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## NEW RECORDS OF SPECIES OF CRICONEMATIDAE FROM IRAN WITH DESCRIPTION OF *CRICONEMOIDES DECIPIENS* SP. N. (NEMATODA: TYLENCHIDA)

by  
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**Summary.** Six species of Criconematidae recently found in Iran, are reviewed. *Criconemoides decipiens* is described as a new species, characterized by very low number of annules (36-41) and strongly crenate posterior margins of annules. *C. paragoodeyi*, known only from Korea so far, is recorded from Iran.

Barooti (1987) summarized reports of species of Criconematidae found in Iran during 1956-1986, listing the following species:

*Hemicriconemoides cocophilus* (Loos, 1949), reported by Kheiri and Barooti, 1983;

*H. mangiferae* Siddiqi, 1961 by Kheiri and Barooti, 1983;

*Ogma multisquamatum* (Kirjanova, 1948) by Kheiri, 1972, as *Crossonema civellae* (Steiner, 1949);

*Mesocriconema curvatum* (Raski, 1952) by Kheiri, 1972, as *Macroposthonia curvata*;

*M. antipolitanum* (de Guiran, 1963) by Kheiri, 1972, as *Macroposthonia macrolobata* (Jairajpuri et Siddiqi, 1963);

*M. sphaerocephalum* (Taylor, 1936) by Kheiri, 1972, as *Macroposthonia sphaerocephala*;

*Criconema jaejuense* (Choi et Geraert, 1975) by Kheiri and Barooti, 1983, as *Nothocriconema jaejuense*;

*Criconema mutabile* (Taylor, 1936) by Barooti, 1981, as *Nothocriconema mutabile*.

During a survey for plant-parasitic nematodes, carried out from 1986 to 1989, several more species were found, among which one considered as undescribed. They are dealt with in this paper. Fig. 1 shows the collecting localities.

### Methods

The nematodes were extracted by the centrifugation-flotation technique described by Jenkins (1964), fixed in

TAF and killed according to de Grisse (1965) and transferred to glycerin by the method of Seinhorst (1959). The SEM photos of Figs. 4, 7 and 9 were made on a Jeol JSM 35 C at the TFDL, Wageningen.

### Genus *Criconemoides* Taylor, 1936

syn *Criconemella* de Grisse et Loof, 1965

Key to Iranian species:

- Stylet length under 54  $\mu\text{m}$ ; number of body annuli well over 100 2
- Stylet length over 55  $\mu\text{m}$ ; number of body annuli under 80 3
- 2. - Body length under 0.35 mm; stylet length under 40  $\mu\text{m}$ ; postvulvar body part short, trapezoid to rounded; V = over 91 *C. parvus* Raski, 1952.
- Body length over 0.36 mm; stylet length over 45  $\mu\text{m}$ ; postvulvar body part elongate-conoid; V = under 90 *C. paragoodeyi* (Choi et Geraert, 1975).
- 3. - R = under 43; stylet length over 90  $\mu\text{m}$ ; annuli with longitudinal striae and strongly crenate posterior margins; V = 84-90 *C. decipiens* sp.n.
- R = over 48; stylet length under 85  $\mu\text{m}$ ; annuli without clear longitudinal striae, posterior margins smooth to slightly irregular; V = 88-94 *C. informis* (Micoletzky, 1922).

*CRICONEMOIDES DECIPIENS* sp. n.  
(Fig. 2-5)

Dimension:

Females: see Table I.

J-4 (n = 1): L = 0.64 mm; a = 10; b = 4.2; stylet = 77  $\mu$ m; R = 42; width of first annulus = 20  $\mu$ m; length of genital primordium = 48  $\mu$ m.

J-3 (n = 7): L = 0.34-0.41 mm; a = 6-8; b = 3.2-3.7; stylet = 59-67  $\mu$ m; R = 42-45; width of first annulus = 15-17  $\mu$ m; length of genital primordium = 15-24  $\mu$ m.

J-2 (n = 17): L = 0.23-0.29 mm; a = 7-9; b = 2.3-3.0; stylet = 50  $\mu$ m (44-55); R = 46-49; width of first annulus = 9-12  $\mu$ m; length of genital primordium = 8-14  $\mu$ m.

Description. Female: Body slightly curved ventrad in death, tapering slightly anteriorly, more strongly posteriorly. Annuli very coarse, distinctly retrorse from fifth; with fine longitudinal striae, the posterior margins are strongly crenate. First annulus transverse, not retrorse, slightly offset from second. Anteriorly the first annulus are irregularly lobate ventrally (Fig. 3, B). Oral disc surrounded by six pseudolips, the submedian ones slightly en-



Fig. 1 - Map of Iran showing collecting localities. 1, Amol; 2, Tonekabon; 3, Tarom; 4, Polimbera; 5, Bandaranzali; 6, Kochesfahan (Ghilan); 7, Manzadaran-Nour; 8, Zanjan; 9, Jolfa; 10, Dorod; 11, Khozestan; 12, Shahdad; 13, Taleghan; 14, Shahriar; 15, Mahalat; 16, Tehran; 17, Karaj; 18, Miandoab.

larged, resembling submedian lobes. Stylet and pharynx typical; terminal bulb relatively large and well developed. Vulva a transverse slit, vulval annulus ventrally projecting less than surrounding annuli. Vagina not sigmoid. Spermatheca large, broadly oval to round, filled with sperms. Postvulval body regularly elongate-conical, terminal annulus protruding lobe-like.

Juveniles: Ornamentation of annuli same as in female.

Male unknown.

Type locality: Mahalat, central Iran.

Type habitat: Soil around roots of apple.

Holotype: Female on slide WT 2801, Nematode collection of Agricultural University, Wageningen, Netherlands.

Paratypes: 44 females on slides WT 2802-2817, same collection; 12 females on slides 1138-I, 1138-II and 1138-III in the collection of the PPDRI, Tehran, Iran; three females deposited at each of the following addresses: Muséum national d'Histoire naturelle, Paris, France; USDA, Beltsville, USA; Rothamsted Experimental Station, Harpenden, England; Randse Afrikaanse Universiteit, Johannesburg, South Africa; University of California, Davis, USA; University of California, Riverside, USA; Eötvös Loránd Tudományegyetem, Budapest, Hungary; Commonwealth Institute of Parasitology, St. Albans, England; Laboratory of Nematology and Soil Zoology, Ibaraki, Japan; Instytut Zoologii, Warszawa, Poland; Rijksfaculteit Landbouwwetenschappen, Gent, Belgium and Istituto di Nematologia agraria, Bari, Italy.

Discussion and diagnosis: The specific name *decipiens* (meaning «misleading») was chosen because the species at first sight looks like a species of the genus *Neolobocriconema* Mehta et Raski, 1971 because of the low number of very coarse annuli with longitudinal striae and strongly crenate posterior margins, presence of submedian lobes and closed vulva. However, SEM photos show that the head structure unambiguously is of the *Criconemoides* type (Loof and de Grisse, 1989). Moreover, the shape of the posterior part of the female body (elongate-conical resulting in an anterior vulva position) is unlike *Neolobocriconema*, and finally the annuli of juvenile stages are similar to those of the adult female, lacking rows of spines or scales.

The genus *Criconemoides* (incl. *Criconemella*) contains at present 26 species. *C. xiamensis* Tang Chongti, 1981 is *species dubia*, and of *C. echinopanaxi* Mukhina, 1981 the description was not available. The lowest annule number recorded among the 24 remaining species is 49 in *C. informis* (see de Grisse and Loof, 1970) and this species the annuli are not particularly coarse and lack ornamentation; moreover, length of body and stylet is much less, VL/VB is lower and V is higher.

*C. decipiens* sp.n. is sufficiently characterized by its greater body length, very low number of strongly crenate annuli and longer stylet (only *C. annulatus* has stylet length up to 108  $\mu$ m). But examination of juveniles is essential for recognizing it as a species of *Criconemoides*. Vulva position in *C. decipiens* is also unusual, V ranging in the other species from 87 to 96.

TABLE I - *Dimensions of Criconemoides decipiens, females (n = 101)*

	Range	Mean	SD	CV	Holotype
L mm	0.58-0.80	0.68	46.5 $\mu$ m	6.9	0.69
a	6.6-10.2	8.2	0.73	8.9	8.0
b	3.4-4.7	4.0	0.24	6.0	4.3
c	10.3-20.2	14.9	2.4	16.0	13
V	84-90	87	1.15	1.3	88
VL/VB	1.1-1.9	1.42	0.15	10.4	1.3
G	26-82	59	11.6	19.8	63
Stylet $\mu$ m	90-115	101	5.0	4.9	98
St % L	13-17	15	0.85	5.7	14
Width R-1	26-37 $\mu$ m	32 $\mu$ m	2.49 $\mu$ m	7.8	31
Rex	11-15	13	0.75	5.7	13
RV	5-8	6.8	1.0	15	7
RVan	1-2	1.5	0.5	33	1
Ran	3-5	4.0	0.21	5.3	5
R	36-41	39	1.14	2.9	39

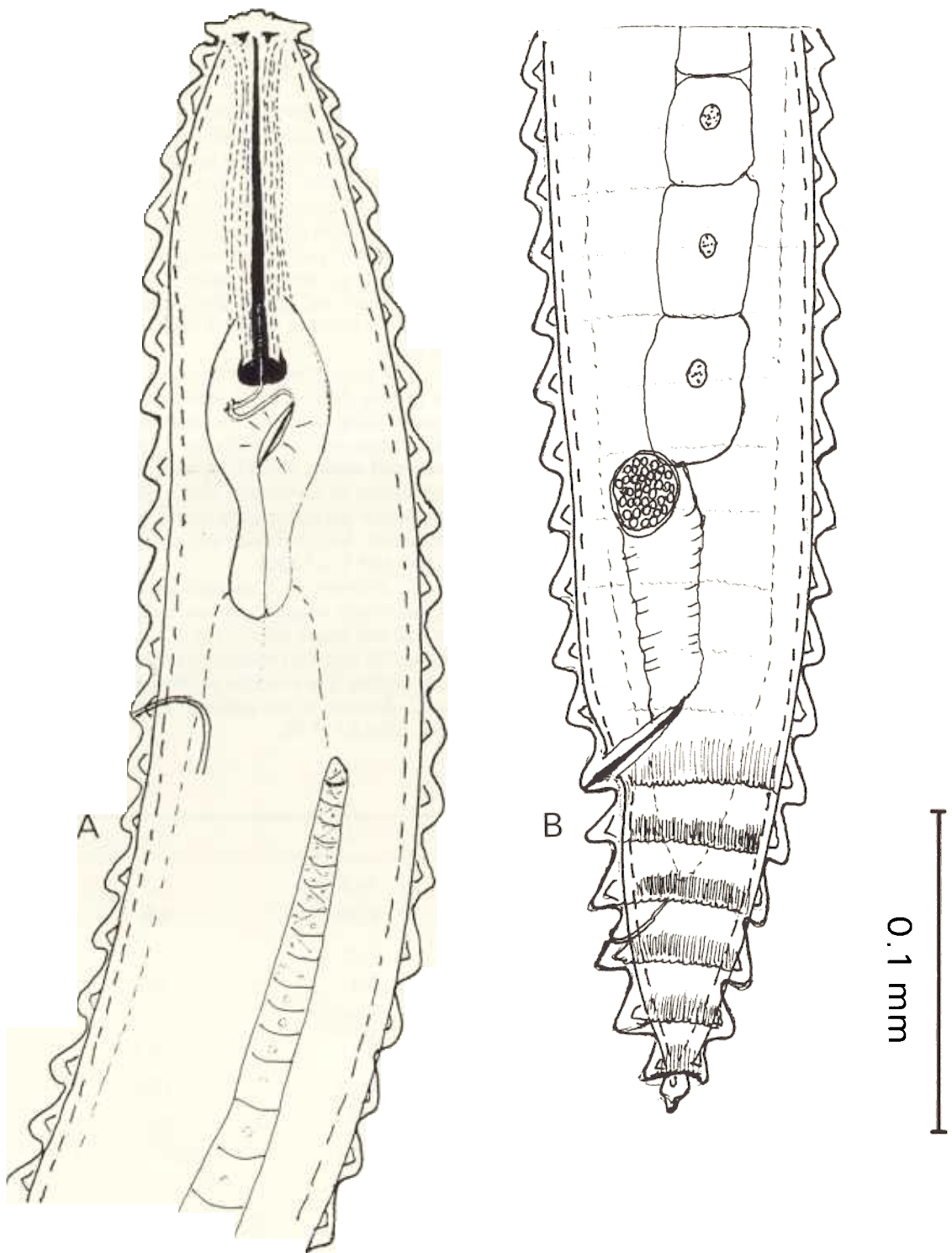
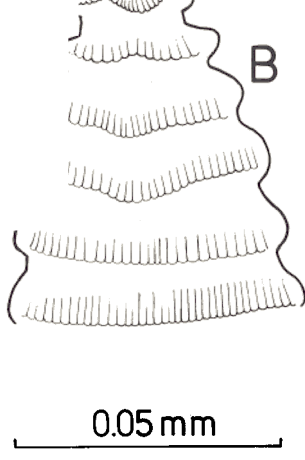
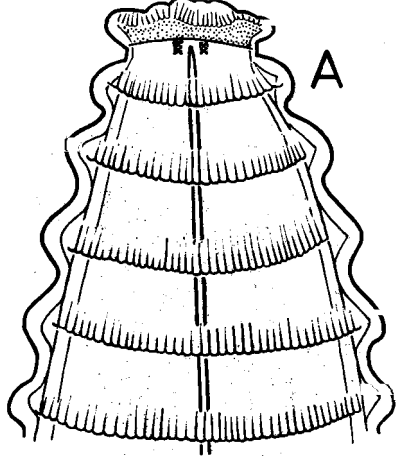
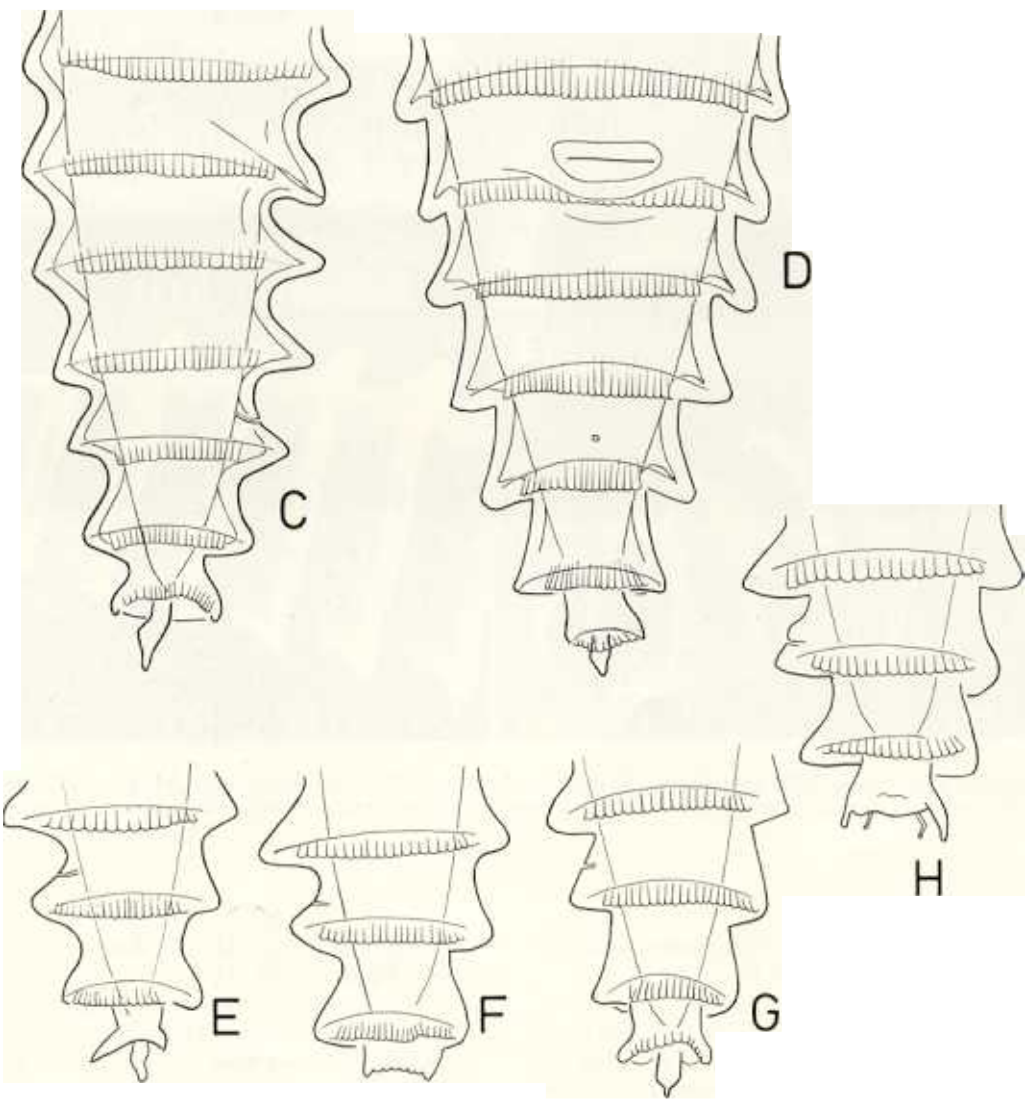


Fig. 2 - *Criconemoides decipiens* sp.n., female. A, anterior part; B, posterior part.

Fig. 3 (Front page) - *C. decipiens* sp.n., female. A and B, cuticular sculpture at anterior end, A, lateral view, B, ventral view; C and D, posterior region, C, lateral view, D, ventral view; E-H, variations in terminus, lateral view.



0.05 mm





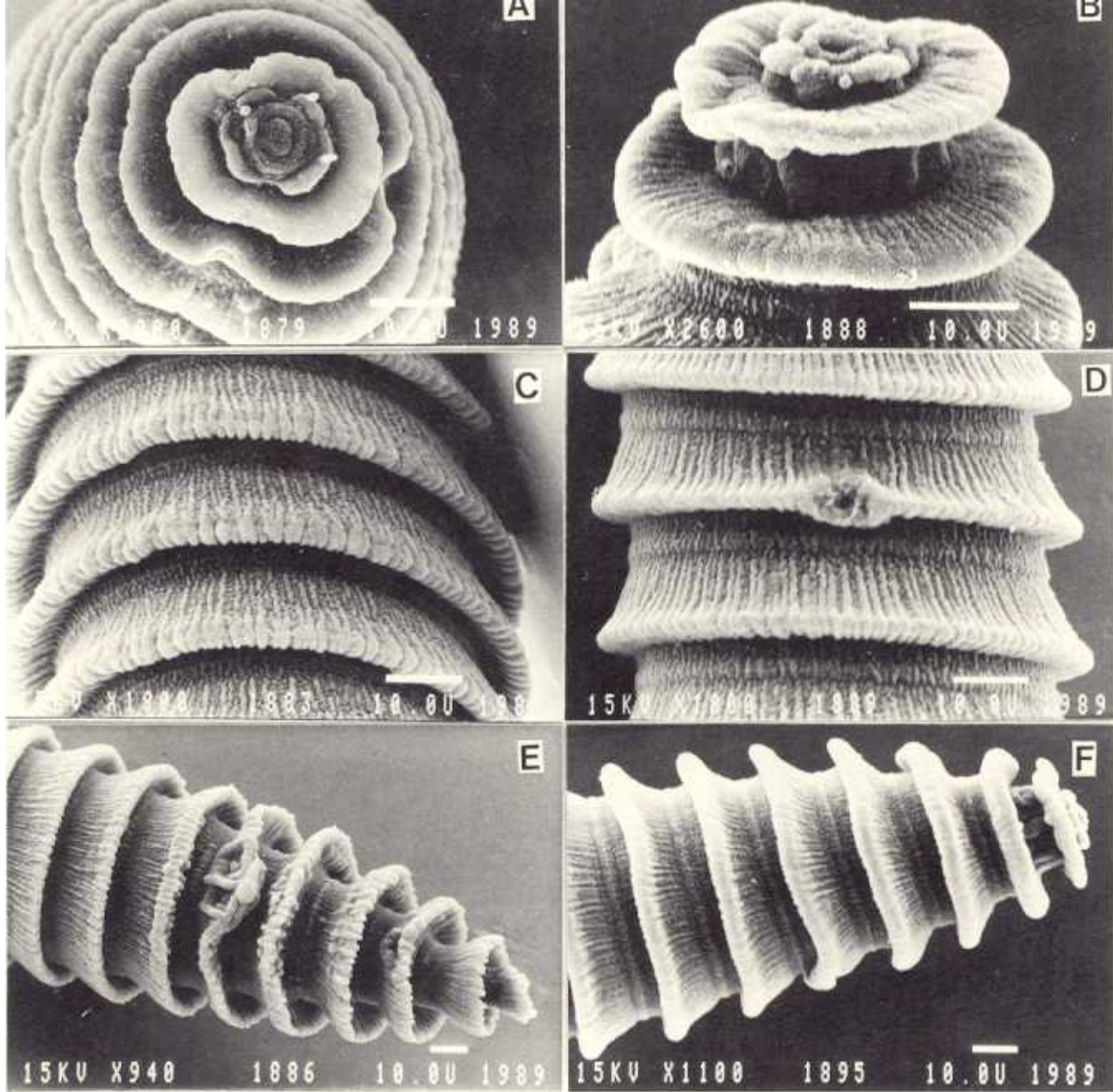


Fig. 4 - *C. decipiens* sp.n., female, SEM photographs: A, end-on view of head; B, oblique lateral view of head end; C, cuticular sculpture, lateral view; D, cuticular sculpture, ventral view with excretory pore; E, posterior region showing vulva and anus; F, anterior region, lateral view.

***CRICONEMOIDES INFORMIS* (Micoletzky, 1922)**  
(Fig. 6, A-B; 9, F)

Dimensions of females: (n = 20): L = 0.57 mm (0.45-0.62); a = 12 (10-14); b = 3.8 (3.2-4.3); c = 26 (18-44); V = 91 (89-94); VL/VB = 1.1 (1.0-1.3); stylet = 76  $\mu$ m

(71-81); St%L = 13 (11-17); Rex = 22 (21-24); RV = 8 (6-9); RVan = 2 (1-3); Ran = 5 (3-6); R = 71 (65-77).

This species is conspicuous for its relatively low number of body annuli, conoid posterior body part, large «submedian lobes» and stout stylet (length = about 20x width of shaft).

Within this species de Grisse and Loof (1970) distinguished two forms. One has a short stylet (57-69  $\mu\text{m}$ ), low R (49-62) and spermatheca filled with sperms. This form (originally described as a separate species *C. flandriensis* de Grisse, 1964) is known only from Belgium, the Netherlands and Western Germany. The second has a longer stylet (63-82  $\mu\text{m}$ ), higher R (56-74) and empty spermatheca, and has a very wide distribution (Europe, India, Korea, USA, Turkey). All Iranian specimens belong to the latter form.

The submedian lobes are somewhat smaller than in European specimens (Fig. 9, F).

Economic importance: No damage to plants has up to now been reported, but in view of the strong stylet the species might occasionally be harmful.

Distribution in Iran: Soil around roots of cabbage and alfalfa, Zanjan; of apricot, Julfa; of walnut, Tarom; of citrus, Shahdad; of *Punica*, Khozestan. Also found in sandy soil at Bandaranzali, collected by Sturhan in 1970.

***CRICONEMOIDES PARVUS* Raski, 1952**  
(Fig. 6, C-D; 7)

Dimensions of 33 females: L = 0.29 mm (0.24-0.33); a = 13 (10-16); b = 3.7 (3.2-4.2); c = 35 (21-55); V = 96 (94-97); VL/VB = 0.75 (0.6-0.9); stylet = 29  $\mu\text{m}$  (26-32); St%L = 10 (9-11); Rex = 46 (41-53); RV = 10 (8-12); RVan = 1 (0-4); Ran = 8 (6-11); R = 154 (142-172).

*C. parvus* is most probably a species complex (Loof, 1989). The Iranian populations are characterized by distinctly crenate annuli, trapezoid to rounded postvulval body part, large spermatheca filled with sperms, and distinct submedian lobes. Laterally there is some differentiation (Fig. 7, B and D), occasionally the annuli are broken laterally over some distance (Fig. 7, C) but true anastomoses appear to be absent, at least in the Ghilan population (Fig. 7, C, D, F); in the Polimbera specimens an occasional anastomosis was found (Fig. 7, E).

Distribution in Iran: Five population were found: Soil around of *Populus* sp. at Mazandaran, Bandaranzali and Polimbera; around roots of citrus at Tonekabon. All four localities are in the subtropical zone along the coast of the Caspian Sea. The fifth population came from grapevine, Miandoab (cold climate). Specimens from Tonekabon and Polimbera appear under the light microscope to have larger submedian lobes than those from Bandaranzali and Mazandaran, but under SEM the difference was not distinct (Fig. 7, A and B).

***CRICONEMOIDES PARAGOODEYI***  
(Choi et Geraert, 1975)  
(Fig. 8; 9, A-B)

Dimensions of 20 females: L = 0.35-0.46 mm; a = 9-12; b = 4.0-4.8; c = 11-14; V = 85-88; VL/VB = 1.4-

1.9; stylet = 45-48  $\mu\text{m}$ ; St%L = 11-13; Rex = 39-45; RV = 18-21; RVan = 4-7; Ran = 13-15; R = 139-155.

This species was known till now only from Korea. Its occurrence in Iran suggests that it may have a wider distribution in Asia.

The Iranian specimens conform well to the original description, only R is higher (139-155 vs 132-137). The lip

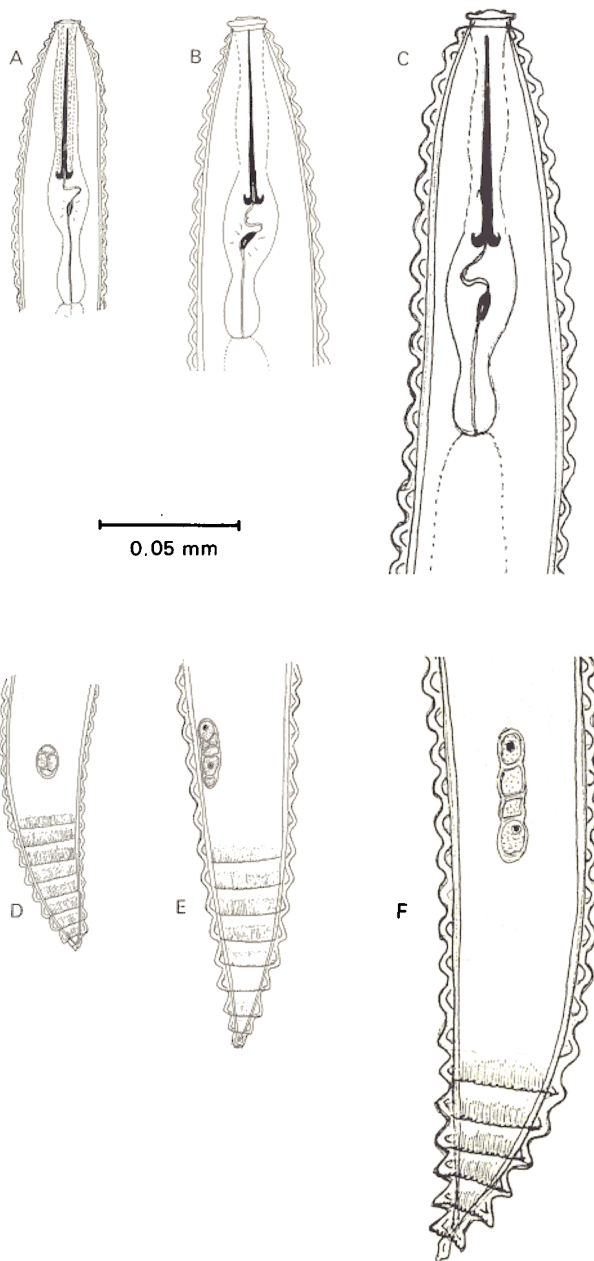
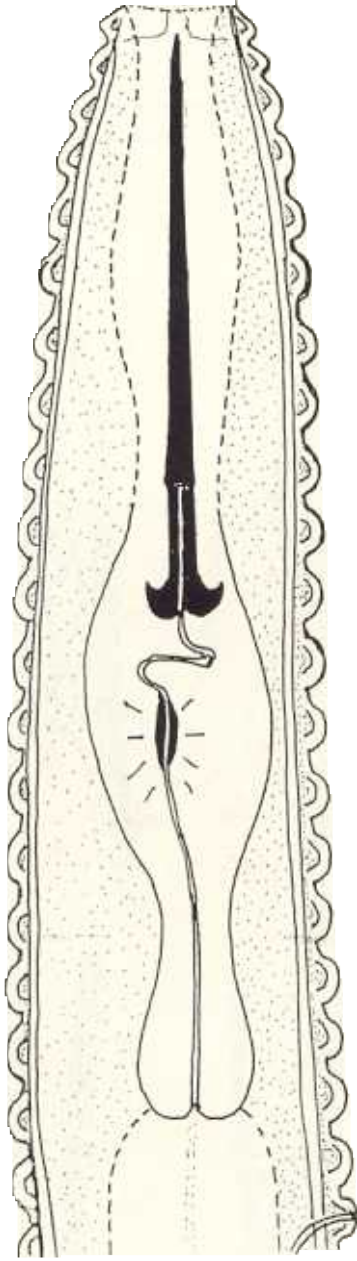
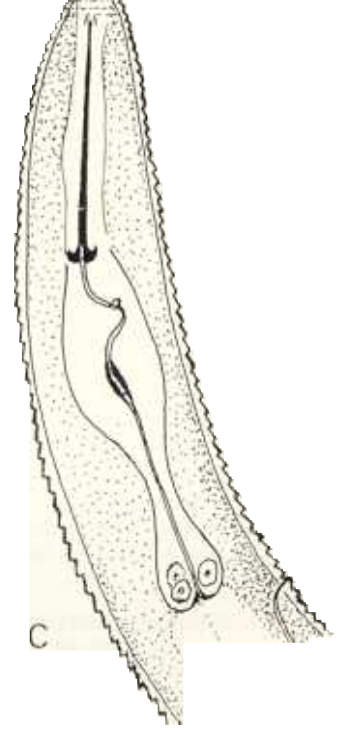
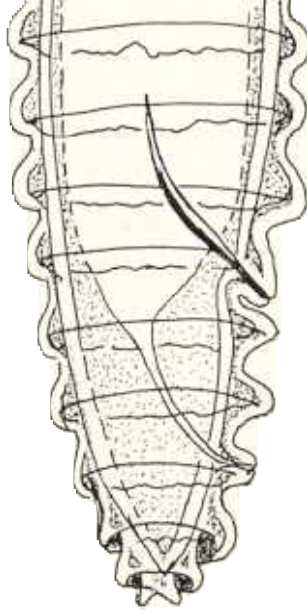


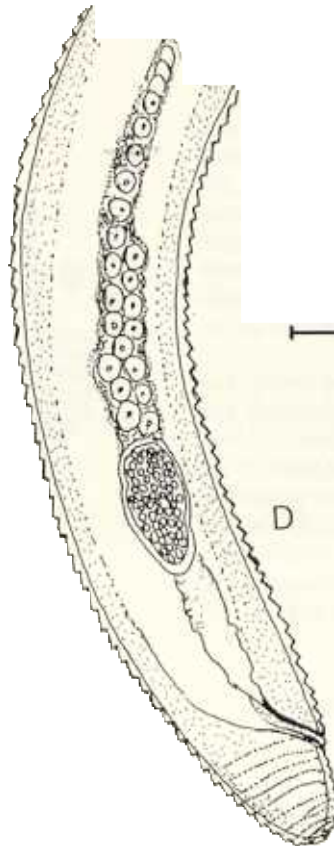
Fig. 5 - *C. decipiens* sp.n., juveniles. A-C, anterior region, D-F posterior region. A and D, J-2; B and E, J-3; C and F, J-4.



A



C



D



0.05 mm



region is surrounded by a high ridge; the submedian lobes are very weakly developed, as in *C. morgensis* (Fig. 9, C and D) and *C. annulatus* (Fig. 9, E).

Distribution in Iran: Soil around roots of rice, Ghilan and Amol-Mazandaran, both localities in the subtropical zone along the coast of the Caspian Sea.

#### Genus *Mesocriconema* Andr ssv. 1965

Until now this genus has been known under the name *Macroposthonia* de Man, 1880. Recently it was agreed that it is preferable to drop this name (Loof and de Grisse, 1989; Coomans *et al.*, 1990)

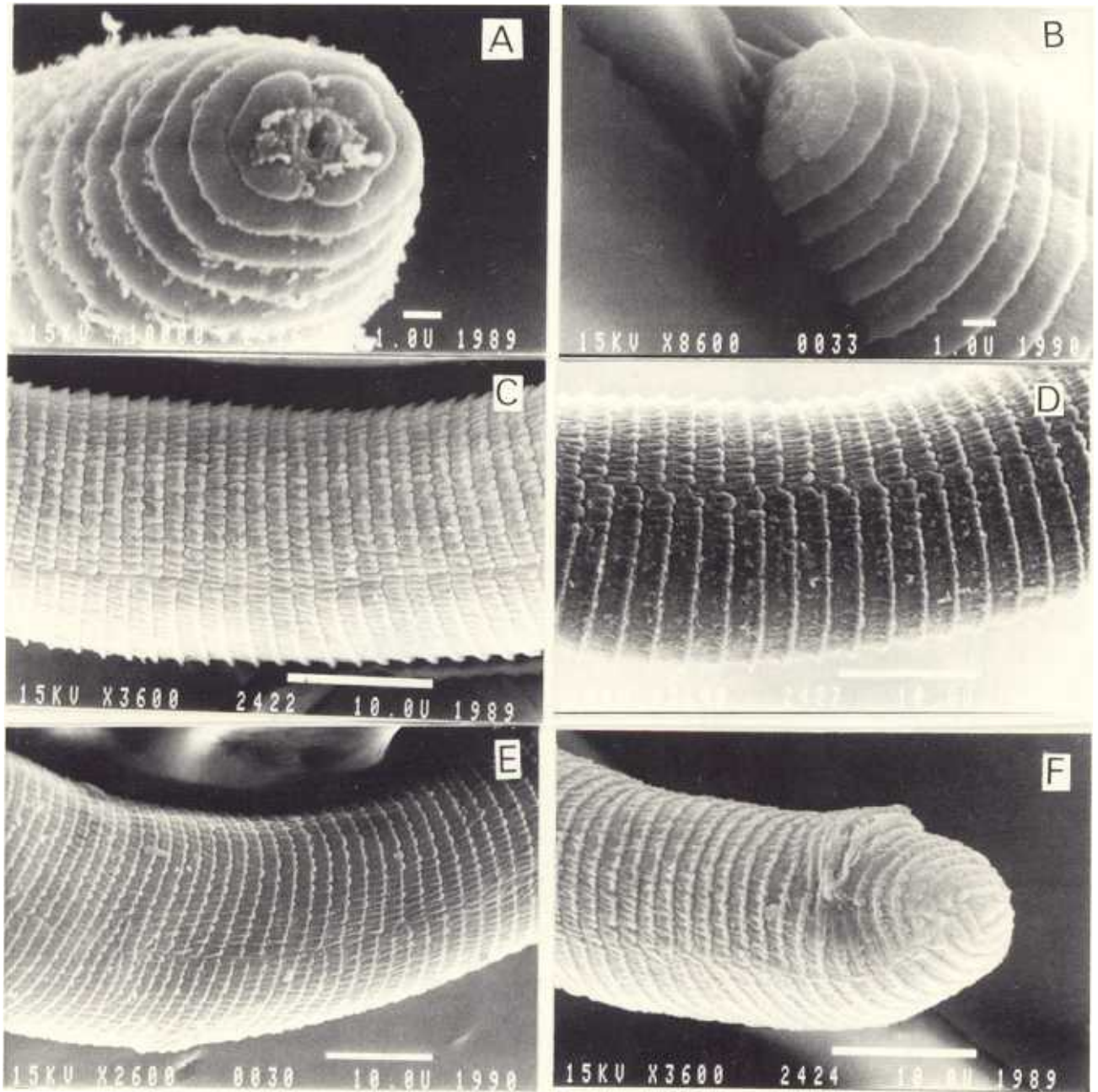
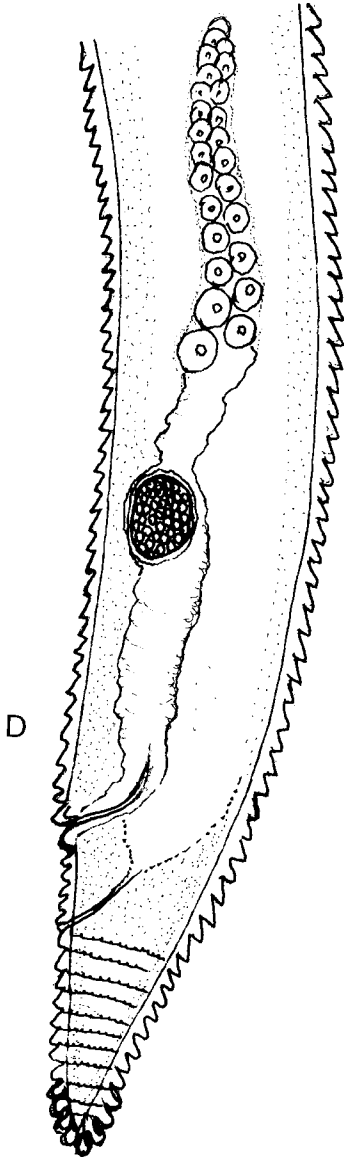
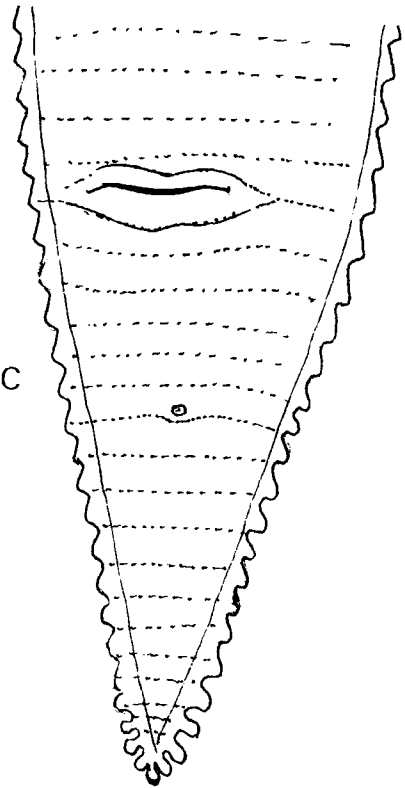
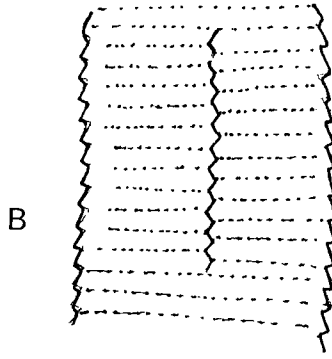
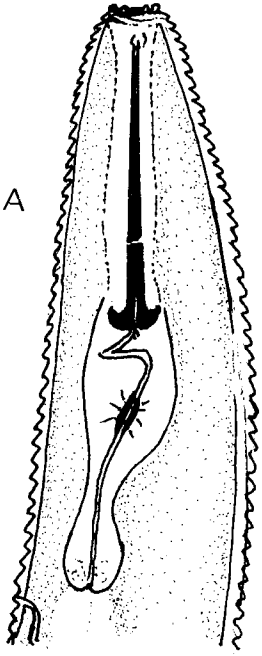


Fig. 7 - *C. parvus*, SEM photos. ACDF, female from Ghilan; BE, female from Polimbera; A, end-on view of head; B, oblique view of head; CDE, lateral body sculpture; F, posterior region.

Fig. 6 (Front page) - A-B: *C. informis*, female from Jolfa. A, anterior part; B, posterior part. *C. parvus*, female from Ghilan. C., anterior part; D, posterior part.



0.05 mm A B D  
0.05 mm C

Key to Iranian species:

1. - Annuli with numerous anastomoses forming short zigzag lateral lines; prevulvar annulus very large on ventral side  
*M. sphaerocephalum* (Taylor, 1936)

2. - Anastomoses rare, never forming zigzag lateral lines; prevulvar annulus ventrally not very large  
2. - Submedian lobes very large, protruding, flattened anteriorly;

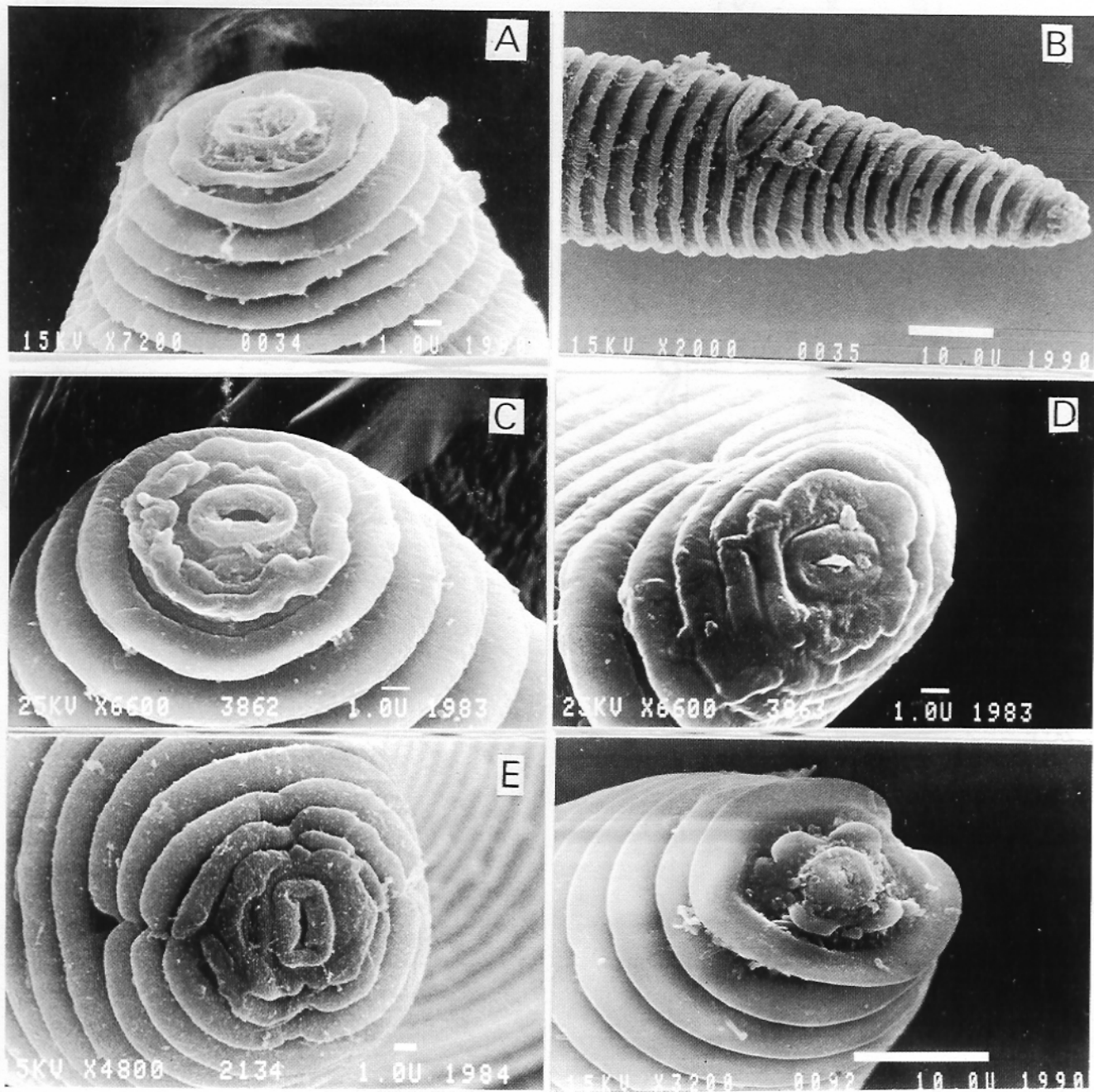


Fig. 9 - SEM photographs of: *C. paragoodeyi*, female from Kochesfahan. A, oblique view of head end; B, posterior part. *C. morgensis*, females from The Netherlands, end-on view of head; E, *C. annulatus*, female from California, end-on view of head; F, *C. informis*, female from Khozestan, Iran, end-on view of head.

Fig. 8 (Front page) - *C. paragoodeyi*, female from Amol. A, anterior part; B, lateral field; C, posterior region, ventral view; D, posterior region, lateral view.

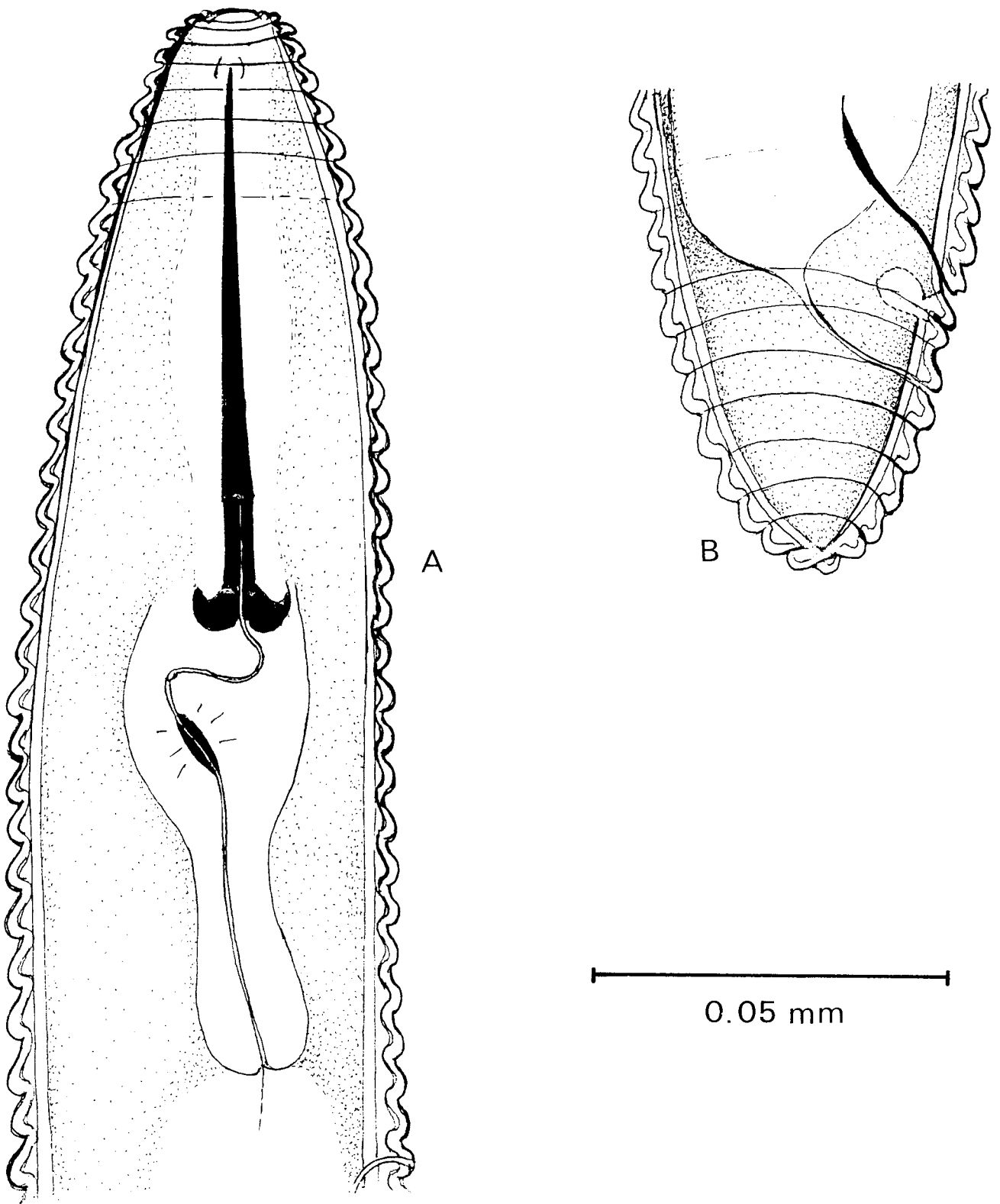


Fig. 10 - *Mesocriconema xenoplax*, female from Shahriar. A, anterior part; B, posterior part.



R = 75-91; stylet = 66-77  $\mu\text{m}$

*M. antipolitanum* (de Guiran, 1963)

Submedian lobes small, not flattened

anteriorly 3

Vagina sigmoid *M. xenoplax* (Raski, 1952)

Vagina not sigmoid *M. curvatum* (Raski, 1952).

### MESOCRICONEMA XENOPLAX (Raski, 1952)

(Fig. 10)

Within this species de Grisse and Loof (1970) distinguished two forms. The first has a shorter stylet (58-78  $\mu\text{m}$ ), lower R (75-95) and the spermatheca is filled with sperms. This form is known from the Netherlands, West Germany and Switzerland. The second has a longer stylet (68-86  $\mu\text{m}$ ), higher R (96-114) and the spermatheca is empty. This form has a cosmopolitan distribution. Both forms have been found in Iran.

Form 1: One female was found at Bandaranzali. Dimensions: L = 0.54 mm; a = 16; b = 4.0; c = 22; V = 94; stylet = 62  $\mu\text{m}$ ; St%L = 11; Rex = 22; RV = 8; Rvan = 2; Ran = 5; R = 96. One female found near roots of *Populus* sp. at Nor-Mazandaran probably also belongs to this form: stylet length = 66  $\mu\text{m}$ , R = 86, but the spermatheca is empty.

Form 2: Seven females were found at Shahriar. Dimensions: L = 0.54-0.72 mm; a = 10-11; b = 3.3-4.5; c = 19-26; V = 90-97; stylet = 74-80  $\mu\text{m}$ ; St%L = 10-14; Rex = 27-32; RV = 8-10; RVan = 1-3; Ran = 6-7; R = 98-110.

This species is rather polyphagous; hosts are mainly woody plants, it also occurs in vineyards. Mostly it is not very harmful, but damage has been reported to carnation, peach and possibly spruce (see Orton Williams, 1972).

### MESOCRICONEMA ANTIPOLITANUM

(de Guiran, 1963)

Distribution in Iran: Kheiri (1972) has reported the species from Tehran and Tonekabon, near roots of wheat, sesame, apple and orange. We found it in soil near roots of apple and alfalfa, Taleghan; of potato, Dorod; of alfalfa, Zanjan, of wheat, Karaj, and of apricot, Julfa. All localities are in the colder parts of the country.

This species, originally described from France, has a wide distribution in the Levant: it has been reported from Greece by Koliopanos and Vovlas (1978) and has been found also in Bulgaria, Turkey and Iraq. Furthermore it occurs in Poland (Szczygiel, 1974) and Western Germany, and its distribution extends eastward to Kashmir (Jairajpuri and Siddiqi, 1963).

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