

Fotedar, D. N. & Handoo, Z. A., 1978. A revised scheme of classification to order Tylenchida Thorne, 1949 (Nematoda).
Journal of Science, University of Kashmir (1975), 3, 55-82.

A Revised Scheme of Classification to Order Tylenchida Thorne, 1949 (Nematoda).

D. N. Fotedar and Z. A. Handoo

Post Graduate Department of Zoology,

University of Kashmir, Srinagar-190006, India.

ABSTRACT

A revised scheme of classification has been proposed for the order Tylenchida Thorne, 1949, on the basis of an upto date information collected on the classification of Nematodes. Under the order Tylenchida the sub-families Ditylenchinae, Aphasmatylenchinae and Rotylenchinae have been raised to the rank of families and included in the revised scheme. Diagnostic features of these families have been given. New sub-families :- Macrotrophurinae, cypanguinae, Acontylinae, Hirschmaniellinae, Dolichorhynchinae and Nothanguinae have also been proposed. Regrouping of several genera under the order Tylenchida, has also been undertaken wherever felt necessary, and these genera shifted to their appropriate families. These additions seemed desirable and necessary to provide more useful groupings and a large superstructure for the many diverse taxa involved. The changes incorporated are found to make the classification practically easier to handle. Moreover a brief account of the previous work of order Tylenchida and also revised keys to some superfamilies, families and sub-families is given.

The classification scheme of the order Tylenchida as presented here comprises of 2 sub-orders, 9 super-families, 32 families, 55 sub-families and 158 genera. This scheme is based on the experience and concepts gained by the authors during years of research in the Nematode taxonomy and also the researches of other scientists as reported in the literature upto 1977.

Order : Tylenchida Thorne, 1949

PREVIOUS WORK

The oldest plant parasitic nematode ever observed was wheat gall nematode (*Anguina tritici*) by Needham in 1743. Fifty years later

this nematode was named as *Vibrio tritici* by Steinbuch. Orley (1880) published his monumental monograph on Anguillulidae, which is a remarkable and highly commendable piece of work. Infact, this is the first comprehensive taxonomic survey of free living nematodes which includes keys to genera and species of the group. He listed 47 genera in his work of which 18 were discussed at length. He divided nematoda into three main groups :

1. Parasita (endoparasites)	4 families
2. Rhabditiformae (Transitional forms)	1 family
3. Anguillulidae (Free living forms)	5 families

De Man can be regarded as the first modern nematologist, who laid the taxonomy of plant parasitic nematodes on a sound footing. His formula of body measurements forms the main basis of taxonomic approach. Cobb, N. A. (1913) was one of the finest researcher in Nematology. His writings 'contributions to Science of nematology' are among the most outstanding contributions in nematology. The term nematology dealing with the study of soil and plant parasitic nematodes was coined by him, who also suggested its separation from Helminthology. The term nema to replace nematodes was also coined by him.

Micoletzky (1922) listed 142 valid genera and 931 species. He did not accept the classification of Cobb and did not catagorize the genera and families into higher groups. He discussed five families Alaimidae, Trilobidae, Rhabditidae, Odontopharyngidae and Tylenchidae. Although his classification is mostly based upon heterogeneity, the value of his work is still not disputable.

Goodey, T (1933) provided the general classification of Stylet bearing nematodes. The credit for the first methodical classification goes to Filipjev (1934) who defined and differentiated class Nematoda into seven orders. He also proposed and defined the family Tylenchidae to include stylet bearing Nematodes. The family Tylenchidae was further sub-divided into five sub-families; Aphelenchinae, Tylenchinae, Heteroderinae, Ogminae and Sphaerularinae. Chitwood (1937) upgraded family Tylenchidae to super-family rank Tylenchoidea. Filipjev and Schurmans Stekhoven (1941) placed free living genera under 17 families. Pearse (1942) divided nematodes into nine orders. The over all contributions of chitwood remains unparalleled so far, who divided the nematodes into two large natural groups i.e. class Phasmidia and Aphasmidia and considered nematoda as a Phylum. Thorne (1941, 1943) made very valuable contribution in the study of two major groups of Tylenchid Nematodes i.e. Neotylenchids and Criconematids.

Thorne (1949) proposed the order Tylenchida for those plant parasitic nematodes which possessed a protrusible stylet, oesophagus made up of procorpus, Isthmus and terminal bulb. The order Tylenchida was further divided into 2 super-families i.e. Tylenchoidea and Aphelenchoidea.

Goodey, J. B. (1963) dropped class Phasmidia and Aphasmidia and he grouped free living non marine nematodes under nine orders including Tylenchida containing two super-families: Tylenchoidea and Aphelenchoidea. Seven families were included under Tylenchoidea, while as under super-family Aphelenchoidea he listed only four families.

Geraert (1966) raised Criconematidae to the rank of super-family. He also upgraded super-family Tylenchoidea and Aphelenchoidea to the rank of sub-orders. In his scheme of classification the new sub order Tylenchina includes two super-families, Super-family Criconematoidea includes the families Criconematidae, Hemicycliphoridae, Paratylenchidae, Sphaeronematidae and Tylenchulidae and Super-family Tylenchoidea includes the families:- Tylenchidae, Neotylenchidae, Hoplolaimidae, and Heteroderidae.

Allen and Sher (1967) in their revised scheme of classification of Tylenchida recognized 2 super-families Tylenchoidea and Aphelenchoidea. In Tylenchoidea they included 8 families, 36 sub-families and 114 genera, where as superfamily Aphelenchoidea included 4 families and 19 genera.

Jairajpuri and Siddiqi (1969) proposed a new super-family Neotylenchoidea under which they included five families.

Golden (1971) accepted the inclusion of sub-orders Tylenchina and Aphelenchina under Tylenchida. He made a synthesis of the earlier schemes of classification, incorporating all the valid taxa and making it upto date by including the valid super-families, families, sub-families and genera. In all he listed 5 super-families, 18 families, 46 sub-families and 136 genera.

Wuts (1972) redefined the family Heteroderidae and Meloidoderinae. Meloidoderinae has been raised to the rank of family but not accept the elevation of Heteroderidae to Heteroderoidea for incorporating Heteroderidae. His classification of family Heteroderidae is based by Paramonov in (1967) except that besides Meloidoderinae, a new sub-family Meloidoderinae has

6? super families,
23 families, 46
subfamilies, and
136 genera

The present authors are in full agreement with Golden (1971) in recognizing super-family Heteroderoidea. However, they are of the opinion that the sub-family Rotylenchulinae which deserves the rank of a family should also be included in it.

Andrassy (1976) giving a revised classification of nematodes, includes the order Tylenchida and Rhabditida under the sub class Secernentia. The order Tylenchida includes two sub-orders, Tylenchina and Aphelenchina. Aphelenchina, includes one super-family which comprises of 4 families, 7 sub-families and 25 genera where as sub-order Tylen-

rley (1880) which is a is the first ich includes genera in d nematoda

families
1 family
families

logist, who nd footing. f taxonomic er in Nema- are among nematology atodes was m Helmin- ed by him.

species. He agorize the ve families Tylenchidae. genity, the

of Stylet ication goes atoda into lenchidae to was further hinae, He- aded family l Schurmans ies. Pearse ontributions nematodes Aphasmidia) made very Tylenchid

those plant oesophagus Tylenchida hoidea and

china includes 4 super-families which are comprised of 19 families, 38 sub-families and 123 genera.

Order Tylenchida Thorne, 1949

Diagnosis (emended): Secernentia. Body cylindrical and tapering at either end or Variously Swollen in Heteroderoidea, Allantonematidae, Sphaerularidae. Cephalic and somatic setae absent except in Atylenchoidea. Lateral field present. Body cuticle finely or coarsely striated, sometimes the cuticle Variously ornamented. Head with Six or eight sectors, bearing Six lips of which the sublaterals being sometimes reduced. In criconematoidea the lips are replaced by submedian lobes. Stoma bearing protrusible stylet. Proximal end of spear bearing generally three rounded anteriorly or Posteriorly directed knobs. Amphids degenerate located in the lateral lips, opening through small pore except in Psilenchidae (where amphids are located below the lateral lips opening through oblique slit like apertures). Hypodermal and caudal glands absent. Phasmids primarily present except in Aphasmatylenchidae. Deirids generally present. Oesophagus consisting of Procorpus, Valvate metacarpus (except in Neotylenchoidea), isthmus and basal bulb. Procorpus and metacarpus amalgamated with reduced Isthmus and basal bulb in criconematoidea. The oesophageal gland nuclei numbering 3-6 and are lodged in the basal bulb. Excretory pore, hemizonid and hemizonion generally present. Female genital organs paired or unpaired, ovary outstretched. Bursa often present with or without papillae. Gubernaculum present.

Fungal, bacterial or plant feeders living in the soil as free living, feeding on lower organisms or on roots of higher plants as ectoparasites or migratory endoparasites. Members of Heteroderoidea are obligate parasites and their feeding results into giant cell formation.

Distinguishing Charactes of Sub-Orders of Tylenchida Thorne, 1949.

	Aphelenchina	Tylenchina
Oesophagus terminus	Generally lobed	Generally bulb like.
Opening of Dorsal-oesophagealgland.	In median bulb	behind Buccal spear
Bursa	Absent (exceptionally present)	Present
Male Genital Papillae	Present	Absent

Sub Order : Tylenchina (Orley, 1880) Geraert, 1966

Diagnosis (emended): Tylenchida. Body shape vermiform or swollen in obligate parasitic forms. Body cuticle finely striated except in members of Criconematoidea. Buccal spear small weakly developed (measuring 6-7 microns to moderately long and strongly developed or very long

19 families,

tapering at
tonematidae,
Atylenchoi-
ly striated,
six or eight
sometimes
median lobes.
g generally
s. Aphids
small pore
the lateral
dermal and
in Aphasm-
onsisting of
a), isthmus
with reduced
geal gland
Excretory
ale genital
ten present

il as free
plants as
eroderioidea
l formation.

rne, 1949.

hina

bulb like.

ccal spear

6

or swollen
n members
(measuring
very long

and flexible (*xenocriconemella*). Elongation and strengthening of spear is not helpfull in the evolution of mode of feeding. Procorpus not differentiated in groups which show a tendency towards amalgamation with metacarpus. Dorsal oesophageal gland generally opening at the base of buccal spear, or located considerably posterior as far as upto the middle of procorpus, e.g. in *Rotylenchulus*. Median oesophageal bulb represented by merely a slight swelling, hardly distinguishable either from procorpus or isthmus, and this condition occurs in forms where the associated valvular structure is also absent (Neotylenchoidea). Female genital organs paired or single. When gonad paired, the vulva is mostly equatorial, except in *Trophurus* which has a single ovary, whereas in monodelphic forms the vulva is postequatorial. Posterior-uterine-sac is invariably present in all the groups except criconamatoidea. In Pratylenchidae, sometimes rudimentary posterior ovary is also present. Bursa generally present, rudimentary in some groups of Tylenchidae; well developed covering the entire tail or subcaudal. In Dolichodoridae the bursa is bilobed, papillae absent. Tail in females varying from long filiform to short rounded terminus.

Soil inhabitant, ecto or endoparasites of higher plants rarely parasitizing insects. Eight super-families are included which are keyed out as follows.

Revised Key to the Super-Families of Tylenchina (Orley, 1880) Geraert, 1966

1. Head with setae... Atylenchoidea (Skarbilovich, 1955) Golden, 1971.
 Head without setae. 2
2. Valvular median oesophageal bulb absent...
 ... Neotylenchoidea (Thorne, 1941) Jairajpuri and Siddiqi, 1969.
 Valvular median oesophageal bulb present... 3
3. Procorpus enlarges gradually and merges with metacarpus forming an amalgamated bulb... 6
 Procorpus well defined not merging with metacarpus, amalgamated bulb absent ... 4
4. Females inactive, swollen, sessile attached to or within plant roots, with pronounced sexual dimorphism, eggs may be retained in body or often deposited in gelatinous matrix; males vermiform with or without caudal alae.
 ... Heteroderioidea (Filipjev, 1934) Golden, 1971.
 Both sexes active, vermiform nematodes. Free living, ectoparasites or migratory endoparasites usually with or without sexual dimorphism; eggs deposited outside body not in gelatinous matrix... 5

5. Cephalic frame work cuticularized. Spear well developed with large knobs. Terminal bulb mostly absent. Female tail short rounded or elongate with rounded terminus. Bursa reaching near tail tip ...
 Hoplolaimoidea Filipjev, 1934.

Cephalic frame work weakly sclerotized. Spear weak with or without knobs. Terminal bulb generally set off from intestine, female tail long. Bursa small
 Tylenchoidea (Orley, 1880) Chitwood and Chitwood, 1937.

6. Female with coarse body annules, either smooth or retrorse with or without ornamentation. Some times additional cuticular sheath also present Criconematoidea (Taylor, 1936) Geraert, 1966.

Female with fine body annules, neither retrorse nor smooth bearing ornamentation. Additional cuticular sheath absent 7

7. Caudal alae well developed, extending to terminus
 Tylenchoicriconematoidea Raski and Siddiqi, 1975.

Caudal alae lacking or very reduced... ..
 Tylenchoidea Raski and Siddiqi, 1975.

Super Family: Tylenchoidea (Orley, 1880) Chitwood & Chitwood, 1937.

Diagnosis (emended): Tylenchina. Both sexes vermiform. Body cuticle striated. Lateral field present having generally 2-6 incisures. Deirids present. Cephalic frame work weakly cuticularized, six setae; lips generally six of which the two laterals are sometimes reduced. Papillae obscure, amphid located in lateral lips generally inconspicuous opening by small pore, but sometimes these are comparatively more developed located sublabially opening through oblique slits. Spear length varying considerably, weakly developed generally knobbed, but in some groups knobs are absent. Oesophagus with a distinctly differentiated procorpus which may be located either in middle or anterior or posterior half of oesophageal length, intermediate bulb weak to moderately developed with distinct or indistinct cuticularized valve; isthmus long terminating into cylindrical, pyriform or abutting bulb. Female genital organ paired or unpaired. Posterior-Uterine-Sac generally present in monodelphic forms, except in *Diptenchus*. Vulva post equatorial when single gonad present. Vulval membrane mostly present. Phasmid invariably present as small pore like structure on the tail. Tail in both sexes elongate filiform or long and conoid. Bursa generally not enveloping the entire tail.

Type Family: Tylenchinae. Orley, 1880

Revised Key to the Families of Tylenchoidea

1. Amphids distinct, located below the sublateral lips. Amphidial aperture oblique slit like... ..
 Psilenchidae Paramonov, 1967.

- Amphids indistinct, located in the sublateral lips. Amphidial aperture minute pore like... .. 2
2. Oocytes usually arranged in multiple series arranged about the rachis... .. Anguinidae Nicoll, 1935.
- Oocytes not in multiple rows, and not arranged about the rachis 3
3. Lip region striated, basal bulb pyriform set off from the intestine. Oesophago-intestinal-valve present Tylenchidae Orley, 1880.
- Lip region not striated, basal bulb abutting or overlapping the intestine. Oesophago-intestinal-valve absent Ditylenchidae (Golden, 1971) New rank.

Family : Ditylenchidae (Golden, 1971) New Rank.

Diagnosis : Body vermiform, averaging less than 1 mm. Body cuticle finely striated, lateral fields with plain band having four to six lines. Median oesophageal bulb valular. Basal oesophageal bulb either pyriform and set off with definite oesophago-intestinal valve or in the form of abutting bulb or overhanging in the form of long lobes. Amphidial aperture pore like located in the lateral lips, cephalic sclerotization weak. Spear small and weakly developed, sometimes flexed. Post-uterine-sac present, except in *Diptenchus*. Vulva sometimes very posteriorly located reaching upto 9/10 of body length. Female tail conoid with acute or subacute terminus except in *Neoditylenchus* and *Sychnotylenchus*, in which female tail is short and rounded and bursa surrounding the male tail, where as in others the bursa does not reach upto the tail tip.

Free living, parasites of higher plants and insect parasites.

Revised Key to the Sub-Families of Ditylenchidae

- Oesophageal gland enclosed in a bulb, small cardia present Sychnotylenchinae (Paramonov, 1967) Golden, 1971.
- Oesophageal gland either enclosed in basal bulb or may be variously expanded and some-times lobe like extending over the intestine. Cardia absent Ditylenchinae Golden, 1971.

Family : Psilenchidae Paramonov, 1967

Diagnosis (emended). Tylenchoidea Free living in soil around plant roots. Vermiform body, size averaging 1 mm. Cuticle finely striated. Head with six sectors unsclerotized, amphids distinct placed below the head, aperture slit like situated outside sublateral lips. Spear small and weakly developed with or without knobs or long and attenuated. Oesophagus with a distinct procorpus, median bulb muscular, sometimes oval and weakly developed situated either anterior to middle

with large rounded or bil tip ... pjev, 1934.

with or intestine, ... ood. 1937.

orse with ear sheath t. 1966.

th bearing7

1975.

od. 1937.

ly cuticle . Deirids rd; lips Papillae : opening developed length in some entiated posterior oderately nus long e genital esent in al when Phasmid Tail in rally not

nphidial ov, 1967.

of oesophagus or located in posterior half of oesophageal length. Isthmus long and tubular, basal oesophageal bulb pyriform distinctly set off from the intestine by an oesophago-intestinal-valve (cardia). Excretory pore and hemizonid distinct. Deirids present. Gonad single or double. Post-uterine-sac present. Tails in both sexes long and filiform, with clavate or sub clavate terminus excepting *Macrotrophuinae*, where the female tail is short hemispherical and male tail is short conoid with pointed terminus and bursa reaching upto the tail tip. Type Sub-family: *Psilenchinae* Paramonov, 1967

Revised Key to the Sub-Families of *Psilenchidae*

1. Spear very long, female tail short rounded with thick cuticle. Male tail short with bursa enveloping tail.
 *Macrotrophurinae* New. sub-family.
 Spear small, female and male tail filiform ending into a clavate or subclavate terminus. Bursa sub caudal... ..2
2. Female with two ovaries
 *Psilenchinae* Paramonov, 1967.
 Female with one ovary... ..
 *Basirinae* Andrassy 1976.

Sub-Family: *Macrotrophurinae* New. Sub-Family

Diagnosis: *Psilenchidae*. Body vermiform averaging over 1 mm. Body cuticle distinctly striated. Lip region not off set from body and cephalic frame work weakly developed. Spear very long, the anterior part measures $2\frac{1}{2}$ times as long as the shaft, the later being small with rounded knobs. Procorpus appears swollen when the spear is retracted. Median bulb rounded. Isthmus long. Female tail short rounded with thick terminal cuticle. Vulva median. Gonads paired opposed and outstretched. Male tail short with large bursa enveloping the entire tail. Phasmids located at about the middle of tail length in both the sexes. Gubernaculum present. Type and only genus: *Macrotrophurus* Loof, 1958.

Family: *Anguinidae* Nicoll, 1935.

Diagnosis: (emended): *Tylenchoidea*. Stout or obese forms sometimes with female often coiled ventrally. Body tapering at both the ends. Cuticle finely annulated. Head low with weakly developed sclerotization, annulated, hardly offset from the body. Lateral field plain or with four incisures which sometimes contain longitudinal transverse and oblique stria also. Deirids usually indistinct or invisible. Amphid apertures pore like, labial. Stylet weak and short with spear knobs. Median bulb with crescentic valves. Isthmus crossed by nerve ring:

Basal oesophageal bulb swollen or having a digit like process with internal lumen extending posteriorly from the swollen glandular portion of the oesophagus. Oesophageal glands enclosed in the large basal bulb generally numbering three. In *Paranguina* there are four oesophageal glands located about half way between median bulb and junction of oesophagus or separated at their base.
 Type subfamily: Anguininae Nicoll, 1935.

Revised Key to the Sub-Families of Anguinidae

- 1 Basal oesophageal bulb enlarged, broadly pyriform Anguininae Nicoll, 1935
- Basal oesophageal bulb with a digit like process, with internal lumen extending posteriorly from swollen glandular portion Cynpanguininae New. Sub-family.

Sub-Family: Cynpanguininae New. Sub-Family

Diagnosis: Anguinidae. Body in female is coiled, very stout, tapering radially to both extremities $a = 12.1-16.2$. In males body is crescentic. The stoma is armed with slender stylet, metacarpus clavate with small but distinct valve; digit like process with internal lumen extends posteriorly from swollen glandular portion of oesophagus. Lateral field contains longitudinal transverse and oblique striae. Oocytes arranged around rachis, post-uterine-sac present. Males with capitulum calmus one third spicule length, gubernaculum present.
 Type Genus: *Cynpanguina* Maggenti et al, 1974.

Super-Family Hoplolaimoidea Filipjeff, 1934

Diagnosis (emended): Tylenchina. Vermiform nematodes. Body cuticle distinctly striated. Lateral field marked by crenate incisures which becomes aerolated especially in the neck and tail region. Labial frame hexaradiate. Head generally deeply offset with transverse or even longitudinal striations; head may be lobed in certain cases. Spear strongly moderately long with well developed spear knobs. Opening of dorsal oesophageal gland located either at the base or half to 2/3rd of spear length below the base of spear. Amphidial aperture pore like, labial in position. Procorpus well defined with a rounded metacarpus, the latter with strongly developed valve; isthmus short encircled by nerve ring. Oesophageal gland numbering 3-6, located in the form of lobes which overlap the intestine. Female gonads generally paired. Vulva median or located in the posterior third of body in case of monodelphic forms. Male tail short, conoid completely enveloped by bursa. Strong sexual dimorphism encountered in some groups. Phasmids large (scutellae) located in anal region or even anterior to vulva; sometimes phasmids are small located in anal or preanal region. Phasmids are absent in Aphasmatylenchidae. Female tail short

rounded or short conoid with broadly rounded or subacute terminus. Testes single, outstretched. Spicules and Gubernaculum present. Bursa terminal or subterminal.

Type family: Hoplolaimidae Filipjev, 1934.

Revised Key to the Families of Hoplolaimoidea

- 1. Phasmid present 2
 Phasmid absent Aphasmatylenchidae (Sher, 1965) New. rank
- 2. Bursa lobed... ..
 .. Dolichodoridae (Chitwood & Chitwood, 1950) skarbilovich, 1959.
 Bursa not lobed 3
- 3. Tail in both sexes, elongate, phasmid near middle of tail 4
 Tail in both sexes short with phasmid near and anterior to anal region Hoplolaimidae (Filipjev, 1934) Wieser, 1953
- 4. Cephalic sclerotization strong, head low flat, endoparasites... .. 5
 Cephalic sclerotization weak, head not low and flat 6
- 5. Oesophageal glands extending dorsally, dorsolaterally over intestine, strong sexual dimorphism present
 Radopholidae Khan and Nanajapa, 1972
 Oesophageal gland extending ventrally and ventro-laterally over intestine, sexual dimorphism absent... ..
 Pratylenchidae (Thorne, 1949) Siddiqi, 1963
- 6. Head with four lobes
 Belonolaimidae (Whitehead, 1959) Siddiqi, 1970.
 Head without four lobes
 Tylenchorhynchidae (Eliava, 1964) Golden, 1971.

Family: Aphasmatylenchidae (Sher, 1965) New. Rank

Diagnosis: Hoplolaimoidea. Head annulated, set off, with well developed cephalic frame work. Stylet well developed, slender with basal knobs. Oesophageal lobes narrow which are overlapping the intestine ventrally. Lateral field with 4 incisures, incompletely aerolated. Ovaries amphidelphic, outstretched. Phasmids and deirids absent. Female tail short, less than two anal-body-widths with hemispherical terminus. Bursa enveloping tail.

Revised Key To The Sub-Families Of Hoplolaimidae

1. Phasmid small, pore like. Body comparatively shorter and less stout... .. 2
- Phasmid large (Scutella). Body long stout Hoplolaiminae Filipjev, 1934.
2. Distinct sexual dimorphism present. Female swollen in posterior half of body Acontylinae New. sub-family
- Sexual dimorphism absent. Female not swollen in posterior part of body... .. Rotylenchoidinae Whitehead, 1958.

Sub-Family : Acontylinae New. Sub-family

Diagnosis : Hoplolaimidae. Small vermiform nematodes with very distinct sexual dimorphism, sometimes swelling in posterior part of female. Cephalic sclerotization well developed in female, while lesser developed in male. Opening of dorsal oesophageal gland located at least half of spear length behind spear base. Lateral field well developed with four incisures. Phasmids pore like located near anal latitude or posterior to anus. Ovary prodelphic, Post-uterine sac present. Tail short. Type Genus : **Acontylus** Megher, 1968

Family : Pratylenchidae (Thorne, 1949) Siddiqi, 1963.

Diagnosis (emended) : Hoplolaimoidea. Median sized vermiform nematodes. Body cuticle finely annulated. Head low and flat in general, where as rather high with conoid to flat labial surface in Hoplotylinae. Labial sclerotization fairly strong. Stylet well developed with anteriorly directed or rounded knobs. Lateral field with incisures. Oesophageal gland surrounding the anterior part of intestine or in the form of sub-cylindrical bulb or overlapping anterior part of intestine ventrally or dorsally. Ovary prodelphic, out stretched or didelphic with a median vulva. Female tail cylindrical with a rounded or sub-acute terminus, with or without annules. Males when present have bursa enveloping the entire tail.

Key to sub-Families of Pratylenchidae

1. Ovary prodelphic 2
- Ovary amphidelphic Hirschmanniellinae New. sub-family
2. Oesophageal gland lob overlapping the intestine ventrally Pratylenchinae Thorne, 1949.
- Oesophageal gland lobe overlapping intestine dorsally... .. Hoplotylinae Khan, 1969.

te terminus.
esent. Bursa

a
... .. 2
) New. rank
lovich, 1959.
... .. 3
tail 4
rior to anal
Vieser, 1953
ites... .. 5
... .. 6
er intestine,
ajapa, 1972
erally over
ddiqi, 1963
... ..
loiqi, 1970.
... ..
lden, 1971.

developed
sal knobs.
ventrally.
amphidel-
ail short,
s. Bursa

Sub-Family : Hirschmanniellinae New. Sub-Family

Diagnosis : Pratylenchidae. Small cylindrical or large vermiform nematodes, the body length reaches upto the maximum of 4.2 mm. Head flattened hemispherical or sometimes conoid but always flattened anteriorly. Cephalic sclerotization conspicuous. Lateral field with incisures. Stylet strong with well developed basal knobs. Oesophageal gland either in the form of a sub-cylindrical compact bulb with dorsal gland extending a short distance over anterior end of intestine or the gland surrounding anterior end of intestine, and extending posteriorly as a long lobe on ventral side, or even there is an elongated ventral gland lobe. Ovaries amphidelphic, outstretched. Female tail short cylindrical or elongated conoid with a rounded smooth terminus or with a pointed mucro respectively. Phasmid either in middle of tail or in posterior third of tail.

Type genus : *Hirschmanniella* Luc and Goodey, 1963.

Family : Dolichodoridae (Chitwood & Chitwood, 1950) Skarbilovich, 1959.

Diagnosis (emended) : Hoplolaimoidea Moderately to large vermiform nematodes without sexual dimorphism. Head lobed or unlobed with moderately developed to heavily developed sclerotization. Head likely or completely set off from the body. Cuticle distinctly transversally striated, sometimes longitudinal striations also present. Lateral field present. Spear moderately or strongly developed with prominent basal knobs. Dierids may be absent. Ovaries amphidelphic, outstretched. Female tail elongate, attenuated or rounded to conical pointed. Bursa enveloping tail, either notched at the tip or trilobed.

Type Sub-Family : Dolichodorinae Chitwood & Chitwood, 1950.

Sub-Family Dolichorhynchinae New. Sub-Family

Diagnosis : Dolichodoridae. Body less than 1 mm length marked with fine transverse and longitudinal striations, crossing each other to form small squares. Head bilobed set off from the body. Labial frame work moderately sclerotized. Spear 15-17 microns in length, with small posteriorly directed knobs. Metonchium and telonchium almost equal in length. Oesophagus typical of tylenchoid with setoff bulb and conoid and sometimes bilobed cardia. Gonads amphidelphic, outstretched. Tail elongate conoid, annulated except the tail tip region. Phasmid near middle of tail. Male tail completely enveloped by bursa which has a characteristic notch, leaving the hind part of the tail uncovered.

Type and only genus : *Dolichorhynchus* Mulk and Jairajpuri, 1974.

Family : Nothotylenchidae Thorne, 1949.

Diagnosis : (emended) : Neotylenchoidea. Body in most of the cases vermiform, sometimes swollen with highly developed gonads. Body striations fine to coarse. Lip region low, flat not set off, striated. Head with six lips, sclerotization weak. Spear small to moderately developed with small rounded knobs. Lateral field present with four

to six incisures. Basal Oesophageal bulb enclosing the oesophageal glands with distinct carida, or the bulb overlaps the intestine. Female gonads single, out stretched. Tail in both the sexes either elongate-conoid, cylindrical or filiform. Bursa not enclosing the tail tip. Gubernaculum generally present, except in Nothanguinae
Type SubFamily: Nothotylenchidae Thorne, 1941

Revised Key to the Sub-Families of Nothotylenchidae

1. Oocytes arranged around the rachis, body somewhat swollen. gubernaculum absent; causing galls on leaves, stem and flowers
 Nothanguinae New. sub-family.
 Oocytes not arranged around the rachis, body vermiform. Parasitic or forming galls... .. 2
2. Amphids slit like, conspicuous, spear knobs flanged... ..
 Boleodorinae Khan, 1964
 Amphids minute, inconspicuous, spear knobs rounded
 Nothotylenchinae Thorne, 1941.

Sub-Family Nothanguinae New. Sub-Family

Diagnosis: Body in both sexes some what swollen. Cuticle with fine transverse striation. Lateral field with incisures. Head low and flat, contineous with the body. Spear small with well developed rounded knobs. Procorpus cylindrical slightly swollen posteriorly to form the fusiform metacarpus without valve. Isthmus crossed by nerve ring. Terminal bulb swollen sometimes irregularly. Ovary prodelphic, anteriorly with one or two flexures. Spermetheca absent. Oocytes in multiple rows arranged round the rachis. Both ovary and testes with a cap cell. Vulva posterior. Post-vulval-sac present. Spicule elaborate. Gubernaculum absent.

Type and only genus: *Nothanguina* Whitehead, 1959.

Super-Family: Heteroderoida (Filipjev, 1934) Golden, 1971

Diagnosis (emended): Tylenchina. Adult females swollen to sub-spherical, sedentary didelphic. Cuticle annulated or non annulated. Tail generally absent except in Rotylenchulidae. Anus located terminally or subterminally Excretory pore generally opposite or anterior to median bulb. Basal plate sub divides head into six sectors of which two lateral sectors are narrower than the four others. Stylet reaches upto length or 25 microns. Procorpus and median bulb not amalgamated. Median bulb ovate to spherical with well developed cresentic valve plates. Oesophageal, glands overlaping intestine ventrally. Infective stage: Second stage larva in case of Meloidogynidae and Heteroderidae, where as immature female in Rotylenchulidae. Second stage jviniles have the basal plates which subdivides the head as in female. Stylet

the vermiform
of 4.2 mm.
rays flattened
with incisures.
ageal gland
dorsal gland
or the gland
eriorly as a
entral gland
rt cylindrical
ith a pointed
in posterior

ilovich, 1959.

e vermiform
nlobed with
Head likely
transversally
Lateral field
ninant basal
outstretched.
nted. Bursa

1950.

marked with
ther to form
frame work
with small
almost equal
f bulb and
outstretched.
n. Phasmid
bursa which
l uncovered.
1974.

f the cases
gonads. Body
off, striated.
moderately
with four

moderate to well developed. In immature females of Rotylenchulidae opening of dorsal oesophageal-gland more than half of stylet length behind the base of spear.

Revised Key to Families of Heteroderoidea

1. Female becoming cysts or remaining soft bodied; pyriform-saccate, spheroid or lemon shaped, cephalic frame work of females not sclerotized; males cylindroid well developed and without bursa...
 Heteroderidae (Filipjev; 1934) Golden, 1971.
 Female bodies soft; saccate, or kidney shaped; cephalic frame work of females sclerotized; males vermiform, sometimes degenerate anteriorly and with small but distinct bursa 2
2. Tail absent, female swollen to sub-spherical endoparasites...
 Meloidogynidae (Skarbilovich, 1959 Wouts; 1973
 Tail present, female swollen, elongate or kidney shaped, semi-endoparasites 3
3. Female with single ovary, vulva and anus subterminal
 Naccoboderidae (Chitwood & Chitwood, 1950) Golden, 1972
 Female with two ovaries, vulva post median
 - ... Rotylenchulidae (Hussain and Khan, 1967) New rank

Family Rotylenchulidae (Hussain & Khan, 1967) New Rank

Diagnosis: Heteroderoidea. Conspicuous cephalic frame work, particularly in immature females. Stylet well developed in immature and adult female, with basal knobs. Outlet of dorsal-oesophageal-gland more than 1/2 stylet length from base of stylet. Adult female swollen, kidney shaped. Oesophageal glands overlapping anterior portion of intestine often on lateral sides. Sexual dimorphism pronounced ovaries two Eggs deposited in gelatinous matrix. Vulva post-equatorial. Males vermiform, generally degenerate in anterior portion, with small weak stylet. Bursa small, subterminal.

Type and only genus: *Rotylenchalus* Linford and Oliveira, 1940

ORDER TYLENCHIDA THORNE, 1949

Sub Order

Tylenchina
(Orley, 1880) Geraert, 1966

Super-families

- Atylenchoidea (Skarbilovich, 1959) Golden, 1971
- Criconematoidea (Taylor, 1936) Geraert, 1966
- Heteroderioidea (Filipjev, 1934) Golden, 1971
- Hoplolaimoidea Filipjev, 1934
- Neotylenchoidea (Thorne, 1941) Jairajpuri & Siddiqi, 1969
- Tylenchocriconematoidea Raski & Siddiqi, 1975
- Tylenchoidea (Orley, 1880) Chitwood & Chitwood, 1937
- Tylenchulidoidea Raski & Siddiqi, 1975
- Aphelenchoidea (Fuchs, 1937) Thorne, 1949

Aphelenchina
(Fuchs, 1937), Geraert, 1966

tylenchulidae
length behind

form-saccate,
females not
out bursa...
Golden, 1971.

halic frame
as degenerate
.....2

sites...
Wouts; 1973

aped, semi-
..... 3

olden, 1972

sw. rank

Rank

k, particu-
nature and
oesophageal
let. Adult
ng anterior
pronounced
equatorial.
with small

SUPER FAMILY (1) TYLENCHOIDEA (ORLEY, 1880) CHITWOOD & CHITWOOD 1937

Family	Sub-family	Genera
a) Tylenchidae Orley 1880	Tylenchinae (Orley, 1880) Marcinowski, 1909	<p><i>Aplenchus</i> (Andrassy, 1954) Meyl, 1961 (Syn. <i>Telenohus</i> (<i>Aplenchus</i> Andrassy, 1954) <i>Cephalenchus</i> (Goodey, 1962 (Golden, 1971 (Syn. <i>Tylenchus</i> <i>Cephalenchus</i> Goodey, 1962) <i>Filenchus</i> (Andrassy, 1954) Meyl, 1961 (Syn. <i>Tylenchus</i> (<i>Filenchus</i> Andrassy, 1954) <i>Irantylenchus</i> (Kheri, 1972) Andrassy, 1976 (Syn. <i>Tylenchus</i> <i>Irantylenchus</i> Kheri, 1972) <i>Malenchus</i>, Andrassy, 1968 <i>Miculenchus</i> Andrassy, 1959 <i>Tylenchus</i>, Bastian, 1865 <i>Ottolenchus</i> (Hussain & Khan 1967) Wu, 1967 (Syn. <i>Tylenchus</i> (<i>Ottolenchus</i>) (Hussain & Khan, 1967) <i>Aetotylenchus</i> Fotedar & Handoo, 1977</p>
	Tyloporinae Paramonov, 1967	<i>Tylodorus</i> Meagher, 1963
	Trophurinae Paramonov, 1967	<i>Trophurus</i> Loof, 1956 <i>Paratrophurus</i> Arias, 1970
	Dactylotylenchinae Wu, 1969	<i>Dactylotylenchus</i> Wu, 1968
	Pleurotylenchinae Andrassy, 1976	<i>Pleurotylenchus</i> Szczygiel, 1969
	Ditylenchinae Golden, 1971	<i>Ditylenchus</i> Filipjev, 1936 <i>Pseudhalenchus</i> Tarjan, 1958
b) Ditylenchidae (Golden, 1971) New. rank	Synchnotylenchinae (Paramonov, 1967) Golden, 1971	<i>Diptenchus</i> Khan et al, 1969 <i>Synchnotylenchus</i> Ruhm, 1956 <i>Neoditylenchus</i> Meyl, 1961

- b) Ditylenchidae (Golden, 1971) New rank
 Ditylenchinae Golden, 1971
Ditylenchus Filipjev, 1936
Pseudhalenchus Tarjan, 1958
Diptenchus Khan et al, 1969
Sychnotylenchus Ruhm, 1956
Neoditylenchus Meyl, 1961

SUPER-FAMILY TYLENCHOIDEA

- c) Psilenchidae Paramonov, 1967
 Psilenchinae Paramonov, 1967 *Psilenchus* De Man, 1921
 Basirinae Andrassy, 1976
 Basiria Siddiqi, 1959 (Syn. *Tylenchus* (*Clavilenchus*) Jairajpuri, 1966) Thorne, & Malek, 1968
Basiroides Thorne, Malek, 1968
Neopsilenchus Thorne & Malek, 1968
 Macrotrophurinae New sub-family
 Anguininae Nicoll, 1935
Macrotrophurus Loof, 1958
Anguina Scopoli, 1777

- d) Anguinidae (Nicoll, 1935)
Paraanguina Kirjanova, 1955
Subanguina Paramonov, 1967
 Cynipanguinae New sub-family.
Cynipanguina Maggenti et al, 1974

2 SUPER FAMILY : ATYLENCHOIDEA (Skarbilovich, 1959, Golden, 1971)

- Atylenchidae Skarbilovich, 1959
 Atylenchinae Skrabilovich, 1959
Atylenchus Cobb, 1913
Eutylenchus Cobb, 1913

3 SUPER FAMILY : HOPLOLAIMOIDEA FILIPJEV, 1934

- Hoplolaimidae (Filipjev, 1934) Wieser, 1953
 Hoplolaiminae Filipjev, 1934
Hoplolaimus Daday, 1905 (Syn. *Nemanchus* Cobb, 1913)
Aorolaimus Sher, 1965
Scutellonema Andrassy, 1958
Peltamigratus Sher, 1965
 Acontylinae New sub-family
 Acontylus Meagher, 1968
 Rotylenchoideinae Whitehead, 1958
Rotylenchoides Whitehead, 1958
Helicotylenchus Steiner, 1945
Anttatylenchus Sher, 1973

- Rotylenchus* Filipjev, 1936
(Syn. *Gattholdsteineria* Andrassy, 1958)
Aphasmatylenchus Sher, 1965
- Pratylenchus* Filipjev, 1936
- Hirschmanniella* Luc & Goodey, 1963
(Syn. *Hirschmannia* Luc & Goodey, 1962)
Pratylenchoides Winslow, 1958
Zygotylenchus Siddiqi, 1963
(Syn. *Mesotylus* de Guiran, 1964)
Apratylenchoides Sher, 1973
- Hoplolytus* S'Jacob, 1959
- Radopholus* De Guiran, 1967
Radopholoides De guiran, 1967
- Dolichodorus* Cobb, 1914
Brachydorus de Guiran & Germani, 1968
Neodolichodorus Andrassy, 1976
- Dolichothenchus* Mulik & Jairaipuri, 1974
- Belonolaimus* Steiner, 1949
Monolaimus Sauer, 1966
Carphodorus Colbran, 1965
- Telotylenchoides*
Histotylenchus Siddiqi 1971
Telotylenchus Siddiqi, 1960
Tricotylenchus Whitehead, 1959
- b) Aphasmatylenchidae Aphasmatylenchinae Sher, 1965
(Sher, 1965) New. Rank
- c) Pratylenchidae Pratylenchinae Thorne, 1949
(Thorne, 1949)
Siddiqi, 1963
Hirschmanniellinae
New sub-family
- d) Radopholidae Hoplotylinae Khan, 1969
Khan & Nanajapa, 1972
Radopholinae Allen & Sher, 1967
- e) Dolichodoridae Dolichodorinae
(Chitwood & Chitwood, 1950, Skarbilovich, 1959)
Chitwood & Chitwood, 1950
- f) Belonolaimidae Dolichothenchinae
(White head, 1959)
Siddiqi, 1970
New. sub-family
Belonolaiminae Whitehead, 1959
Telotylenchinae Siddiqi, 1960

Carphodotus Colbran, 1965

Telotylenchoidea
Histotylenchus Siddiqi, 1971
Telotylenchus Siddiqi, 1960
Tricotylenchus Whitehead, 1959

Telotylenchinae Siddiqi, 1960

Siddiqi, 1970

SUPER FAMILY HOPLOLAIMOIDEA FILIPJEV, 1934 (Conted.)

- g) Tylenchorhynchidae (Eliava, 1964) Golden 1971
 - Tylenchorhynchinae Eliava, 1964
 - Tylenchorhynchus* Cobb, 1913 (Syn. *Anguillulina* (*Tylenchus* Cobb, 1913) Schneider, 1939
 - Tylenchus* (*Tylenchorhynchus* Cobb 1913) Filipjev, 1934 ;
 - Tylenchus* (*Bitylenchus* Filipjev, 1934)
 - Uliginotylenchus* Siddiqi, 1971
 - Quinsulicius* Siddiqi, 1971
 - Saurtylenchus* Sher, 1974
 - Merliniinae Siddiqi, 1971
 - Merlinius* Siddiqi, 1970
 - Geocenamus* Thorne & Malek, 1968
 - Negelus* Thorne, & Malek, 1968
 - Leipotylenchinae Sher, 1973
 - Leipotylenchus* Sher, 1973
 - Trivetsus* Sher, 1973

(4) SUPER-FAMILY CRICONEMATOIDEA (TAYLOR, 1936) GERAERT, 1966

- a) Criconematidae (Taylor, 1936) Thorne, 1949
 - Criconema* Hofmaner & Manze, 1914
 - Hakernema* Wu, 1964
 - Croselinema* Khan, Chawla & Saha, 1975
 - Crossonema* (Mehta & Raski, 1971) Khan, Chawla & Saha, 1975
 - Lobocriconema* De Grisse & Loof, 1965
 - Neolobocriconema* Mehta & Raski, 1971
 - Patetacephalanema* Mehta & Raski, 1971
 - Sertespinula* (Mehta & Raski, 1971) Khan, Chawla & Saha, 1975
 - Variasquamata* (Mehta & Raski, 1971) Khan, Chawla & Saha, 1975
- b) Madinematidae Khan, Chawla & Saha, 1975
 - Criconemella* De Grisse & Loof, 1968
 - Criconemoides* Taylor, 1936
 - Discocriconemella* De Grisse & Loof, 1965
 - Macrocriconemella* De Man, 1880

SUPER FAMILY CRICONEMATOIDEA TAYLOR, 1936

Nothocricanema De Grisse & Loof, 1965
Nothocricanemoides Mass, Loof & De Grisse, 1971
Xenocricanemella De Grisse & Loof, 1965
Calasia Siddiqi and Goodey, 1963
Hemicycliophora De Man, 1921
 (Syn. *Pracricanema*, Micoletzky, 1925)
Hemicricanemoides Chitwood & Birchfield, 1957
 (Syn. *Iota* Cobb, 1931)

Hemicycliophorinae
 Skarbilovich, 1959

c) Hemicycliophoridae

5 SUPER-FAMILY : HETEROEROIDEA (FILIPJEV, 1934) GOLDEN, 1971

1. Heteroderidae
 (Filipjev, 1934)
 Golden, 1971

Heteroderinae Filipjev, 1934

Heterodera Schmidt, 1871
Sarisodera Wouts & Sher, 1971

Meloidoderinae Golden, 1971

Meloidodera Chitwood, Hannon & Esser, 1956

Ataloderinae Wouts, 1973

Cryphodera Colbran, 1966
Zeladodera Wouts, 1973
Atalodera Wouts & Sher, 1971
Shetodera Wouts, 1973

2. Meloidogynidae
 (Skarbilovich, 1959)
 Wouts, 1973

Meloidogyninae
 (Skarbilovich, 1959)
 Wouts, 1972

Meloidogyne Goeldi, 1892
Meloidederita Poghossain, 1966
Meloinema Choi & Geraert 1973

3. Naccoboderidae
 (Chitwood &
 Chitwood, 1950)
 Golden, 1972

Naccobinae Chitwood &
 Chitwood, 1950

Naccobus Thorne & Allen, 1944

Naccoboderinae Golden &
 Jensen, 1974

Naccobodera Golden & Jensen, 1974

4. Rotylenchulidae
 (Hussain & Khan,
 1967) New. Rank

Rotylenchulus Linford & Olivera, 1940
 (Syn. *Spyratylenchus* Lordello & Cesnik, 1958
Leiperotylenchus Das, 1968)

tylenchulus Jubbilo & Chiyora 1940
(Syn. *Spyatylenchus Jorde*) & Cernik, 1958
Leipotylenchus Das, 1968)

(6) SUPER FAMILY : TYLENCHULIDOIDEA RASKI & SIDDIQI, 1975

Paratylenchidae
Thorne, 1949

Paratylenchoides Raski, 1973
Cacopautus Thorne, 1943

Paratylenchus Micoletzky, 1922
(Syn. *Trophonema* Raski, 1957)
Gracilacus Raski, 1962
Sphaeronema Raski & Sher, 1952

Tylenchulidae
Skarbilovich, 1947

Sphaeronematinae
Raski & Sher, 1952
Tylenchulinae
Skarbilovich, 1947

Tylenchulus Cobb, 1913
Syn. *Trophotylenchulus* Raski, 1957
Trophotylenchus

(7) SUPER FAMILY : TYLENCHOCRICONEMATOIDEA THORNE, 1941

Tylenchocriconematidae

(8) SUPER FAMILY : NEOTYLENCHOIDEA (THOROE, 1941) JAIAJPURI & SIDDIQI, 1969

a. Nothotylenchidae
Thorne, 1941

Nothotylenchinae
Thorne, 1941

Tylenchocticonema Raski & Siddiqi, 1975.
Doisalla Jairajpuri, 1966
Nothotylenchus Thorne, 1941
Thada Thorne, 1941
Sakia Khan, 1964-Syn. *Basilophora* Hussain & Khan, 1965.
Nothotylenchoides Fotedar & Handoo, 1978
Nothanguina Whitehead, 1959

Nothoanguininae
New. sub-family.

Roleodorinae Khan, 1964

Boleodoroides Mathur, Khan & Prasad, 1966
Boleodorus Thorne, 1941

b. Paurodontidae
Thorne, 1941

Bealius Massey & Hinds, 1971
Paurodontella Hussain & Khan, 1968
Paurodontus Thorne, 1941
Stictyles Thorne, 1941
Syn. *Paurodontoides* Jairajpuri & Siddiqi, 1969

(8) SUPER FAMILY : NEOTYLENCHOIDEA

- v. Neotylenchidae
 Thorne, 1941
- Misticiinae Massey, 1967 *Anguillonema* Fuchs, 1938
 Misticus Massey, 1967
 Neotylenchinae Thorne, 1941
 Deladenus Thorne, 1941
 Dotylophus Andrassy, 1958
 Gymnotylenchus Siddiqi, 1961
 Hadtodenus Mulvey, 1969
 Hexatylus Goodey, 1926
 (Syn. *Anuillulina Hexatylus* Goodey, 1926)
 Schneider, 1939: Neotylenchus
 Steiner, 1931) Schneider, 1939)
 Scytaleum Andrassy, 1961
 Syn *Neopseudodentus* Tikyani & Khera, 1968
 Halenchus Cobb in Cobb, 1963-
 (Syn. *Anguillulina* Helenchus Cobb in Cobb,
 1933) Schneider, 1939
- Halenchinae Jairajpuri &
 Siddiqi, 1969
- Ephyadorinae
 Skarbilovich, 1959
- Iotonchinae Goodey, 1953
 Ephyadophara De Man, 1921
 Ephyadopharoides Corbett, 1964
 Iotonchium Cobb, 1920
 Syn. *Anguillulina* (Iotonchium Cobb, 1920)
 Schneider, 1939
- d. Ephyadophoridae
 Skarbilovich, 1959
- e. Iotonchidae Goodey,
 1953
- f. Sphaerulariidae
 Lubbock 1861

Obligate parasites in insects. The 21 genera belonging to 3 sub-families, not free living animals, an enumeration of sub-families and genera are not given here

ORDER TYLENCHIDA THORNE, 1949

- Sub order
 Aphelenchinae
 (Fuchs, 1937)
 Geraert, 1966
- Super family
 Aphelenchoidea (Fuchs, 1937)
 Thorne, 1949
- Family
 Aphelenchidae (Fuchs, 1937) Steiner 1949
 Paraphelenchidae (Goodey, 1951) Goodey,
 1960
 Aphelenchoidea (Skarbilovich, 1947)
 Paramonov, 1953
 Entaphelenchidae Nickle, 1970

Sub order

Aphelenchinae (Fuchs, 1937) Geraert, 1966

Super family

Aphelenchoidea (Fuchs, 1937) Thorne, 1949

Family

Aphelenchidae (Fuchs, 1937) Steiner 1949
Paraphelenchidae (Goodey, 1951) Goodey, 1960
Aphelenchoiidae (Skarbilovich, 1947) Paramonov, 1953
Entaphelenchidae Nickle, 1970

SUPER FAMILY : APHELENCHOIDEA (FUCHS, 1937) THORNE, 1949

Family

1. Aphelenchidae (Fuchs, 1937) Steiner, 1949

Sub-Family

Aphelenchinae Fuchs, 1937

2. Paraphelenchidae (Goodey, 1951) Goodey, 1960

3. Aphelenchoiidae Skarbilovich, 1947

Genera

Aphelenchus Bastian, 1865 Syn. *Isonchus* Cobb, 1913
Metaphelenchus Steiner, 1943
Paraphelenchus (Micoletzky, 1922) Micoletzky, 1925
Syn. *Aphelenchus* (*Paraphelenchus* Micoletzky, 1922)

Aphelenchoiinae

Aphelenchoides Fischer, 1894
Aprutides Scognamilio, Talame & S'Jacob, 1970
Laimaphelenchus Fuchs, 1937
Megadorus Goodey, 1960
Paphaphelenchus Andrassy, 1973
Paraseinura T mm, 1961
Ruehmaphelenchus Goodey, 1963
Schistonchus (Cobb, 1927) Fuchs, 1937
Syn. *Aphelenchus* (*Schistonchus* Cobb, 1927);
Pathoaphelenchus (*Scuistonchus* Cobb, 1927) Steiner, 1931
Seinura Fuchs, 1931
Steraphelenchus Nickle, 1970
Tylaphelenchus Ruhm, 1956

Bursaphelenchinae
Paramonov, 1964

Bursaphelenchus Fuchs, 1937
(Syn. *Aphelenchoides* *Bursaphelenchus* Fuchs, 1937) Ruhm, 1956; *Divibursaphelenchus* Kakulia, 1967
Huntaphelenchoides Nickle, 1970
Omemea Massey, 1971

Parasitaphelenchus Fuchs, 1920
 Syn. *Aphelenchoides* (*Parasitaphelenchus* Fuchs, 1929) Filipjev, 1934

Rhadinaphelenchus Goodey, 1960

Rhadinaphelenchinae
 Paramonov, 1964

Cryptaphelenchus (Fuchs, 1937) Ruhm, 1954
 Syn. *Parasitaphelenchus* (*Cryptaphelenchus* Fuchs, 1937)

Fuchs, 1937 nec. Micoletzky, 1922)
Ektaphelenchus (Fuchs, 1937) Skarjabin, Shikhobolova, Sobulev, Paramonov and Sudarekov, 1954

Syn. *Parasitaphelenchus* (*Ektaphelenchus* Fuchs, 1937,

Cryptaphelenchoides Goodey, 1960
Peraphelenchus Wachek, 1955

Anomyctus Allen, 1940

Anomyctinae Goodey, 1960

Entaphelenchus Wachek, 1955
Praecacilenchus Poiner, 1969
Roveaphelenchus Nickle, 1970

Entaphilenchinae Nickle, 1970

Entaphelenchidae
 Nickle, 1970

REFERENCES

- Allen M. W. 1960 "The genera *Pratylenchus*, *Radopholus* *Pratylenchoides*, *Rotylenchulus* and *Nacobus*; *Tylenchulus*, *Trophotylenchus* and *Sphaeronema* pp. 181-184 in *Nematology* Ed. Sasser, J. N. & Jenkins, W. R. Univ. N Carolina 480 pp.
- Allen M. W. 1965 A review of nematode genus *Tylenchorhynchus* *Univ. Publ. Calif. Zoology*: 61 (3) : 129-166
- Allen M. W. & Sher, S. A. 1967 Taxonomic problems concerning the phytoparasitic nematodes *Annual Rev. of Phytopath* (5): 247-264
- Andrassy E. 1961 Taxonomic der Neotylenchiden *Nematologica* 6 (1): 25-36
- Bastian, C. H. 1865 Monograph on Anguillulidae, or free nematodes, marine land and fresh water; with description of 100 new species *Trans. Linn. Soc. London*, 25: 73-184
- Chitwood, B. G. 1949 Root knot nematode Part I. A revision of genus *Meloidogyne* Geoldi, 1881. *Proc. Helmn. Soc. Wash.* 16: 90-104.
- Chitwood, B. G. 1959 The classification of plant parasitic nemas and related forms *15th Internat. Cong. Zool. Sect. 8 Paper* 29: 681-693
- Cobb, N. A. 1913 New nematode genera found inhabiting fresh water and non brakish soils *J Wash. Acad Sci.* 3: 432-444.
- Cobb, N. A. 1914-1935 Contributions to Science of nematology. William & Nilkins, Baltimore. Maryland. 499 pp.
- Cobb, N. A. 1920 "One hundred new nemas." *Contri. Sci. Nemat.* (9): 217-343
- Cobb, N. A. & Cobb, M. V. 1933 New nemic gener and species with taxonomic notes. *Jour Parast* (20): 82-94
- Das, V. M. 1960 Studies on nematode parasites of plant in Hyderabad. India *Zeitchrift. fur. Parastitenkunde* 19 (6): 553-605
- De Man, J. G 1880 Die einheimischen, frei in der reinen Erde und 1 m Sussen Wasser lebenden. In. *Tijdschr. ned. dierk. dierk. vereen* 5: 58-59

- De Man, J. G. 1884 Die, frei in der reinen Erde und in Sussen Wasser Labenden Nematoden der niederlandischen Fauna Leiden : 1-206
- Filipjev, I. N. 1934 The classification of free living nematodes and their relation to the parasitic nematodes. *Smithson. Misc. Collus.* **89** : 1-63.
- Filipjev, I. N. 1936 On the classification of the Tylenchinae. *Proc. helm Soc. Wash.* **3** : 80-82
- Fotedar D. N. & Handoo, Z. A. 1977 On a new tylenchid nematode parasite from soil around Safron Corm. *Crocus sativus*, in pampore kashmir. *Proc. 65th Ind. Sci. Cong : Part III Section VII, Zoology, Entomology and Fisheries, Ahmedabad, India. Abst.* **12** : 204 pp.
- Fotedar D. N. & Mahajan, R. 1973 On the synonymy of *Basiroides* Thorne and Malek, 1968 with *Basiria* Siddiqi, 1959 (Nematoda : Tylenchidae) with a note on *Neopsilenchus* Thorne & Malek, 1968 *Proc. helm Soc. Wash. Vol.* **40**. **2** : 280-282
- Geraert, E. 1965 The systematic position of the families Tylenchulidae and Criconematidae. *Nematologica* **12** : 362-368
- Geraert, E. 1970 The relationship between the genera *Tylenchus*, *Psilenchus* and *Basiria* (Nematoda : Thlenchida) *Proc. IX Intern. Symp. Nemat. Warsava (Poland)* pp. 55-58.
- Golden, A. M. 1971 Classification of the genera and higher catagories of the order Tylenchida (Nematoda). In plant parasitic nematodes Vol. 1, 191-232
- Goodey, T. 1951 Soil and fresh water Nematodes. Revised by Goodey (1963). Methuen & Co. London pp. 554.
- Grisse, A De & Loof, P. A. A. 1965 Revision. of the genus *Criconemoides* (Nematoda) overdrunk vit, de Medd, van. de Land-bonweg end. opzoe kings *Van de state* to gent. Deel. **30** : 577-603
- Hussain, S. I. & Khan, A. M. 1965 A new genus and six new species of nematodes from India belonging to family Neotylenchidae with an amendment of sub-family Ecphyadophorinae. *Proc. helm. Soc. Wash.* **32** : 7-15
- Hussain, S. I. & Khan, A. M. 1967 On the status of genera of super family Aphelenchoidea (Fuchs, 1937) Thorne, 1949 with the

- description of six new species from India. *Proc. Helm. Soc. Wash.* 34 (2): 167-174
- Jairajpuri, M. S. 1966 A redescription of *Psilenchus* De Man, 1921 and *Tylenchus* Sub-genus *Filenchus* Andrassy, 1954 with the erection of *Clavilenchus* New. sub-genus under *Tylenchus* Bastian, 1965. *Nematologica* 11 (4): 619-622
- Jairajpuri, M. S. and Siddiqi, M. R. 1961 *Paurodontoides* n. gen (Paurodontidae: Neotylenchida) with an outline classification of Neotylenchoidea) n. rank *Nematologica* 15: 287-288
- Jairajpuri, M. S. & K. Siddiqi, M. R. 1977 Taxonomic Studies on Hoplolaimidae (Nematoda: Tylenchida) with proposal of *Orientylus* N. Gen and *Calvatylus* N. Gen. under Rotylenchoidinae Al. India Stmporium on Helminthology, Srinagar Kashmir. Abstract No: 27 pp. 16
- Khan, E. Chawla, M. L. and Seshadri A. R. 1969- *Diptenchus indicus* n. gen. n. sp. (Nematoda-Tylenchidae) from soil around roots of grapevine from Delhi, India. *Nematologica* 15 (3): 337-340
- Kheiri, A. 1972 *Tylenchus (Trantylenchus) clavidorus* n. sp. (Tylenchida: Nematoda) from Iran. *Nematologica* 18: 339-346
- Khan, E., Chawla, M. L. & Saha, M 1975 Criconematoidea (Nematoda: Tylenchida) from India, with description of Nine new species, two new genera and a family. *Indian Jour. Nemat.* 5: 70-103
- Loof P. A. A. 1964 b Free living and plant parasitic nematodes from Venezuela. *Nematologica* 10: 201-300
- Mahajan, R. 1971 Preliminary report of the occurrence of Plant parasitic and soil nematodes in Jammu and Kashmir State. *Kashmir. Sci.* VIII, 1-2: 115-119
- Mehra, U. R. & D. J. 1971 Revision of genus *Criconema* Hofmanner and Menzel, 1914 and other related genera (Criconemidae: Nematoda) *Ind. Jour. of Nematol* (2): 145-198
- Tranjanov, A. A. 1967 A critical review of the sub-order Tylenchina (Filipjev, 1934) Nematoda: Secernentia). *Trudy gel. mint. Lab.* 18: 78-101
- D. J. & I. A. 1975 *Tylenchocticonema alleni* n. gen. n. sp. from Guatemala (Tylenchocticonematidae New. fam: Tylenchocticonematoidea New. super-fam. Nematoda). *Jour. of Nemat.* 7: (3) 247-251
- S. A. 1966 Revision of Hoplolaiminae (Nematoda) VI *Helicotylenchus* Steiner, 1945. *Nematologica* 12: 1-56

- Sher, S. A. & Allen, M. W. 1953 Revision of the genus *Pratylenchus* (Nematoda) Tylenchida *Univ. Calif. Pub. Zool* 57 : 441-470
- Siddiqi, M. R. 1970 On the Plant parasitic nematode genera *Merlinius* gen. n. and *Tylencharhynchus* Cobb and the classification of the families Dolichodoridae and of the families Dolichodoridae and Belonolaimidae n. rank *Proc. helm. Soc. of Wash* Vol 27 (1) 68-77 pp.
- Siddiqi, M. R. 1971 Structure of oesophagus in the classification of the super-family Tylenchoidea (Nematoda) *Indian Jour. Nemat.* 1 25-43 :
- Steiner, G. 1949 Plant nematodes the grower should know. *Proc. Soil. Soc. Fla* 43 : 82-117
- Steiner, G. 1949 Plant nematodes the grower should know *Proc. Soil Soc. Fla. 1942.* 4-B : 72-117
- Swarup, G. & Seshadri, A. R. 1974 Nematology in India-Problems and progress. *Current. Trends. in Plant. Pathology. Lucknow. Univ. Botany Deptt.* pp. 303-311.
- Thorne, G. 1941 Some nematodes of the family Tylenchidae which do not possess a valvular median bulb *Great Basin. Nat.* 2 : 37-85
- Thorne, G. 1949 On the classification of Tylenchida, new order (Nematoda : Phasmida). *Proc. Helm. Soc. Wash.* 16 : 37-73.
- Thorne, G. 1961 Principles of Nematology Mc. Grow Hill Book. Co. Inc. N. Y. pp. 553
- Thorne & Malek 1968 Nematodes of Northern great plains part I Tylenchida (Nemata : Secernentia) *Tech. Bult. S. Dak, Agric. Expt. Stn.* No. 31 : 111 pp.
- Wouts, W. M. 1973 A revision of the family Heteroderidae (Nematoda : Tylenchoidea) III the sub-family Ataloderinae, *Nematologica* 19-(3) : 279-284
- Wouts, W. M. & Sher, S. A. 1971 The genera of the sub-family Heteroderinae (Nematoda : Tylenchoidea) with a description of two new genera *J. Nematology* 3 : 129-144



