

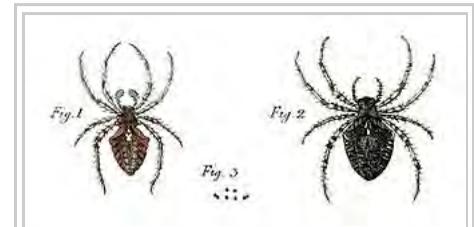
# Spider taxonomy

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**Spider taxonomy** is the taxonomy of the spiders, members of the Araneae order of the arthropod class Arachnida with about 46,000 described species. However, there are likely many species that have escaped the human eye to this day, and many specimens stored in collections waiting to be described and classified. It is estimated that only one third to one half of the total number of existing species have been described.<sup>[1]</sup>

Arachnologists currently divide spiders into two suborders with about 114 families.

Due to constant research, with new species being discovered every month and others being recognized as synonyms, the number of species in the families is bound to change and can never reflect the present status with total accuracy. Nevertheless, the species numbers given here are useful as a guideline – see the table of families at the end of the article.



Paintings of *Araneus angulatus* from *Svenska Spindlar* of 1757, the first major work on spider taxonomy

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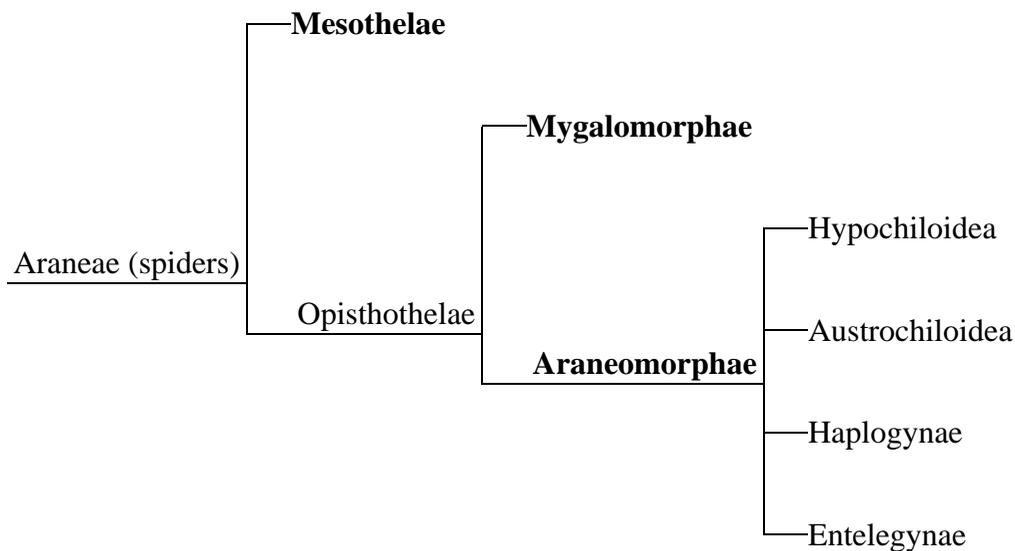
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## History

Spider taxonomy can be traced to the work of Swedish naturalist Carl Alexander Clerck, who in 1757 published the first binomial scientific names of some 67 spiders species in his *Svenska Spindlar* ("Swedish Spiders"), one year before Linnaeus named over 30 spiders in his *Systema Naturae*. In the ensuing 250 years, thousands more species have been described by researchers around the world, yet only a dozen taxonomists are responsible for more than a third of all species described. The most prolific authors include Eugène Simon of France, Norman Platnick and Herbert Walter Levi of the United States, Embrik Strand of Norway, and Tamerlan Thorell of Sweden, each having described well over 1,000 species.<sup>[2]</sup>

## Overview of phylogeny

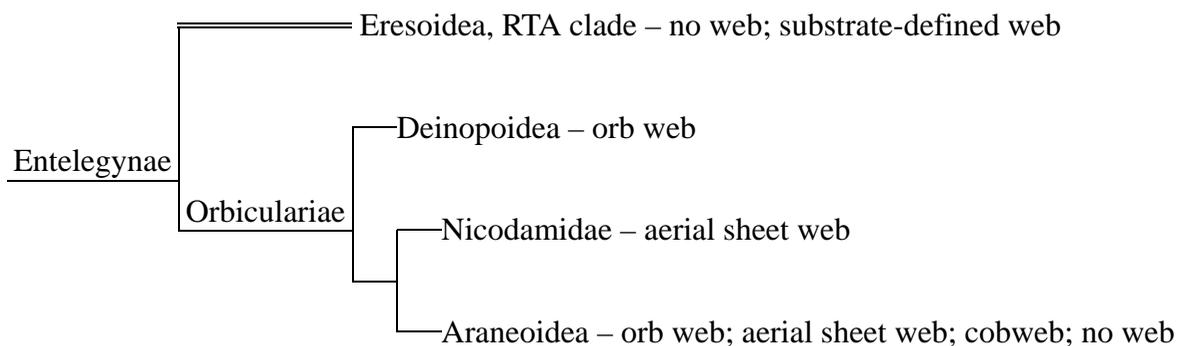
At the very top level, there is broad agreement on the phylogeny and hence classification of spiders, which is summarized in the cladogram below. The three main clades into which spiders are divided are shown in bold; as of 2015, they are usually treated as one suborder, Mesothelae, and two infraorders, Mygalomorphae and Araneomorphae, grouped into the suborder Opisthothelae.<sup>[3][4]</sup> The Mesothelae, with only 9 species, make up an insignificant proportion of the total of around 45,000 known species. Mygalomorphae species comprise around 6% of the total, the remaining 94% being in the Araneomorphae.<sup>[note 1]</sup>



The Araneomorphae are divided into two main groups: the Haplogynae and the Entelegynae. The Haplogynae make up about 10% of the total number of spider species, the Entelegynae about 83%.<sup>[note 1]</sup> The phylogenetic relationships of the Haplogynae, Entelegynae and the two smaller groups Hypochiloidea and Austrochiloidea remain uncertain as of 2015. Some analyses place both Hypochiloidea and Austrochiloidea outside Haplogynae;<sup>[5]</sup> others place the Austrochiloidea between the Haplogynae and the Entelegynae;<sup>[6][7]</sup> the Hypochiloidea have also been grouped with the Haplogynae.<sup>[8]</sup> Earlier analyses regarded the Hypochiloidea as the sole representatives of a group called the Paleocribellatae, with all other araneomorphs placed in the Neocribellatae.<sup>[9]</sup>

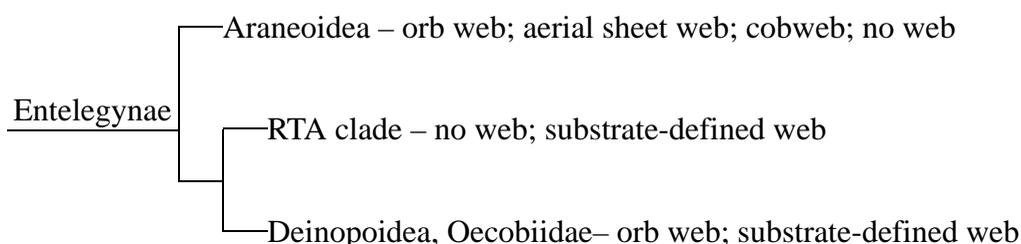
The Haplogynae are a group of araneomorph spiders with simpler male and female reproductive anatomy than the Entelegynae. Like the mesotheles and mygalomorphs, females have only a single genital opening (gonopore), used both for copulation and egg-laying;<sup>[10]</sup> males have less complex palpal bulbs than those of the Entelegynae.<sup>[11]</sup> Although some studies based on both morphology and DNA suggest that the Haplogynae form a monophyletic group (i.e. they comprise all the descendants of a common ancestor),<sup>[12][8]</sup> this hypothesis has been described as "weakly supported", with most of the distinguishing features of the group being inherited from ancestors shared with other groups of spiders, rather than being clearly indicative of a separate common origin (i.e. being synapomorphies).<sup>[13]</sup> One phylogenetic hypothesis based on molecular data shows the Haplogynae as a paraphyletic group leading to the Austrochilidae and Entelegynae.<sup>[14]</sup>

The Entelegynae have a more complex reproductive anatomy: females have two "copulatory pores" in addition to the single genital pore of other groups of spiders; males have complex palpal bulbs, matching the female genital structures (epigynes).<sup>[12]</sup> The monophyly of the group is well supported in both morphological and molecular studies. The internal phylogeny of the Entelegynae has been the subject of much research. Two groups within this clade contain the only spiders that make vertical orb webs: the Deinopoidea are cribellate – the adhesive properties of their webs are created by packets of thousands of extremely fine loops of dry silk; the Araneoidea are ecribellate – the adhesive properties of their webs are created by fine droplets of "glue". In spite of these differences, the webs of the two groups are similar in their overall geometry.<sup>[15]</sup> The evolutionary history of the Entelegynae is thus intimately connected with the evolutionary history of orb webs. One hypothesis is that there is a single clade, Orbiculariae, uniting the orb web makers, in whose ancestors orb webs evolved. A review in 2014 concluded that there is strong evidence that orb webs evolved only once, although only weak support for the monophyly of the Orbiculariae.<sup>[16]</sup> One possible phylogeny is shown below; the type of web made is shown for each terminal node in order of the frequency of occurrence.<sup>[17]</sup>



If this is correct, the earliest members of the Entelegynae made webs defined by the substrate on which they were placed (e.g. the ground) rather than suspended orb webs. True orb webs evolved once, in the ancestors of the Orbiculariae, but were then modified or lost in some descendants.

An alternative hypothesis, supported by some molecular phylogenetic studies, is that the Orbiculariae are paraphyletic, with the phylogeny of the Entelegynae being as shown below.<sup>[18]</sup>



On this view, orb webs evolved earlier, being present in the early members of the Entelegynae, and were then lost in more groups,<sup>[19]</sup> making web evolution more convoluted, with different kinds of web having evolved

separately more than once.<sup>[16]</sup> Future advances in technology, including whole-genome sampling, should lead to "a clearer image of the evolutionary chronicle and the underlying diversity patterns that have resulted in one of the most extraordinary radiations of animals".<sup>[16]</sup>

## Suborder Mesothelae

Mesothelae resemble the Solifugae ("wind scorpions" or "sun scorpions") in having segmented plates on their abdomens that create the appearance of the segmented abdomens of these other arachnids. They are both few in number and also limited in geographical range.

- Arthrolycosidae (primitive spiders, extinct)
- Arthromygalidae (primitive spiders, extinct)
- Liphistiidae (primitive burrowing spiders)

## Suborder Opisthothelae

Suborder Opisthothelae contains the spiders that have no plates on their abdomens. It can be somewhat difficult on casual inspection to determine whether the chelicerae of members are of the sort that would classify them as mygalomorphs or araneomorphs. The spiders that are called "tarantulas" in English are so large and hairy that inspection of their chelicerae is hardly necessary to categorize one of them as a mygalomorph. Other, smaller, members of this suborder, however, look little different from the araneomorphs. (See the picture of *Sphodros rufipes* below.) Many araneomorphs are immediately identifiable as such since they are found on webs designed for the capture of prey or exhibit other habitat choices that eliminate the possibility that they could be mygalomorphs.



Digitally enhanced image of a *Sphodros rufipes* that shows the nearly perfectly vertical orientation of the chelicerae, a prime characteristic of the Mygalomorphae.

## Infraorder Mygalomorphae

Spiders in infraorder Mygalomorphae are characterized by the vertical orientation of their chelicerae and the possession of four book lungs.

## Infraorder Araneomorphae

Most, if not all, of the spiders one is likely to encounter in everyday life belong to infraorder Araneomorphae. It includes a wide range from the spiders that weave their distinctive orb webs in the garden, the more chaotic-looking webs of the cobweb spiders that frequent window frames and the corners of rooms, the crab spiders that lurk waiting for nectar- and pollen-gathering insects on flowers, to the jumping spiders that patrol the outside walls of a dwelling, and so on. They are characterized by having chelicerae whose tips approach each other as they bite, and (usually) having one pair of book lungs.

Some important spider families are :

- Pholcidae (daddy long-legs spiders)



*Megaphobema robustum*, one of the many kinds of spiders called "tarantulas"

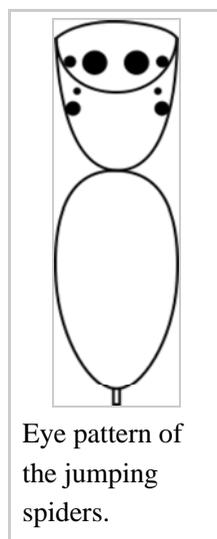
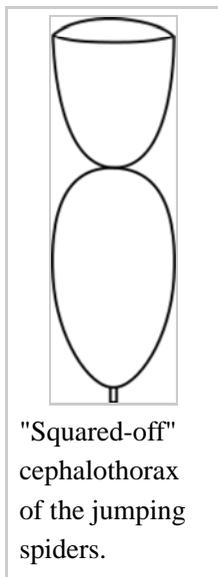
These spiders are frequently seen in cellars. When light contact disturbs their web their characteristic response is to set the entire web moving the way a person would jump up and down on a trampoline. It is unclear why they cause their webs to vibrate in this way; moving their webs back and forward may increase the possibility that insects flying close by may be ensnared, or the rapid gyrations caused by the spider in its web may make the spider harder to target by predators.

- Salticidae (jumping spiders)

The family of Salticidae commonly called jumping spiders have a characteristic cephalothorax shapes, as shown in the diagram below. They have eight eyes, two of them very prominent, and excellent vision. Their maximum size is perhaps 13/16 inch (20 mm), but many species are much smaller than that. The largest North American species such as *Phidippus regius*, *P. octopunctatis*, etc., are so heavy bodied that they cannot jump far. The smaller species of jumping spider can jump many times their own body length. They hunt by first getting within range of a prey animal such as a fly, securing a silken "climbing rope" to their current perch, and then jumping onto their prey and biting it. Many seem to take unerring aim at the neck of their prey. Should they jump from one twig to another in an attempt to capture prey and miss or get knocked off the second twig by their struggling prey then they are protected from falling by their silken lifeline. At night these spiders usually retreat to a silken "pup tent" that they construct for their own protection and, when needed, as a place to deposit their eggs. They are frequently seen in sunlit areas on walls, tree trunks, and other such vertical surfaces. They are perhaps the only family of spiders who will take cognizance of a human in their general area and then turn their bodies and elevate their cephalothoraxes to keep the human under observation. If approached closely, e.g., with the lens of a camera, some of them may choose to jump onto the nearby object to explore it. This behavior may be alarming but it never seems to be aggressive since these spiders are unwilling to attack prey that are very much larger than they are.



Photograph showing orientation of the chelicerae of the Araneomorphae.



## Classification above families

Spiders were long classified into families that were then grouped into superfamilies, some of which were in

turn placed into a number of higher taxa below the level of infraorder. When more rigorous approaches, such as cladistics, were applied to spider classification, it became clear that most of the major groupings used in the 20th century were not supported. Many were based on shared characters inherited from the ancestors of multiple clades (plesiomorphies), rather than being distinctive characters originating in the ancestors of that clade only (apomorphies). According to Jonathan A. Coddington in 2005, "books and overviews published prior to the last two decades have been superseded".<sup>[20]</sup> Listings of spiders, such as the World Spider Catalog, currently ignore classification above the family level.<sup>[20][21]</sup>

At the higher level, the phylogeny of spiders is now often discussed using informal clade names, such as the "RTA clade",<sup>[22]</sup> the "Oval Calmistrum" clade or the "Divided Cribellum" clade.<sup>[23]</sup> Older names previously used formally are used as clade names, e.g. Entelegynae and Orbiculariae.<sup>[24]</sup>

## Table of families

### Key

Genera	1	≥2	≥10	≥100
Species	1–9	≥10	≥100	≥1000

Spider families<sup>[note 2]</sup>

Family	Genera	Species	Common name	Example
<b>Mesothelae</b>				
Liphistiidae	8	96	segmented spiders	Kimura spider
<b>Opisthothelae: Mygalomorphae</b>				
Actinopodidae	3	47		<i>Missulena</i> (mouse spiders)
Antrodiaetidae	2	35	folding trapdoor spiders	<i>Antrodiaetus riversi</i>
Atypidae	3	51	purse web spiders	Red legged purseweb spider
Barychelidae	42	295	trapdoor baboon spiders	<i>Sason sundaicum</i>
Ctenizidae	9	130	cork-lid trapdoor spiders	<i>Cteniza sauvagesi</i>
Cyrtachaeniidae	11	107	wafer trapdoor spiders	<i>Amblyocarenum nuragicus</i>
Dipluridae	24	188	funnel-web tarantulas	Spruce-fir moss spider
Euctenizidae	7	75		<i>Aptostichus simus</i>
Hexathelidae	12	113	venomous funnel-web tarantulas	Sydney funnel-web spider
Idiopidae	22	323		Black rugose trapdoor spider
Mecicobothriidae	4	9	dwarf tarantulas	
Microstigmatidae	7	16		<i>Envia garciai</i>
Migidae	10	91	tree trapdoor spiders	
Nemesiidae	45	390		Black wishbone spider
Paratropididae	4	10	baldlegged spiders	
Theraphosidae	131	981	tarantulas	Goliath birdeater
<b>Opisthothelae: Araneomorphae</b>				
Agelenidae	70	1168	araneomorph funnel-web spiders	Hobo spider
Amaurobiidae	51	287	tangled nest spiders	<i>Callobius claustrarius</i>
Ammoxenidae	4	18		
Amphinectidae	32	159		<i>Metaltella simoni</i>
Anapidae	38	154		
Anyphaenidae	56	542	anyphaenid sac spiders	Yellow ghost spider
Araneidae	169	3097	orb-weaver spiders	<i>Zygiella x-notata</i>
Archaeidae	4	71	pelican spiders	<i>Eriauchenius gracilicollis</i>
Austrochilidae	3	9		Tasmanian cave spider
Caponiidae	15	98		<i>Diploglena capensis</i>
Chummidae	1	2		
Cithaeronidae	2	8		
Clubionidae	15	587	sac spiders	<i>Clubiona trivialis</i>

Corinnidae	67	729	dark sac spiders	<i>Castianeira</i> sp.
Ctenidae	41	503	tropical wolf spiders	Brazilian wandering spiders
Cyatholipidae	23	58		
Cybaeidae	10	179		Water spider
Cycloctenidae	5	36		
Deinopidae	2	61	net-casting spiders	Rufous net-casting spider
Desidae	38	185	intertidal spiders	<i>Phryganoporus candidus</i>
Dictynidae	52	578		<i>Nigma walckenaeri</i>
Diguetidae	2	15	coneweb spiders	
Drymusidae	1	16	false violin spiders	
Dysderidae	24	534	woodlouse hunter spiders	Woodlouse spider
Eresidae	9	97	velvet spiders	<i>Eresus sandaliatus</i>
Eutichuridae	12	343		<i>Cheiracanthium mildei</i>
Filistatidae	18	121	crevice weavers	Southern house spider
Gallieniellidae	10	55		
Gnaphosidae	122	2178	flat-bellied ground spiders	<i>Drassodes cupreus</i>
Gradungulidae	7	16	large-clawed spiders	Carrai cave spider
Hahniidae	28	249	dwarf sheet spiders	
Hersiliidae	15	179	tree trunk spiders	<i>Hersilia savignyi</i>
Holarchaeidae	1	2		
Homalonychidae	1	3		
Huttoniidae	1	1		<i>Huttonia palpimanoides</i>
Hypochilidae	2	12	lampshade spiders	<i>Hypochilus thorelli</i>
Lamponidae	23	192		White-tailed spider
Leptonetidae	22	272		Tooth cave spider
Linyphiidae	601	4533	dwarf / money spiders	<i>Linyphia triangularis</i>
Liocranidae	32	272	liocranid sac spiders	
Lycosidae	123	2403	wolf spiders	<i>Lycosa tarantula</i>
Malkaridae	4	11	shield spiders	
Mecysmaucheniidae	7	25		
Micropholcommatidae	19	66		
Mimetidae	13	158	pirate spiders	<i>Oarces reticulatus</i>
Miturgidae	33	159	long-legged sac spiders	
Mysmenidae	13	135	spurred orb-weavers	<i>Mysmenopsis</i> sp.

Nephilidae	5	61	golden-orb web spiders	<i>Nephila pilipes</i>
Nesticidae	13	228	cave cobweb spiders	<i>Nesticella marapu</i>
Nicodamidae	9	29		
Ochyroceratidae	15	187	midget ground weavers	<i>Theotima minutissima</i>
Oecobiidae	6	110	disc web spiders	<i>Oecobius navus</i>
Oonopidae	112	1613	dwarf hunting spiders	<i>Oonops domesticus</i>
Orsolobidae	30	188		
Oxyopidae	9	453	lynx spiders	Green lynx spider
Palpimanidae	16	139	palp-footed spiders	
Pararchaeidae	7	35		
Penestomidae	1	9		
Periegopidae	1	3		
Philodromidae	30	539	philodromid crab spiders	<i>Philodromus dispar</i>
Pholcidae	79	1461	daddy long-legs spiders	<i>Pholcus phalangioides</i>
Phrurolithidae	14	197		
Phyxelididae	14	64		
Pimoidae	4	38		<i>Pimoida cthulhu</i>
Pisauridae	47	335	nursery web spiders	<i>Pisaura mirabilis</i>
Plectreuridae	2	31		
Prodidomidae	31	309	long-spinneret ground spiders	<i>Lygromma anops</i>
Psechridae	2	57		
Salticidae	588	5841	jumping spiders	Zebra spider
Scytodidae	5	232	spitting spiders	<i>Scytodes thoracica</i>
Segestriidae	4	120	tubeweb spiders	<i>Segestria florentina</i>
Selenopidae	10	256	wall spiders	<i>Selenops radiatus</i>
Senoculidae	1	31		
Sicariidae	2	139	recluse spiders	Brown recluse
Sinopimoidae	1	1		
Sparassidae	85	1180	hunter spiders	Avondale spider
Stenochilidae	2	13		
Stiphidiidae	22	135		<i>Tartarus mullamullangensis</i>
Symphytognathidae	8	71	dwarf orb-weavers	<i>Patu digua</i>
Synsphyridae	3	13		
Synotaxidae	14	82		

Telemidae	9	62	long-legged cave spiders	
Tetrablemmidae	31	160	armored spiders	
Tetragnathidae	47	973	long jawed orb-weavers	Orchard spider
Theridiidae	122	2459	cobweb spiders	Redback spider
Theridiosomatidae	18	109	ray spiders	<i>Theridiosoma gemmosum</i>
Thomisidae	175	2150	crab spiders	Goldenrod spider
Titanoecidae	5	53		<i>Goeldia obscura</i>
Trachelidae	16	208		
Trechaleidae	16	120		
Trochanteriidae	19	152		
Trogloaraptoridae	1	1		<i>Trogloaraptor marchingtoni</i>
Udubidae	4	12		
Uloboridae	18	272	hackled orb-weavers	<i>Uloborus walckenaerius</i>
Viridasiidae	2	9		
Zodariidae	81	1095		<i>Zodarion germanicum</i>
Zoropsidae	25	177		<i>Zoropsis spinimana</i>

## Notes

- Species counts from Platnick & Raven (2013, Table 1), family classification from Coddington (2005, p. 20).
- Currently accepted families and counts based on the World Spider Catalog version 16.5 as of 6 November 2015.<sup>[25]</sup> Assignment to sub- and infraorders based on Coddington (2005, p. 20) (when given).

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20. Coddington (2005), p. 24.
21. World Spider Catalog (2015).
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## External links

- Abbreviations for Insect and Spider Collections of the World (<http://hbs.bishopmuseum.org/codens/codens-inst.html>)
- International Commission on Zoological Nomenclature (<http://www.iczn.org/iczn/index.jsp?article=23&nfv=#9>)
- European and Australian spiders - info and identification (<http://www.xs4all.nl/~ednieuw>)
- Spiders of Europe and Greenland (<http://www.jorgenlissner.dk/>)
- Information about the largest spider (<http://www.largestspider.info/>)

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