

FAIRBAIRN ODD COUPLES (2013)

SUPPLEMENTARY TABLE A

Allocation of reproductive function in the Animal Kingdom: proportion of species with asexual and sexual reproduction, frequency of dioecy in sexual species, type of hermaphroditism where present, and patterns of sexual dimorphism in dioecious species. Estimates are shown separately for each of the 31 animal phyla and their constituent classes.^{a,b,c}

<i>PHYLUM, class, description</i>	<i>No. of species</i>	<i>Reproduction</i>		<i>Dioecy</i>	<i>Hermaphroditism^d</i>	<i>Sexual dimorphism (SD)</i>
		<i>Asexual^e</i>	<i>Sexual</i>			
ACANTHOCEPHALA						
Spiny- or thorny-headed worms						
Archiacanthocephala Small (<2.5 cm) intestinal parasites with complex life cycles involving intermediate hosts (mainly insects, centipedes and millipedes) and definitive hosts (primarily terrestrial birds and mammals).	172	none	all	all	none	Females larger than males (up to 3 times longer and 15 times larger by volume) ^f ; also SD in proboscis shape, number and pattern of proboscis hooks, trunk spination, and genital papillae; males mature earlier and die more rapidly than females.
Eocanthocephala As above. Definitive hosts are fishes and reptiles; intermediate hosts are crustaceans.	167	none	all	all	none	As above.
Palaeacanthocephala As above. Primary hosts are aquatic vertebrates.	>800	none	all	all	none	As above and also dwarf males (1/64 th the size of females) in some species.
ANNELIDA						
Segmented worms						
Clitellata Oligocheates (incl. earthworms) and leeches: primarily terrestrial and freshwater.	4150	minority	majority	none	s, pa	n/a

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		<i>Asexual^e</i>	<i>Sexual</i>	<i>Dioecy</i>		
<p>Polychaeta^g Primarily benthic marine worms; many sessile; found in diverse habitats including hydrothermal vents.</p>	>9000	rare	majority	majority	s, pa	Females generally larger than males and sometimes thicker-bodied; SD also in number of nephridial papillae, genital papillae, position of the genital opening and shape of the pygidial appendages; SD can be extreme with dwarf males showing great reduction in size and simplification of morphology; males may live within the female's body.
ARTHROPODA						
<p>Arachnida Eight-legged, flightless arthropods incl. spiders, scorpions, mites and ticks; primarily terrestrial and freshwater.</p>	74,000	rare	majority	all	none	Females generally larger than males and this can be pronounced; SD often also in shape and color; male spiders have specialized intromittent appendages (pedipalps).
<p>Branchiopoda Small, freshwater crustaceans incl. fairy shrimp and cladocerans.</p>	800	majority	majority	majority	s	Females generally about two times larger than males and may have brood pouches; males have copulatory organs.
<p>Cephalocarida Horseshoe shrimp: small (< 4 mm), primitive, marine crustaceans found in soft sediments; suspension feeders.</p>	9	none	all	none	s	n/a
<p>Chilopoda Centipedes: fast-moving, many-legged carnivorous arthropods primarily found in soils and leaf litter; a few marine species.</p>	3000	rare	almost all	all	none	Females often have more segments than males; slight SD also in shape of segments and gonopodia. ^h

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		<i>Asexual^e</i>	<i>Sexual</i>	<i>Dioecy</i>		
Diplopoda Millipedes: many-legged, slow-moving, terrestrial, detritus feeders.	10,000	rare	almost all	all	none	Little SD other than gonopodia; females sometimes longer and thicker than males; occasional SD in color.
Entognatha Small, wingless, six-legged arthropods closely related to insects; primarily springtails (collembolans).	4900	minority	majority	all	none	Generally little or no SD in size but females can be larger than males; SD in shape of antennae at terminal abdominal segments ⁱ
Insecta Insects: six-legged arthropods; majority winged and terrestrial.	>10 ⁶	minority	majority	almost all	s	Common and diverse SD; can be pronounced; females usually larger than males but the reverse occurs; SD also in color and in shape and size of body segments, genitalia and appendages; male appendages often specialized for detecting pheromones, sexual signals, sperm transport or grasping females; females often with specialized ovipositors.
Malacostraca Crustacean arthropods including crabs, lobsters, shrimp, eupausids (“krill”), stomatopods (mantis shrimp), amphipods and isopods.	>27,000	rare	majority	minority	pa, s	Males often larger than females because females grow more slowly after maturity, but the reverse also occurs; dwarf males common in parasitic isopods (<i>Bopyrus</i>) and some species (e.g. <i>Jaera</i>) have both small and large males; male appendages often specialized for detecting pheromones, sexual signals, sperm transport or grasping females. Female appendages often modified for holding eggs. Color differences are common in crabs, shrimp and stomatopods.
Maxillopoda Crustacean arthropods including barnacles, copepods and several smaller groups. Most species are planktonic and free-living, but	10,300	minority	majority	majority	s	Diverse, often pronounced SD, especially in copepods and barnacles; females usually larger than males; dwarf males occur in both groups; female shape often modified for egg brooding; male appendages modified for grasping females

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		<i>Asexual^e</i>	<i>Sexual</i>			
sessile and parasitic forms are also common.						and transferring sperm; some males have very large copulatory organs; in copepods, sexes often differ in color. ⁱ
Merostomata Horseshoe crabs: marine, chelicerid arthropods (not true crabs).	4	none	all	all	none	Females about 20% larger than males; in males, first pair of walking legs (pedipalps) modified for grasping females.
Ostracoda Seed or mussel shrimp: small (< 1 mm) arthropods with a bivalved carapace (shell); found in marine or freshwater sediments.	8000	minority	majority	all	none	Males slightly larger than females; male fifth limb palps enlarged for copulation; females have a protruding genital lobe.
Paupoda Small (<1.5mm) soil arthropods resembling centipedes or collembola.	500	rare	majority	all	none	None reported.
Pycnogonida Sea spiders: bottom-dwelling, carnivorous, marine arthropods with four pairs of legs. Typically the legs are very long and thin (6 to 7 times longer than the body).	1000	none	all	all	none	Negligible SD in size (males about 1% larger); males have specialized appendages (ovigera) for brooding of eggs.
Remipedia Primitive, blind, cave-dwelling crustaceans.	17	none	all	none	s	n/a
Symphyla Garden centipedes: small (< 12 mm), blind arthropods with 15-24 body segments and 10-12 pairs of legs; herbivorous and found in soil	160	majority	all	all	none	None reported.

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		<i>Asexual^e</i>	<i>Sexual</i>			
and leaf litter. Not true centipedes.						
BRACHIOPODA						
Lamp shells						
Articulata Sessile, solitary, benthic, marine bivalves with articulated valves.	300	none	all	majority	s	Little SD other than gonad color; valves of females that brood are sometimes shaped to accommodate the brood pouch ^k .
Inarticulata As above but valves do not articulate.	50	none	all	all	none	As above.
CEPHALORHYNCHA						
Kinorhyncha Very small (< 1 mm), spiny animals with 13 segments and eversible heads; found in muddy marine sediments; active predators on bacteria.	150	none	all	all	none	Little SD; males have penile spines; sometimes SD in shape of trunk segments. ^l
Loricifera Very small (< 0.5 mm), segmented animals with eversible heads; posterior segments encased in six overlapping plates (lorica); sessile; found in sandy marine sediments.	120	majority	almost all	all	none	Females slightly larger than males; SD in number and shape of spines and plates; male spines and plates modified for pheromone detection and clasping females during copulation. ^m
Priapulida Penis worms: unsegmented, benthic, marine worms with eversible heads; some have long tails; found in muddy sediments; predators or detritus feeders; <1 cm to 20 cm long.	20	rare	all	all	none	One genus (<i>Tubilucus</i>) shows SD: males have many more and varied cuticular protuberances especially on the ventral abdomen and associate with the genital pores.

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		<i>Asexual^e</i>	<i>Sexual</i>			
CHAETOGNATHA Arrow worms: active, pelagic, marine predators; < 15 cm long; transparent; use long spines to capture prey; possess neurotoxins to immobilize prey.	80	none	all	none	s	n/a
CHORDATA ⁿ						
Cephalochordata Lancelets: small (< 10 cm), marine, fish-shaped animals with a dorsal notochord and nerve chord; live partially buried in sand; filter feeders.	29	none	all	majority	s	No SD; even gonads indistinguishable except during the breeding season.
CHORDATA (Urochordata)						
Tunicates						
Appendicularia Small (most < 6 mm), marine, pelagic tunicates resembling ascidian tadpole larvae; individuals float within a gelatinous “house” through which they filter water to collect food particles.	60	none	all	none	pa, pg	n/a
Ascidiacea Sea squirts: sessile, benthic tunicates consisting of a bag-like body with two prominent siphons; usually attached to substrates; may be solitary or colonial; filter feeders; have an active, dispersing, tadpole-like larval stage.	2,512	majority	all	none	s, pa, pg?	n/a

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Thaliacea Transparent, pelagic tunicates abundant in subtropical oceans; filter feeders; primarily small (< 5 cm) if solitary; colonial species larger.	70	all	all	none	pa, pg	n/a
CHORDATA (Vertebrata)						
Actinopterygii Ray-finned fishes: familiar bony fishes of marine and freshwaters (e.g., salmon, perch, carp, tuna).	24,000	rare	almost all	majority	pg, pa, s	Females generally larger than males but males often larger in species with male-male combat or male paternal care; SD for size shows greatest range of any class in the Animal Kingdom, from dwarf males to males more than 12 times heavier than females; also SD in color and shape (especially fin size and shape).
Amphibia Amphibians: frogs, toads, caecilians, salamanders and newts.	6151	rare	almost all	all	none	Females generally larger than males but males usually larger in species with male-male combat or paternal care. ^o
Aves Birds	9700	none	all	all	none	Males usually larger than females, but females larger in some groups; slight SD in shape; diverse and pronounced SD in color and plumage, usually males more conspicuous.
Cephalaspidomorphi Lampreys	42	none	all	all	none	Slight SD in shape (males thinner) and fin length; other secondary sexual differences are apparent only during the reproductive season (e.g. males have enlarged genital papillae; females develop keel behind the cloaca).
Elasmobranchii Sharks, skates, rays: marine fishes with cartilaginous skeletons, 5 – 7 gill slits.	815	none	all	all	none (possibly 1 sp.)	Females generally larger, but males larger in some species; SD in shape (males thinner), head (male flatter), mouths and teeth; pelvic fins of males absent.

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		<i>Asexual^e</i>	<i>Sexual</i>	<i>Dioecy</i>		
Holocephali Chimeras, ratfish, ghost sharks: marine fishes with cartilaginous skeletons, large heads and long thin tails. Gill slits are covered by an operculum.	35	none	all	all	none	Females generally larger than males; males have pelvic claspers and extra claspers on their heads
Mammalia Mammals	4629	none	all	all	none	Males larger than females in 45% of species, an average 18% heavier than females overall ^q ; females slightly larger in only 3 orders; SD in shape, color, pelage, tooth size, horns and antler females have mammary glands; intromittent organs and scrotal sacks often externally obvious in males.
Myxini Hagfishes: elongate, jawless vertebrates; marine scavengers and predators.	72	none	all	none? ^r	pa, a	n/a
Reptilia Reptiles: turtles, crocodylians, snakes, lizards and tuatara.	8743	rare	almost all	all	none	Females larger in most turtles and snakes, but males larger in most lizards and crocodylians; extreme SD in larger pythons where females may weigh more than 10 times as much as males ^s ; SI also in body shape, tail length, head size, color, scales, and crests.
Sarcopterygii Lobe-finned fishes: lung fish and coelacanths	8	none	all	all	none	Females generally larger than males; some species show slight SD in head shape, fin robustness and vascularization of pelvic fins.

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CNIDARIA						
Radially symmetrical, mainly marine predators with mouths surrounded by tentacles; armed with stinging nematocysts.						
Anthozoa Anemones, corals, sea fans: marine, mainly sessile, often colonial.	6,100	all	all	majority	s, pa, pg	SD in color and externally visible gonad color. Females sometimes thicker because of ripe eggs
Cubozoa Box jellies: mainly solitary and pelagic.	20	all	all	all	none	SD in visible gonad color; some females have colored velar spots. [†]
Hydrozoa Variable forms including freshwater hydra, calcareous, colonial hydrocorals, and pelagic, colonial Portuguese-man-of-war.	2,700	all	majority	majority	s	SD in externally visible gonad color; occasional SD in color; number of tentacles; SD in gonophores common (number, distribution, shape); females sometimes have brood pouches.
Scyphozoa Jellies or jellyfishes: mainly solitary and pelagic.	200	majority	all	majority	s, pa	SD in externally visible gonad color.
Staurozoa Stalked jellies	50	all	all	all or almost all	none or rare	SD in externally visible gonad color.
CTENOPHORA						
Comb jellies: small, radially-symmetrical, marine animals with 8 rows of long, iridescent cilia; predaceous, pelagic and transparent.						
Nuda	22	none	all	none	s	n/a
Tentaculata	78	minority	all	rare	s, pa	SD in externally visible gonad color ^u

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CYCLIOPHORA						
Eucycliophora Microscopic, external parasites of lobsters.	2	all	all	all	none	Dwarf males greatly reduced in size, shape and complexity.
ECHINODERMATA						
Pentameric, radially symmetrical adults with water vascular systems.						
Astroidea Sea stars or starfishes	1600	rare	almost all	majority	s, pa, pg	Generally no SD, but in two species of <i>Xyloplax</i> (Sea Daisies), males are smaller than females and have penile projections. ^v
Crinoidea Sea lilies, feather stars	700	none	all	all	none	Generally no SD, but in species that brood eggs, females have visible brood pouches; males mature at a slightly smaller size than females. ^w
Echinoidea Sea urchins, sand dollars	1000	rare	all	majority	s	Generally no SD, but occasionally SD in shape or in length of genital papillae. Female shape sometimes modified for brooding young. ^x
Holothurioidea Sea cucumbers	1200	rare	almost all	majority	s, pa	Generally no SD, but males may have longer genital papillae than females.
Ophiuroidea Brittle stars	2100	rare	all	majority	s, pa	Females larger than males in some species, and dwarf males occur; SD in many skeletal characteristics such as the number and size of discal scales, the number and length of arm spines and length of genital papillae. ^y
Somasteroidea	1	?	?	?	?	?

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		<i>Asexual^e</i>	<i>Sexual</i>			
ECHIURA						
Echiurida Spoon worms: bottom-dwelling, unsegmented, marine worms with sac-like bodies and an extensible, anterior projection (proboscis) for collecting food particles; live in burrows or rock crevices.	160	none	all	all	none	Generally no SD, but dwarf males in one genus (<i>Bonellia</i>) live within the female's body.
ECTOPROCTA						
Moss animals or bryozoans: mainly marine, sedentary, colonial animals; secrete a hard, non-living body wall; encrust surfaces with distinct, geometrically-patterned colonies.						
Gymnolaemata	4000	all	all	minority	pa	Females have specialized pore for release of egg
Phylactolaemata	540	all	all	none	pa	n/a
ENTOPROCTA						
Goblet worms: small (microscopic to several mm long), stalked, sessile, suspension feeders; mainly marine; solitary or colonial; many commensal on annelid worms.	150	all	all	majority	pa, s	Generally no SD but females reported to be smaller than males in two species and larger in one; female brood pouches may be visible through the body wall when distended.
GASTROTRICHA						
Diverse and very abundant group of very small (0.06 – 3 mm), primarily benthic animals that adhere to sand grains with adhesive tubules; marine and freshwater; consume microalgae, bacteria and protozoans.	725	majority	minority	none	s, pa, pg, a	n/a

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GNATHOSTOMULIDA Jaw worms: microscopic (< 1mm), benthic, marine worms; live interstitially within fine sandy and silt sediments; soft-bodied but with hardened jaws used to scrape bacteria and fungi from sediments.	80	none	all	none	s, pa	n/a
HEMICHORDATA						
Enteropneusta Acorn worms: quite large (0.02 – 2.5 m), benthic marine worms; distinctive three-part body consists of a muscular proboscis, a collar and an elongate trunk; generally burrow through sediment; deposit or suspension feeders.	75	minority	majority	all	none	Generally no SD; a few species have SD in color of genital region ^z and gonads may be visible through the body wall.
Pterobranchia Small (< 1mm) colonial, benthic, marine tube worms; excrete rigid tubes.	15	all	all	rare	s, pa?, pg?	Generally no SD; females sometimes larger than males; one species shows SD in color and number of arms. ^{aa}
MESOZOA						
Orthonectida Internal parasites of marine invertebrates; microscopic; very simplified with only 20-30 cells and no true organs or tissues.	20	all	all	all	none	Females twice as long as males; SD in shape and distribution of cilia.
Rhombozoa Parasites in the kidneys of cephalopods; < 8 mm long; simple body with two cell layers and < 30 cells.	65	all	all	none	s	n/a

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MOLLUSCA						
Aplacophora Small (a few mm), worm-shaped, deep-water, marine molluscs with numerous calcareous spines or scales, but no true shell.	320	none	all	minority	s	Slight SD in epithelium surrounding the gonoduct; ripe gonads are sometimes visible externally.
Bivalvia Pelecypods including clams, scallops, mussels and oysters: molluscs with a hinged, two-valved shell and a laterally flattened body.	15,000	none	all	majority	pa, pg, s	Usually none, but SD in shell shape, gonad size and gonad color in some species; females sometimes larger than males; dwarf males in commensal species are parasitic on females. ^{bb}
Cephalopoda Octopods, squid, nautiloids: active, predatory, marine molluscs with flexible arms and a siphon; single shell reduced and internal except in nautiloids.	600	none	all	all	none	SD often pronounced in size, morphology and life history: reproductive organs of males (e.g. hectocotyl arm in octopods and squid) swollen and obvious when in reproductive condition; dwarf males common in parasitic forms and in pelagic octopods and squid; males may mature before females and have shorter lifespans. ^{cc}
Gastropoda Snails and slugs: single-shelled or shell-less molluscs; bodies and shells exhibit twisting or torsion; diverse lifestyles; marine, freshwater and terrestrial.	62,000	rare	all	minority	pa, a	Females often larger and more robust; dwarf males occur in some parasitic species, where females > 10 times larger than males; males may mature before females and have shorter lifespans. Occasionally foot slightly darker in females. ^{dd}
Monoplacophora Small (< 4 cm), marine, mainly abyssal (depths > 2000 m) molluscs with single, cap-like shells. ^{ee}	31	none	all	all	none	None reported.

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<p>Polyplacophora Chitons: small (most < 5 cm) mollusks with single shells formed by 7 - 8 overlapping and articulating plates.</p>	922	none	all	majority	s	Generally no SD but in at least one species, <i>Chiton tuberculatus</i> , the foot is pink in females and males are slightly larger than females. Gona sometimes differ in color and are visible. ^{ff}
<p>Scaphopoda Tusk shells: marine, sedentary, benthic molluscs with tusk-shaped shells open at both ends; live burrowed in bottom sediments with heads down and posterior shell end protruding.</p>	>500 ^{gg}	none	all	all	none	SD in shape of the posterior apex of the mantle; SD in gonad shape and color visible in species with translucent shells (e.g. <i>Dentalium antillarum</i>). ^{hh}
<p>MYXOZOAⁱⁱ Microscopic, spore-forming, extra-cellular parasites mainly of fish and aquatic annelids.</p>	1250	all	all	none	s	n/a
<p>NEMATODA Roundworms: unsegmented worms with a circular cross section; approximately 19% are parasitic on plants or animals; most are microscopic, but animal parasites can exceed 1 m.</p>						
<p>Adenophorea Primarily free-living but some parasitic; mostly marine and freshwater.</p>	>12,000	minority	majority	majority	s ^{jj}	SD common, especially in parasitic forms; females longer and thicker than males; males have a curved or bent tail and may have a genital copulatory bursae or papillae and copulatory spicules; dwarf males occur and may live inside the female's uterus; females often live longer than males.

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Secernentea Mostly terrestrial; about 50% are parasitic.	>5000	minority	majority	majority	s ^{kk}	SD common, especially in parasitic forms; females up to 10 times longer; males thinner and have a curved or bent tail, copulatory spicules, genital cone and caudal papillae; females often less mobile and live longer than males. ^{ll}
NEMATOMORPHA Horsehair worms: long (up to 2 m), thin, unsegmented worms; adults free-living and aquatic (mainly freshwater) but juveniles parasitic on terrestrial arthropods.	305	none	all	all	none	Females longer and thicker than males in most species; one species has larger males; SD in shape of posterior end; males more active and search for females. ^{mmm}
NEMERTEA Ribbon worms: long, thin, unsegmented worms; bodies flattened dorsoventrally.						
Anopla Generally small (< 10 cm) but can be very long (> 50 m); primarily marine, free-living predators.	600	rare	majority	majority	pa	SD usually negligible, but sometimes SD in gonad color (seen externally) and size (females larger).
Enopla Generally small (< 10 cm) free-living predators but some commensal or parasitic on crustaceans, molluscs, annelids and other invertebrates; primarily benthic and marine but some freshwater and terrestrial.	650	rare	majority	majority	s, pa	SD in size usually slight (males smaller) but can be pronounced, especially in parasitic species (females 4 times the length of males); occasional SD in shape body color (females red, males pale and shape, as well as gonad color. ^{oo}
ONYCHOPHORA Velvet worms: many-legged, soft-bodied, terrestrial animals of moist, tropical forests; body 2 – 15 cm long with 15 – 45 segments, each with a pair of thick, unjointed legs; many are predaceous.	100	rare (1 sp.)	all	all	none	SD in size (some females 3 – 4 times heavier than males and males have fewer segments), gonopores, heads (males have sexual ornamentation on their heads) and appendages (males have fewer legs).

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PHORONIDA Horseshoe worms: sedentary, benthic, marine worms; live in burrows lined with chitinous tubes; up to 50 cm long but very thin; usually only the tentacles (lophophore) are visible.	12	minority	all	rare	s	SD usually minimal but in at least one species males have larger lophophoral organs than females and an epithelial fold or collar under the lophophore. ^{pp}	
PLACOZOA ^{qq} Simplest of all animals with only 4 cell types and no true gonads; < 3 mm in diameter, transparent disks.	1	all	all?	?	?	?	
PLATYHELMINTHES Flatworms							
Cestoda Tapeworms: flattened worms with bodies divided into distinct segments (proglottids), each of which contains multiple ovaries and testes; most are intestinal parasites of vertebrates.	5000	majority	all	none ^{rr}	s, pa	n/a	
Trematoda Flukes: non-segmented, flattened worms; digenea are internal parasites with very complex life cycles including at least one molluscan intermediate host and a vertebrate definitive host; monogenea are external or internal parasites, mainly of aquatic vertebrates.	16000	majority	all	rare	s	Females longer and thinner than males and have specialized ventral groove for fertilization.	

<i>PHYLUM, class, description</i>	<i>No. of species</i>	<i>Reproduction</i>			<i>Hermaphroditism^d</i>	<i>Sexual dimorphism (SD)</i>
		<i>Asexual^e</i>	<i>Sexual</i>	<i>Dioecy</i>		
Turbellaria Free-living flatworms: non-segmented, 0.5 – 50 cm long and extremely flattened; mainly benthic, marine and free-living.	3000	minority	majority	rare	s, pa, pg	In one genus (<i>Kronborgia</i>) females are longer and thinner than males; males more active; dwarf males may occur in one species. ^{ss}
PORIFERA						
Sponges: very simple, sessile, colonial animals with no organs, nerves or musculature; all aquatic, mainly marine suspension feeders; structural support from internal spicules.						
Calcarea Spicules composed of calcium carbonate; marine.	400	all	all	rare	pg	None.
Demospongia Spicules made of protein (spongin) or silica; mainly marine, 300 species freshwater.	4,750	majority	all	minority	s, pg	Freshwater sponges tend to be dioecious; one species (<i>Halichondria moorei</i>) shows slight SD color during reproduction.
Hexactinellida Glass sponges: six-rayed, silica spicules; deep-water (> 200 m), marine.	500	majority	all	none	s	n/a
ROTIFERA						
Rotifers						
Eurotatoria Microscopic with a distinct, ciliated anterior corona; mainly freshwater; most free-living, suspension feeders; some sessile and carnivorous.	1850	all ^{tt}	majority	all	none	Females 10 – 20 times longer than males; males usually structurally reduced, have a copulatory apparatus, swim faster and have shorter lifespan than females. ^{uu}

<i>PHYLUM, class, description</i>	<i>No. of species</i>	<i>Reproduction</i>			<i>Hermaphroditism^d</i>	<i>Sexual dimorphism (SD)</i>
		<i>Asexual^c</i>	<i>Sexual</i>	<i>Dioecy</i>		
Pararotatoria Small (2-3mm) ectosymbionts on marine crustaceans.	3	none	all	all	none	Slight SD in size: males larger than females in o species, females larger than males in another; slight SD in shape; males have a cloacal fold and a fold on their head that may aid in fertilization.
SIPUNCULA Peanut worms: small (most a few mm), benthic marine worms; deposit or detritus feeders; most live in burrows, crevices or cast-off shells.	320	rare	majority	almost all	pa (1 sp.)	Gonadal color sometimes visible through the body wall.
TARDIGRADA Water bears						
Eutardigrada Very small (< 1.2 mm), often transparent animals with head, four body segments and four pairs of stout legs; most live in surface films of freshwater on plants.	435	majority	majority	majority	s	SD in size (females larger), shape, appendages and gonopores. ^{ww}
Heterotardigrada As above but in marine environments and rarely fully aquatic.	345	minority	majority	all	none	Females longer than males but with shorter appendages and claws; SD in gonopores. ^{xx}

^a Primary data sources include Breder and Rosen (1966), Geise and Pearse (1974, 1975a,b, 1977, 1979), Ghiselin (1974), Blackwelder and Shepherd (1981), Bell (1982), Charnov (1982), Adiyodi and Adiyodi (1989, 1990, 1992, 1993, 1994), Lombardi (1998), Conn (2000), Pechenik (2005), Jarne and Auld (2006), de Meeùs et al (2007) and Hickman et al. (2007). Additional sources are given for specific taxa.

^b Taxonomy and nomenclature follow the ITIS Catalogue of Life: 2008 Checklist (Bisby 2008). Phyla are listed alphabetically and their order does not reflect degree of evolutionary relatedness. Classes are listed alphabetically within phyla where recognized class designations exist. Common names are given in parenthesis for phyla or classes, as appropriate.

^c Species counts refer to the approximate number of known, living species and are primarily from Pechenik (2005), Hickman et al. (2007) and Bisby (2008).

^d Hermaphroditism may be simultaneous (s), protandric (pa), protogynous (pg) or alternating (a). Where multiple modes are listed, the order indicates relative frequency.

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- ^e Asexual reproduction includes processes such as fission or budding that do not involve gamete production, and also parthenogenesis, in which females produce offspring from unfertilized eggs. Many species are capable of both sexual and asexual reproduction.
- ^f Poulin & Morand (2000)
- ^g Hilario et al (2011) put the worms in the former class Pogonophora (beard worms: solitary, marine, tube worms of deep ocean bottoms) in the polychaete family Siboglinidae.
- ^h Minelli et al. (2000)
- ⁱ Sharma and Metz (1976), Hopkin (1997)
- ^j Gilbert (1983), Poulin, 1996, Ohtsuka and Huys (2001)
- ^k James et al. (1991)
- ^l Neuhaus & Higgins (2002)
- ^m Kristensen (2002)
- ⁿ The classes within the phylum Chordata are grouped within the three major evolutionary lineages, the cephalochordates (lancelets), urochordates (tunicates) and vertebrates.
- ^o Shine (1979), Kupfer (2007)
- ^p Breder and Rosen (1966), Sims (2005), Filiz & Taskavak (2006)
- ^q Lindenfors et al. (2007)
- ^r Each individual has male and female gonads but only one may become functional.
- ^s Cox et al. (2007)
- ^t Lewis and Long (2005)
- ^u Harbison and Miller (1986)
- ^v O’Loughlin (2001)
- ^w Vail (1987)
- ^x Hamel and Himmelman (1992), Emler (2002)
- ^y O’Loughlin (2001), Stöhr (2001), Tominaga et al (2004)
- ^z Hadfield (1975)
- ^{aa} Hadfield (1975)
- ^{bb} Sastry (1979), Heller (1993)
- ^{cc} Lu (2001)
- ^{dd} Coe (1944), Webber (1977), Heller (1993)
- ^{ee} See Gowlett-Holmes (2001) and Schwabe (2008) for the number and distribution of known species.
- ^{ff} Crozier (1920), Pearse (1979)
- ^{gg} Lamprell and Healy (2001)
- ^{hh} McFadien-Carter (1979)
- ⁱⁱ The taxonomy of Myxozoa is unresolved. Two classes have been proposed (Microsporea and Myxosporea) but are combined here because species counts are not available by class (Kent et al 2001). In both classes, sexual reproduction occurs by formation of haploid nuclei within a spore called a pansporocyst (a process called gametogony), which then unite to form an autogamous zygote.
- ^{jj} Some species develop male function first and store sperm for self-fertilization once female gonads mature.
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^{ll} Maggenti (1981), Poulin (1997)

^{mmm} Schmidt-Rhaesa (2002), Cochran et al. (2004)

ⁿⁿ Stricker et al. (2000), Döhren and Bartolomaeus (2006)

^{oo} McDermott and Gibson (1993), Roe (1993), Stricker et al. (2000)

^{pp} Temereva and Malakhov (2001)

^{qq} Placozoan taxonomy, life history and modes of reproduction are poorly understood (Pearse and Voigt 2007). Most reproduction is asexual but sexual reproduction has been inferred from the production of eggs under stressful conditions in laboratory culture.

^{rr} Only one species (*Dioecotaenia cancellata*) is reputedly dioecious and this is disputed (Campbell 1970, Bell 1982, Adiyodi and Adiyodi, 1993).

^{ss} Two species in the genus *Kronborgia*; both are internal parasites of arthropods (Giese and Pearse 1974).

^{tt} Includes the Bdelloidea which are exclusively parthenogenic and Monogonota which reproduce parthenogenically and sexually.

^{uu} Gilbert and Williamson (1983)

^{vv} Formerly the class Seisonidae. Information on SD from Ricci et al. (1993).

^{ww} Guldberg and Kristensen (2006), Garey et al. (2008)

^{xx} Claxton (1996), Garey et al. (2008)