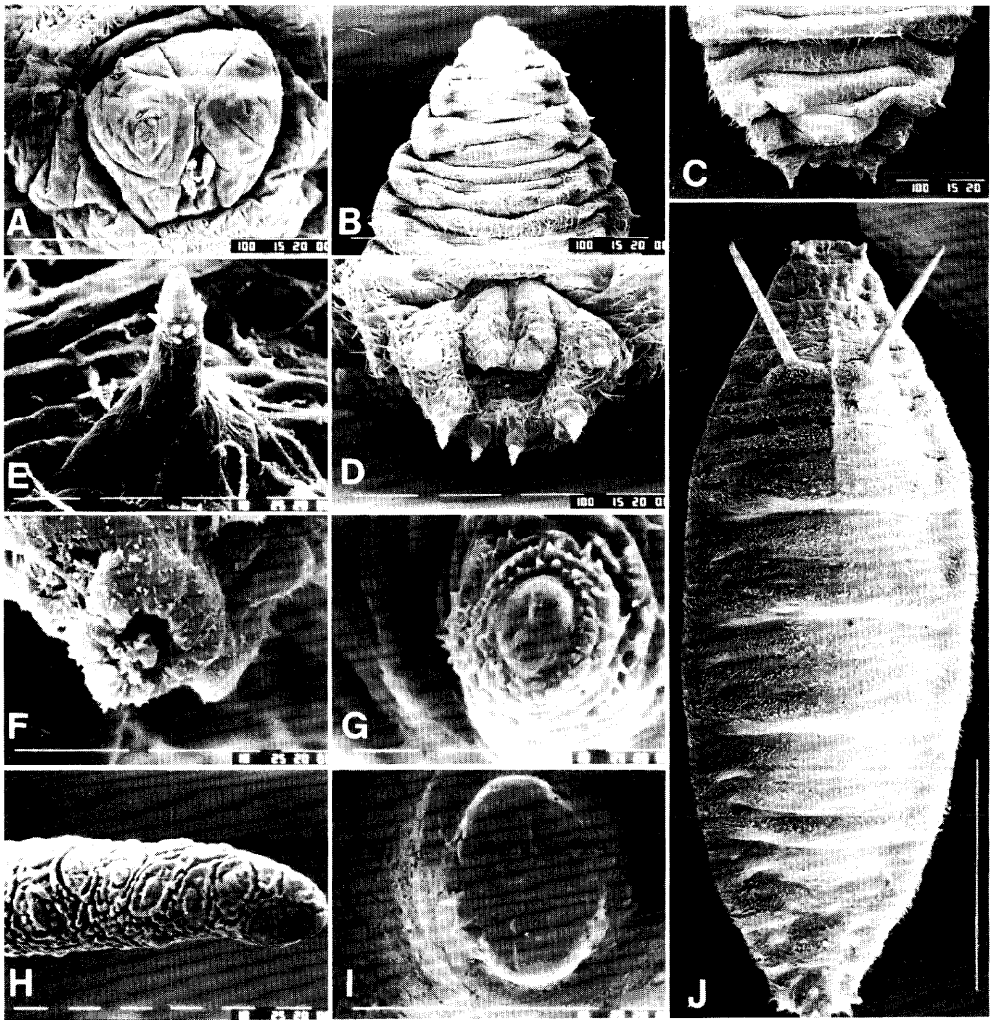

Fig. 4. Mature larva (A-F) and puparium (G-J) of *Megaselia (Aphiochacta) araneivora* sp. nov. **A,** Pseudocephalic segment in anterodorsal view, somewhat laterally ; B, thorax and 1st and 2nd abdominal segments in dorsal view ; C, 7th and 8th abdominal segments in dorsal view ; D, 8th abdominal segment in caudal view ; **E,** segmental process ; F, process situating just above and below posterior spiracular disc ; G, anterior spiracle ; H, distal portion of pupal horn ; I, posterior spiracle ; J, whole puparium in dorsal view. Scales : A-D, 100μm ; E-J, 10μm ; J, 1 mm.

Agriculture, University of the Ryukyus.

Other specimens examined : 3 ♂♂ 13 ♀♀, 3 puparia and 2 mature larvae, same data as holotype.

REMARKS. This new species is undoubtedly related to the Papua New Guinean *Megaselia* (*Aphiochaeta*) *argiopephaga* Disney, 1982 which also attacks egg-sac of *Argiope*. These two share the markedly enlarged male labella, the swollen basal 1/2

of 1st costal sector and the abdominal terga with dark markings, but in *araneivora* the 1st costal sector is shorter than 2nd + 3rd, the female 5th abdominal terga is distinctly present (completely absent in *argiopephaga*), the 1st abdominal terga is entirely yellow and the 2nd one is yellow except brownish lateral portions (dark in posterior 1/4 and lateral margins in *argiopephaga*).

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