

# Gastrotricha

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Phylum of ubiquitous, aquatic micrometazoans, sometimes considered a class of the phylum Aschelminthes or Nemathelminthes. These animals are oblong, strap-shaped to ovoid or tenpin-shaped, 50  $\mu\text{m}$ –3.5 mm (mostly less than 1 mm) in length. The flattened venter bears locomotor cilia. Most gastrotrichs are thigmotactic and possess adhesive tubes; they are interstitial dwellers in loose sediments, epipellic dwellers on compacted sediments, or episymbionts on sessile macrobenthos and floating vegetation. Some lack adhesive tubes and are pseudoplanktonic or planktonic. None are known ectoparasites or endoparasites, and are themselves rarely parasitized by other organisms.

A true cuticle is secreted by the epidermis. The outer lamellar portion has one to many bilayered membranelike sheaths, composed of lipoprotein and nonchitinous polysaccharide, that cover the entire body, including the cilia. The inner fibrous or granular portion may be elaborated into scales, spines, or hooks. The cuticle forms stomodaeal and proctodaeal linings of the gut. The epidermal cells are monociliated or multiciliated ventrally. The tactile, chemoreceptor, and photoreceptor organs are modified cilia. The dual-gland adhesive organs secrete adhesive and releaser substances.

The longitudinal and circular musculature is oblique (occasionally cross-striated) and anastomosing. The mouth is terminal. The triradiate pharynx possesses a single layer of radiating myoepithelial cells. The intestine is composed of a columnar epithelium, bearing lumenally directed microvilli. The anus is subterminal. There are no specialized circulatory or respiratory organs. The protonephridia are solenocytic and form serially arranged clusters or solitary tubes on either side, each with a proximal microtubular basket and one or two flagella.

Gastrotrichs are primitively hermaphroditic, tending in many chaetonotids toward the loss of testes and resultant parthenogenesis. In hermaphroditic forms, sperm are formed into spermatophores and transferred variously from acting-male to acting-female, with fertilization being internal. Fertilized ova are generally released by rupture of the body wall. In predominantly parthenogenetic forms, mature ova are released through a temporary pore in the ventral body surface. Cleavage and subsequent development occur after a released ovum is attached to the substratum. Opsiblastic ova with retarded development occur in freshwater forms, although initiation of the process is little understood. The cleavage pattern is bilaterally radial, the embryo passing through a stereogastrula to hatch as a juvenile by direct development. The pseudocoel is apparently a fixation artifact; if a gonocoel is present, it represents a true coelom; otherwise gastrotrichs are acoelomate.

Gastrotrichs are obtained by collecting 10–20 cm<sup>3</sup> of substratum (sand, barnacle, section of plant stem, leaf), gently draining off the milieu water, covering with 7% (marine) or 1% (freshwater) MgCl<sub>2</sub>, and allowing 10–20 min for narcotization to take place. The fluid is then decanted into a small petri dish, followed by several washes with milieu water. Concentrations of wet plant material can be squeezed directly into the dish.

Gastrotrichs show large-scale patchiness in distribution; they move by ciliary gliding locomotion to optimal habitat zones in response to physical-chemical-biological gradients. Small-scale patchiness also occurs, particularly among adults, but with nearly random dispersion within patches and relative to noncongeneric species. Interactions between conspecifics remain little understood. Some species appear eurytopic, others stenotopic, with respect to substratum, substratum saturation, salinity, temperature, oxygen, sulfides, food sources, and so on. Evidence often indicates the presence of physiological races or sister or sibling species.

In littoral or shallow sublittoral marine habitats, 8–16 (<40) species constituting 5–10 (<18) genera and 4–6 (<8) families may be found, showing H'

species diversities of 1.5–2.5 (<4.0) bits. Genera tend to be cosmopolitan, and species transoceanic, coastally extensive, or regional, although data are inadequate from most of the world.

The Gastrotricha comprise 47 genera and 429 species in 2 orders, Macrodasysida (6 families) and Chaetonotida (7 families). The number of species in each taxon refers to described, currently recognized (1978) species.

**References.** J. L. d'Hondt, Gastrotricha, *Oceanogr. Mar. Biol. Ann. Rev.*, 9: 141–192, 1971; W. D. Hummon, Gastrotricha, in A. C. Giese and J. S. Pearse (eds.), *Reproduction of Marine Invertebrates*, vol. 1, pp. 485–506, Academic Press, New York, 1974; W. D. Hummon, Seasonal changes in secondary production, faunal similarity and biological accommodation, related to stability among Gastrotricha . . . , in G. Persoone and E. Jaspers (eds.), *Proceedings of the 10th European Symposium on Marine Biology*, vol. 2, pp. 309–336, Universa Press, Wetteren, 1976; W. D. Hummon, Some taxonomic revisions and nomenclatural notes concerning marine and brackish-water Gastrotricha, *Trans. Amer. Microsc. Soc.*, 93: 194–205, 1974; L. H. Hyman, Gastrotricha, in *The Invertebrates*, vol. 3, pp. 151–170, McGraw-Hill, New York, 1951; A. Remane, Gastrotricha, in H. G. Bronns (ed.) *Klassen und Ordnungen des Tierreichs (Vermes)*, vol. 4, pp. 1–242, Akademie Verlagsgesellschaft, Leipzig, 1936; G. E. Rieger and R. M. Rieger, Comparative fine structure study of the gastrotrich cuticle . . . , *Z. Zool. Syst. Evol.forsch.*, 15:81–124, 1977; R. M. Rieger, Monociliated epidermal cells in Gastrotricha . . . , *Z. Zool. Syst. Evol.forsch.*, 14:198–226, 1976; E. E. Ruppert, Zoogeography and speciation in marine Gastrotricha, *Mikrofauna Meeresboden*, 61:231–251, 1977; G. Teuchert, The ultrastructure of the marine gastrotrich *Turbanella cornuta* Remane (Macrodasysoidea) . . . , *Zoomorphologie*, 88:189–246, 1977.

## MACRODASYIDA

Oblong, strap-shaped to obovate or tenpin-shaped animals, 150  $\mu\text{m}$ –3.5 mm in length. There are several to many adhesive tubes, borne posteriorly, anteriorly behind the mouth, and often laterally, ventrolaterally, or dorsolaterally. The pharynx has an inverted Y-shaped lumen and pharyngeal pores. Macrodasysida are typically simultaneous or sequential hermaphrodites. The lamellar portion of the cuticle has few to many layers. The epidermal cells are monociliated or multiciliated ventrally.

Members of this order occur in sandy sediments of marine, brackish-water, and estuarine habitats. There are 6 families: Dactylopodolidae, Lepidodasyidae, Macrodasysidae, Planodasyidae, Thaumastodermatidae, and Turbanellidae.

**References.** E. E. Ruppert, The reproductive system of gastrotrichs. II, *Zoomorphologie*, 89:207–228, 1978, and III, *Zool. Scripta*, 7:93–114, 1978.

**Dactylopodolidae.** Tenpin- to strap-shaped animals, 200–580  $\mu\text{m}$  in length. The posterior and anterior adhesive tube groups have few to many tubes each; the lateral group has few to many tubes, or no tubes. The anterior tubes are solitary or borne in tufts or on extensible hands. The pharyngeal pores are located at the base of the pharynx. The posterior end is bilobed, furcate, or bifurcate. The testes and ovaries are paired. The lamellar portion of the cuticle has few to many layers. The epidermal cells are monociliated ventrally. The gut often bears lumenally directed cilia. The trunk musculature is often cross-striated. [See illustration page 859.]

The family comprises 3 genera: *Dactylopodola* (5 species), *Dendrodasys* (4 species), and contra Hummon, 1974, *Xenodasys* (3 species). In *Dactylopodola*, the head is simple or has laterally directed tentacles. The posterior end is bilobed. Lateral adhesive tubes are present. Species are common but seldom abundant (to 5/cm<sup>3</sup> of sediment). In *Dendrodasys*, the head has crenulated lateral lobes. The posterior end is furcate or bifurcate. Lateral adhesive tubes are absent. Species are uncommon (to 1/cm<sup>3</sup> of sediment). In *Xenodasys* (= *Chor-*

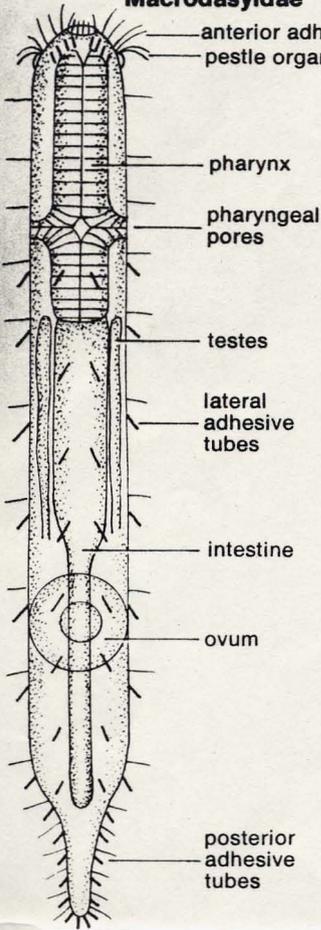
*dodasys*), the head has platelike cuticular thickenings and two pairs of primary tentacles. There are few to many posterior, anterior, and lateral adhesive tubes. The upper body surface has wrinkles, spines, or secondary head and trunk tentacles, producing a rugose appearance. A precaudal cordoid organ is present. Species are known from both sides of the Atlantic Ocean.

Members of this family inhabit brackish to marine sandy sediments from the midlittoral zone onto the continental shelf.

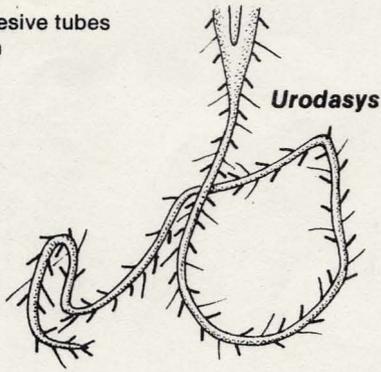
**Lepidodasyidae.** Strap-shaped animals, 400  $\mu\text{m}$ –3.5 mm in length. The posterior and anterior adhesive tube groups have few to many tubes each. The lateral group has few to many tubes, or no tubes. The anterior tubes are borne directly on the ventral body surface, occasionally on extensible hands. Pharyngeal pores are typically located at the base of the pharynx. Cephalic pestle organs are occasionally present. Sometimes cuticular armature is present. The posterior end is truncated, obovately rounded, unilobed, or tapered, or, rarely, bilobed. The testes are paired. The ovary

MACRODASYIDA

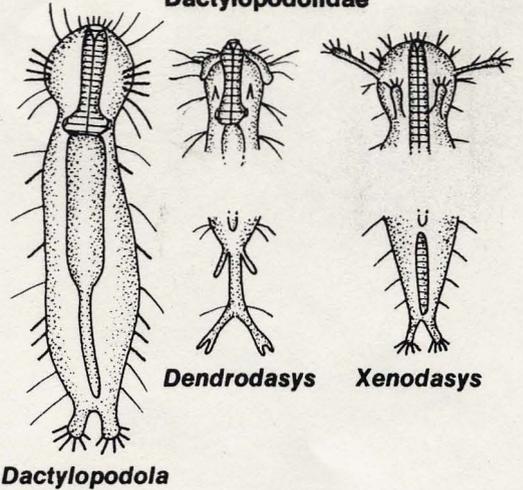
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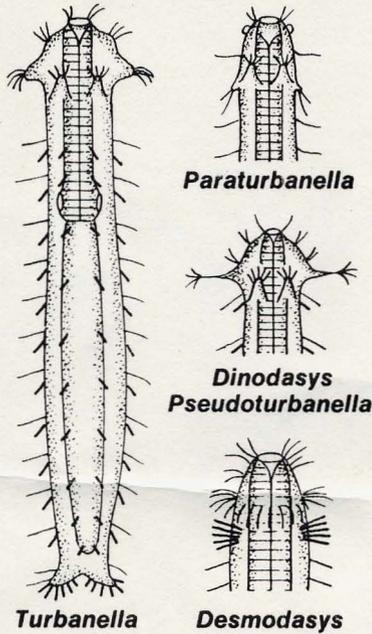
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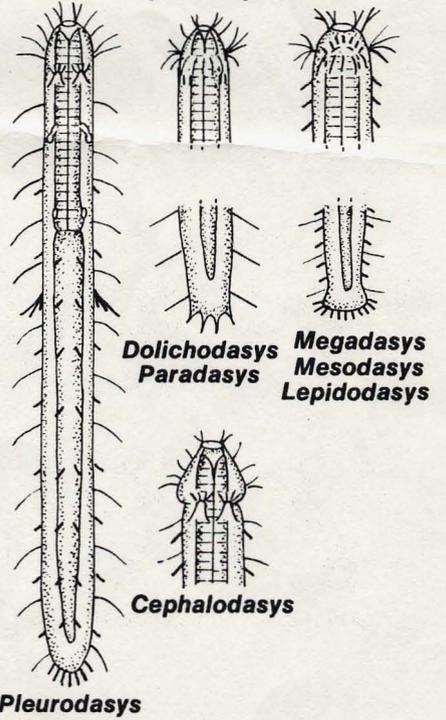
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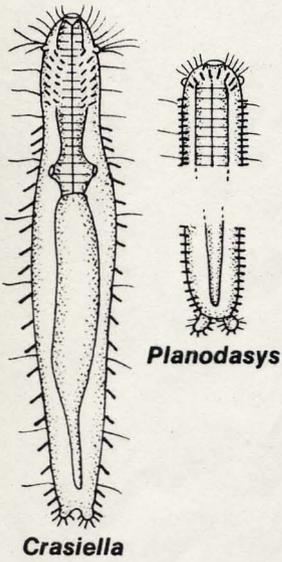
Turbanellidae



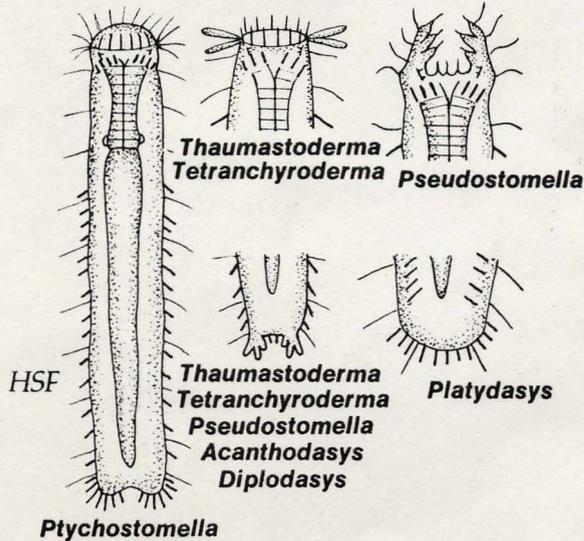
Lepidodasyidae



Planodasyidae

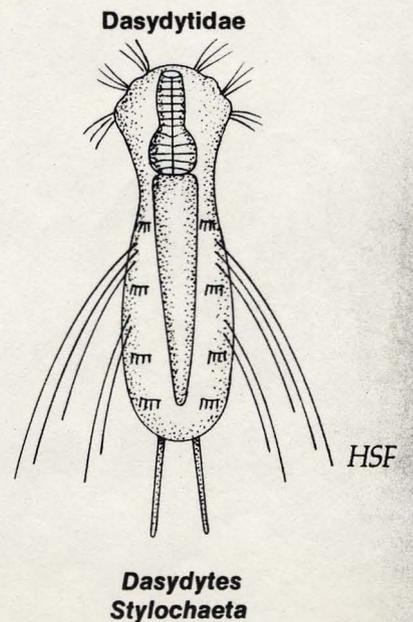
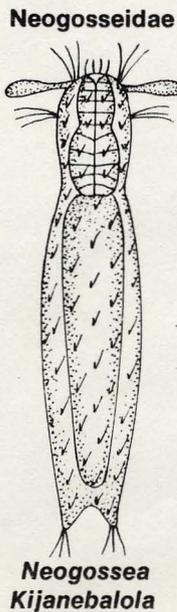
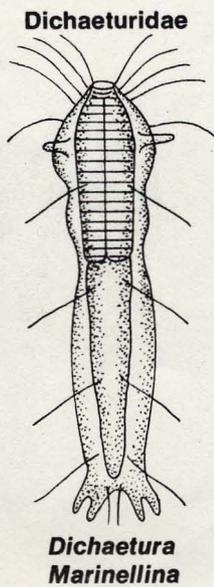
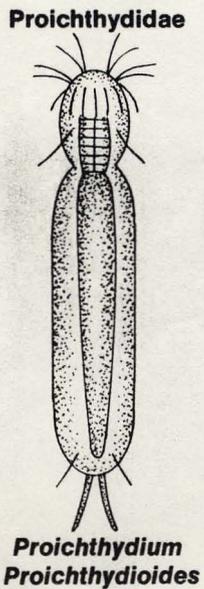
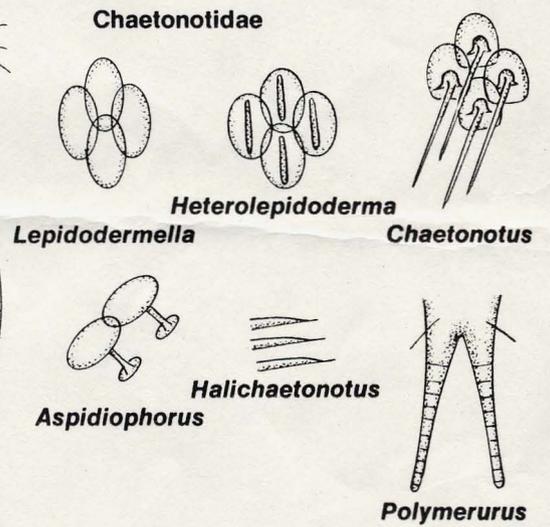
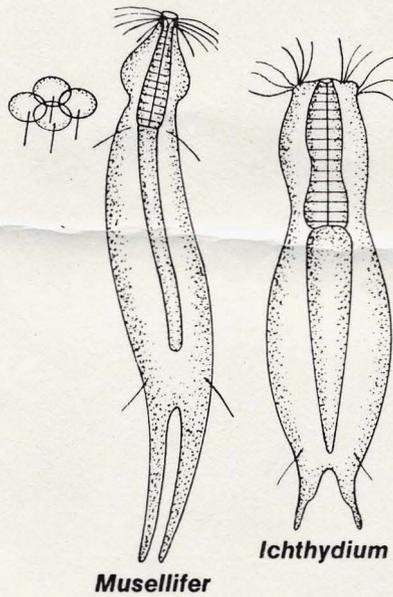
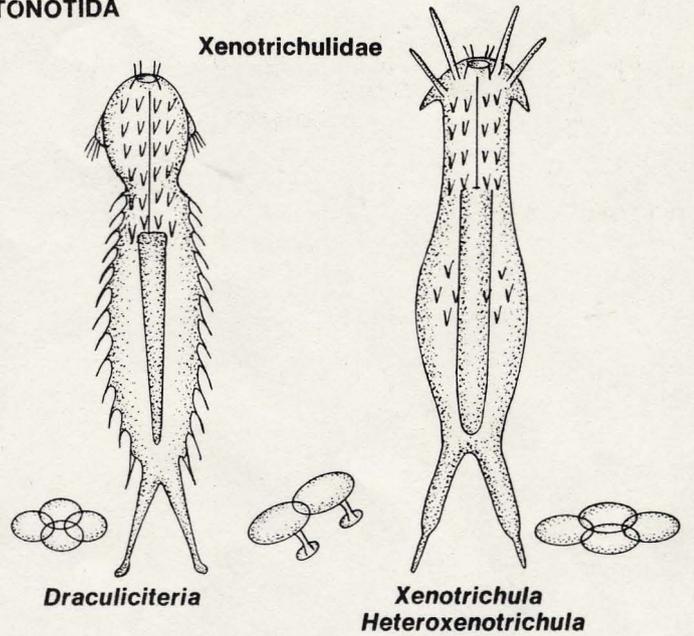
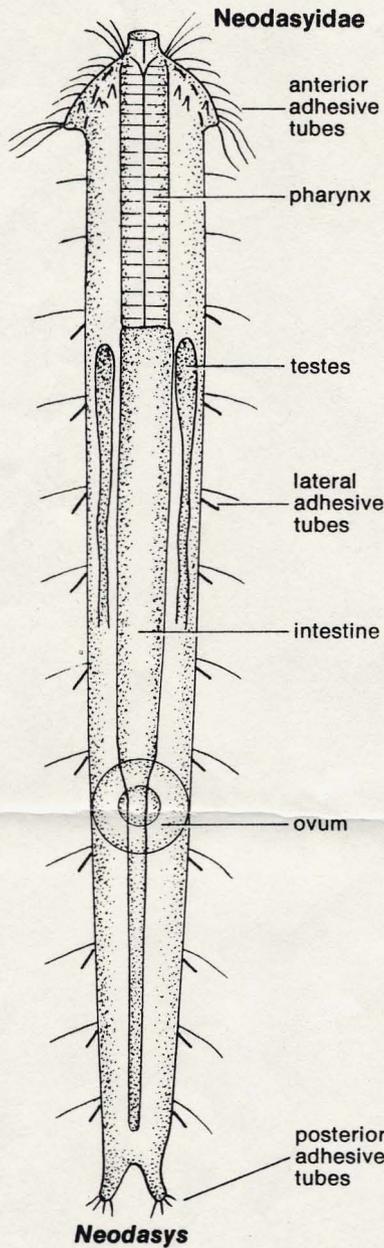


Thaumastodermatidae



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CHAETONOTIDA



is solitary or, occasionally, paired. The lamellar portion of the cuticle has several to many layers. The epidermal cells are monociliated or multiciliated ventrally. [See illustration page 859.]

The family comprises 7 genera: *Lepidodasys* (2 species), *Cephalodasys* (7 species), *Dolichodasys* (3 species), *Megadasys* (2 species), *Mesodasys* (4 species), *Paradasys* (5 species), and *Pleurodasys* (2 species). In *Lepidodasys*, the upper and lower body surfaces bear elongate, keeled, scalelike thickenings. There are several to many posterior, anterior, and lateral adhesive tubes. There are no pharyngeal pores. The posterior end is rounded or unilobed. Species are uncommon. In *Cephalodasys*, a cephalic enlargement is present. There are several to many posterior, anterior, and lateral adhesive tubes. The anterior tubes are borne on extensible hands. The posterior end is rounded, unilobed, or tapered. Species are common and locally abundant (to 6/cm<sup>3</sup> of sediment). In *Dolichodasys*, the length may exceed 2 mm. There are few to several posterior adhesive tubes. There is one pair of anterior tubes, visibly dual. There are no lateral tubes. The posterior end is rounded or tapered. Species are uncommon. In *Megadasys* (= *Thiodasys*), the length may exceed 3 mm. There are many posterior and lateral adhesive tubes. The anterior tubes merge with the lateral rows. The posterior end is rounded or unilobed. The ovaries are paired. Species are known sporadically from the Pacific and Atlantic oceans. In *Mesodasys*, the length may exceed 2 mm. There are many posterior, anterior, and lateral adhesive tubes. The posterior end is rounded, tapered, or unilobed. Species are uncommon. In *Paradasys*, there are few to several posterior and anterior adhesive tubes. There are no lateral tubes. The posterior end is truncated or rounded or, occasionally, bilobed. The ovary is solitary or, occasionally, paired. Species are uncommon (to 1/cm<sup>3</sup> of sediment). In *Pleurodasys*, there are many posterior, anterior, and lateral adhesive tubes. The anterior tubes are borne on extensible hands. There is one pair of posterolaterally directed feet, comprising three adhesive tubes and located in the anterior intestinal region. The cephalic pestle organs are well developed. The posterior end is rounded or tapered. Species are common and locally abundant (to 7/cm<sup>3</sup> of sediment).

Members of this family inhabit brackish to marine sandy sediments from deep sands in the upper littoral zone onto the continental shelf.

**Macrodasyidae.** Strap-shaped animals, 350  $\mu\text{m}$ –1.6 mm in length. The posterior and anterior adhesive tube groups have several to many tubes each; the lateral group has few to many tubes, or no tubes. The anterior tubes are borne directly on the ventral body surface. The species typically have pharyngeal pores nearly midway up from the base of the pharynx. Cephalic pestle organs are present. The posterior end is acuminate or drawn out into a tail. A penis is present; the testes and ovaries are paired. The lamellar portion of the cuticle has few to several layers. The epidermal cells are monociliated ventrally. [See illustration page 859.]

The family comprises 2 genera: *Macrodasys* (15 species) and *Urodasys* (8 species). In *Macrodasys*, the posterior process is short. The species are common and locally abundant (to 6/cm<sup>3</sup> of sediment). In *Urodasys*, the posterior process is elongate and taillike. The penis often has a cuticular stylet. One species lacks testes and reproduces parthenogenetically. *Urodasys* species are uncommon (to 2/cm<sup>3</sup> of sediment).

Members inhabit brackish to marine sandy sediments from the midlittoral zone onto the continental shelf.

**Planodasyidae.** Strap-shaped animals, 380  $\mu\text{m}$ –1.5 mm in length. The posterior, anterior, and lateral adhesive tube groups have many tubes each. The anterior tubes are borne directly on the ventral body surface. The pharyngeal pores are located at the base of the pharynx. Cephalic pestle organs are present. The posterior end is bilobed; the testes and ovaries are paired. The lamellar portion of the cuticle has few to several layers. The epidermal cells are monociliated ventrally. [See illustration page 859.]

The family comprises 2 genera: *Planodasys* (1 species) and *Crasiella* (3 species). In *Planodasys*, the caudal lobes form oval appendages. The anterior adhesive tubes are transversely arranged. *Planodasys* has been reported from India. In *Crasiella*, the caudal lobes form trunk extensions. The anterior adhesive tubes are longitudinally arranged. Species are known sporadically from the Atlantic and Pacific oceans.

Members of this family inhabit marine sandy sediments from the lower littoral zone onto the continental shelf.

**Thaumastodermatidae.** Oblong, strap-shaped to obovate animals, 150–830  $\mu\text{m}$  in length. The posterior, lateral, and anterior adhesive tube groups have few to many tubes each. The anterior tubes are borne directly on the ventral body surface. Pharyngeal pores are located at the base of the pharynx. The cephalic and trunk tentacles are widespread, as is the cuticular armature. The mouth is generally broad. The posterior end is truncated, bilobed, or drawn out into tube-bearing feet. The testis is typically restricted to the right side, and occasionally is paired. The ovary is solitary and located dorsolaterally. The lamellar portion of the cuticle has few to several layers. The epidermal cells are multiciliated ventrally. The family comprises 8 genera: *Thaumastoderma* (6 species), *Acanthodasys* (1 species), *Diplodasys* (4 species), *Hemidasys* (1 species), *Platydasys* (10 species), *Pseudostomella* (5 species), *Ptychostomella* (4 species), and *Tetranchyroderma* (25 species). In *Thaumastoderma*, the upper body surface bears four-spined hooks (tetrancres). The head has two pairs of laterally directed tentacles. Species are common but seldom abundant (to 6/cm<sup>3</sup> of sediment). In *Acanthodasys*, the upper and lower body surfaces bear one-pronged hooks (uniancres). The testes are paired. *Acanthodasys* is uncommon. In *Diplodasys*, the upper body surface bears flat overlapping scales. The testes are paired. Species are uncommon (to 3/cm<sup>3</sup> of sediment). In *Hemidasys*, the upper body surface is naked. Locomotor cilia are restricted to the pharyngeal region. The mouth is narrow. The male genital pore is surrounded by cuticular plates. *Hemidasys* has been reported from Italy. In *Platydasys*, the upper body surface bears papillae but not scales or hooks. Species are uncommon. In *Pseudostomella*, the upper body surface bears three-, four-, or five-spined hooks (triancres, tetrancres, or pentancres). Buccal palps are present and located anteriorly to the mouth. Species are common but seldom abundant (to 2/cm<sup>3</sup> of sediment). In *Ptychostomella*, the upper body surface is naked. Locomotor cilia cover the entire ventral surface. The mouth is broad. Species are uncommon. In *Tetranchyroderma*, the upper body surface bears triancres, tetrancres, or pentancres. The head often has one pair of laterally directed tentacles. Species are common and frequently abundant (to 148/cm<sup>3</sup> of sediment). [See illustration page 859.]

Members of this family inhabit brackish to marine sandy sediments from the midlittoral zone to continental slope depths.

**Turbanellidae.** Strap-shaped animals, 300  $\mu\text{m}$ –1.2 mm in length. The posterior and anterior adhesive tube groups

have several to many tubes each. The lateral and dorsolateral groups have few to many tubes, or no tubes. The anterior tubes are borne on extensible hands, occasionally in tufts. Pharyngeal pores are located at the base of the pharynx. Cephalic pestle organs are occasionally present. The posterior end is bilobed. The testes and ovaries are paired. The lamellar portion of the cuticle has several to many layers. The epidermal cells are multiciliated ventrally. [See illustration page 859.]

The family comprises 5 genera: *Turbanella* (21 species), *Desmodasys* (1 species), *Dinodasys* (1 species), *Paraturbanella* (11 species), and *Pseudoturbanella* (1 species). In *Turbanella*, the head often has lobes or short, laterally directed tentacles. There are several to many posterior, anterior, and lateral adhesive tubes. One to several pairs of posteriorly directed ventral tubes are often present along the intestine, especially anteriorly. Species are ubiquitous and frequently abundant (to 386/cm<sup>3</sup> of sediment). In *Desmodasys*, there are many posterior and anterior adhesive tubes. There are no lateral tubes. The anterior tubes are borne in tufts. *Des-*

*modasys* is known from both sides of the Atlantic Ocean. In *Dinodasys*, the head has two laterally directed tentacles. There are many posterior, anterior, and lateral adhesive tubes. *Dinodasys* is uncommon. In *Paraturbanella*, cephalic pestle organs are often present. The buccal cavity often is spacious, and has heavily cuticularized walls. There are many posterior and anterior adhesive tubes. There are numerous lateral tubes, or lateral tubes are absent. Paired posteriolaterally directed feet, each comprising two adhesive tubes, are present in the midpharyngeal region. Species are common and locally abundant (to 6/cm<sup>3</sup> of sediment). In *Pseudoturbanella*, the head has two posteriorly directed tentacles. There are several to many posterior and anterior adhesive tubes, and few lateral adhesive tubes. *Pseudoturbanella* has been reported from France.

Members of this family inhabit a full range of sandy sediments, including low-salinity estuaries and brackish waters, from deep sand in the upper littoral zone to continental slope depths.

## CHAETONOTIDA

The shape and size of the body and the arrangement of the adhesive tubes, if they are present, vary dramatically between the members of the suborders. The pharynx has a Y-shaped lumen and lacks pharyngeal pores. Chaetonotida are hermaphroditic or parthenogenetic. The lamellar portion of the cuticle has one to several layers. The ventral epi-

dermal cells are monociliated or multiciliated or form a syncytium.

Members of this order occur in nearly all aquatic and semiaquatic habitats. There are 2 suborders: Multitubulatina (1 family) and Paucitubulatina (6 families).

### MULTITUBULATINA

Suborder comprising a single family, Neodasyidae, with 1 genus, *Neodasy* (2 species). These strap-shaped animals are 400–800  $\mu\text{m}$  in length. The posterior adhesive tubes, borne on short feet, are fused at their bases. The anterior adhesive tubes are rudimentary. The lateral adhesive tubes are numerous and papillalike. The head has anteriolateral hyaline lobes but lacks tentacles. The narrow mouth opens through a projecting cuticular tube. The testes and ovaries are paired. The lamellar portion of the cuticle has few to several layers. The epidermal cells are monociliated ventrally. Multitubulatina are common but seldom abundant (to 2/cm<sup>3</sup> of sediment). Members of this suborder inhabit brackish to marine sandy sediments from the midlittoral zone onto the upper continental shelf. [See illustration page 860.]

### PAUCITUBULATINA

Obovate to ovoid, tenpin-shaped animals, 50–625  $\mu\text{m}$  in length. The adhesive tubes are restricted to the posterior end; there are usually two adhesive tubes, at the tips of a caudal furca; or the tubes are absent. Paucitubulatina are hermaphroditic or parthenogenetic. The lamellar portion of the cuticle has one layer. The ventral epidermal cells are multiciliated (Xenotrichulidae) or form a syncytium. Members of this suborder occur in nearly all aquatic and semiaquatic habitats. There are 6 families: Chaetonotidae, Dasydytidae, Dichaeturidae, Neogosseidae, Proichthyidae, and Xenotrichulidae.

**Chaetonotidae.** Tenpin-shaped animals, 50–625  $\mu\text{m}$  in length. The locomotor cilia are normal and are inserted in fields or longitudinal rows or, rarely, in tufts. The posterior

end is furcate, each branch bearing an apical adhesive tube. Cuticular armature is present or absent. Chaetonotids are parthenogenetic or, if hermaphroditic, have reduced or vestigial testes. [See illustration page 860.]

The family comprises 8 genera: *Chaetonotus* (121 species), *Aspidiophorus* (12 species), *Halichaetonotus* (15 species), *Heterolepidoderma* (17 species), *Ichthydium* (26 species), *Lepidodermella* (12 species), *Musellifer* (2 species), and *Polymerurus* (17 species). In *Chaetonotus*, the upper body surface bears spines or spined scales. The furca is short, the branches rarely scaled. Species are mostly parthenogenetic. Most live in freshwater. They are ubiquitous but seldom abundant in marine sediments (to 136/cm<sup>3</sup> of sediment). In *Aspidiophorus*, the upper body surface bears pedunculate scales. Species are parthenogenetic. They are found in marine or freshwater, and are common but seldom abundant in marine sediments (to 1/cm<sup>3</sup> or, under enrichment, to 48/cm<sup>3</sup> of sediment). In *Halichaetonotus*, the upper body surface bears spine-tipped, keeled scales. The ventrolateral body surface bears a row of lamellate or spined hydrofoil scales. Most species are parthenogenetic. They are found in marine habitats, and are common and locally abundant (to 5/cm<sup>3</sup> of sediment). In *Heterolepidoderma*, the upper body surface bears keeled scales. Most species are parthenogenetic. They are found in marine or freshwater habitats, and are uncommon. In *Ichthydium*, the upper body surface is naked, and lacks scales or spines. Most species are parthenogenetic and are found mostly in freshwater where they are common. In *Lepidodermella*, the upper body surface bears scales that lack keels, spines, or setae. Most species are found in freshwater habitats where they are ubiquitous. In *Musellifer*, the upper body surface bears subcircular to oval scales from each of which protrudes a fine seta. The furca is elongate, and the branches are scaled. The head bears a muzzle of cilia anteriorly. Species are hermaphroditic. They are found in ma-

rine habitats, in mud and fine sand. They are known from the Atlantic and Pacific oceans and Mediterranean Sea. In *Polymerurus*, the upper body surface bears keeled or spined scales. The furca is elongate, the branches scaled, and the distal portion typically annulated. Most species are parthenogenetic, and most are found in freshwater where they are common.

Members of this family occur in nearly all aquatic and semiaquatic habitats (freshwater, estuarine, brackish, and marine), from damp soil to the continental slope.

**Dasydytidae.** Ovoid to ovoid-tenpin-shaped animals, 80–285  $\mu\text{m}$  in length. The locomotor cilia are normal, and are restricted to tufts or transverse bands. The posterior end is truncated or bilaterally projected into protuberances, but lacks adhesive tubes. There are several long spines, borne on the head, neck, or trunk; or, if there are only a few spines, they are borne directly on the trunk. Aside from the long spines, there is no cuticular armature. Dasydytids are parthenogenetic. They are often pseudoplanktonic in habit. [See illustration page 860.]

The family comprises 2 genera: *Dasydytes* (15 species) and *Stylochaeta* (6 species). In *Dasydytes*, the posterior end is truncated or projected into protuberances, each of which ends in a stout spine. Distribution is widespread. In *Stylochaeta*, the posterior protuberances are fingerlike; each is tipped with several delicate spines. Distribution is widespread.

Members of this family range from bogs to benthic sapropel and vegetated margins of freshwater ponds and lakes.

**Dichaeturidae.** Tenpin-shaped animals, 100–200  $\mu\text{m}$  in length. The locomotor cilia are normal, arranged in fields or longitudinal rows. Adhesive tubes are located at all four tips of the bifurcate caudum. The cuticle is naked and lacks armature. Species are parthenogenetic. [See illustration page 860.]

The family comprises 2 genera, *Dichaetura* (2 species) and *Marinellina* (1 species), occurring in diverse freshwater habitats. In *Dichaetura*, there are neither head tentacles nor tactile cilia in the midtrunk region. Fleshy protuberances may occur on the dorsolateral trunk surface. Species have been reported sporadically from moss and bogs in Europe and Britain. In *Marinellina*, cephalic tentacles and numerous tactile cilia are scattered over the dorsolateral body surface. *Marinellina* has been reported from sandy stream bottoms in Austria.

**Neogosseidae.** Tenpin-shaped to ovate animals, 100–270  $\mu\text{m}$  in length. The locomotor cilia are normal and restricted to tufts. The posterior end is bilaterally projected into protuberances, but lacks adhesive tubes. Long spines are absent or restricted to posterior protuberances. Cephalic tentacles are present. Cuticular armature is present. Neogosseids are parthenogenetic and pseudoplanktonic to planktonic in habit. [See illustration page 860.]

The family comprises 2 genera: *Neogossea* (5 species) and

*Kijanebalola* (1 species). In *Neogossea*, the trunk is tenpin-shaped, not loricate. The head is not retractable. The posterior protuberances bear several long spines. Distribution is widespread. In *Kijanebalola*, the trunk is ovate and loricate. The head is retractable. The posterior protuberances are spike-shaped and lack spines. *Kijanebalola* has been reported from Uganda and Louisiana, in the United States.

Members of this family inhabit bogs and the vegetated margins of freshwater ponds and lakes.

**Proichthyidae.** Tenpin-shaped animals, 70–150  $\mu\text{m}$  in length. The locomotor cilia are normal and are arranged in fields or longitudinal rows. Adhesive tubes are located at the tips of a caudal furca. A corona of setose bristles is borne across the top of the head. The cuticle is naked, and lacks armature. Proichthyids are parthenogenetic. [See illustration page 860.]

The family comprises 2 genera, *Proichthyidium* and *Proichthyidioides* (1 species each), inhabiting freshwater ponds. In *Proichthyidium*, the locomotor cilia are uniform and are restricted to the head; otherwise, cephalic cilia are missing. *Proichthyidium* has been reported from Argentina. In *Proichthyidioides*, the locomotor cilia form two longitudinal rows from the head onto the trunk. The head has numerous tactile cilia. *Proichthyidioides* has been reported from Japan.

**Xenotrichulidae.** Tenpin-shaped animals, 80–280  $\mu\text{m}$  in length. Locomotor cilia are located beneath the pharynx and are inserted in fields or longitudinal rows as tightly packed hypotrichous cirri. The posterior end is furcate. The branches are scaled and, typically, rigid, and bear apical adhesive tubes. Cuticular armature is present. Xenotrichulids are hermaphroditic or parthenogenetic. [See illustration page 860.]

The family comprises 3 genera: *Xenotrichula* (16 species), *Draculiciteria* (1 species), and *Heteroxenotrichula* (1 species). In *Xenotrichula*, the locomotor cirri are of one size. Midbelly tufts are present. The pharynx lacks an anterior bulb. The trunk scales are typically pedunculate. Species are hermaphroditic. They are common and frequently abundant (to 22/10  $\text{cm}^3$  of sediment). In *Draculiciteria*, the locomotor cirri are of one size. Midbelly tufts are absent. The head is sharply demarcated. The pharynx has an anterior bulb. The trunk scales are flattened and overlapping. The furcal branches are elongate and flaccid. *Draculiciteria* is parthenogenetic. It is uncommon. In *Heteroxenotrichula*, the locomotor cirri are variable in size. Midbelly tufts are present. The pharynx has an anterior bulb. The trunk scales are simple (foliaceous or appressed) or pedunculate. *Heteroxenotrichula* is hermaphroditic. It is common but seldom abundant (to 3/10  $\text{cm}^3$  of sediment).

Members of this family inhabit brackish to marine sandy sediments from the upper littoral zone onto the upper continental shelf.