

The Arachnogeography and the “lines” (of Wallace, Lydekker, Weber)

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Abstract: The paper is an attempt to use the orders of Arachnida for checking the importance of the lines of Wallace, Lydekker and Weber for the distribution of these animals. From the orders of Arachnida some (Ricinulei and Solifugae almost) are missing from the analyzed area (Indomalayan and Australian regions). The distribution of the other orders relatively to the “lines” has been analysed. None of the orders of Acari (Opilioacarida, Prostigmata, Acaridida, Oribatida, Mesostigmata, Ixodida and Holothyrida) is limited by the “lines”.

There is no order of Arachnida living only on one side of the “lines”. Only the spider suborder Mesothelae seems to be limited to the Western side. It is to notice the VACHON’s opinion (1953) (“lines On peut cependant affirmer que la ligne Wallace pour certaines formes de Scorpions – est une frontière réellement existante”) – it could be confirmed what concerns the scorpions. There are families and genera known only on one side, but it is a relatively low level of endemism. Nothing similar to the endemic orders and even subclasses in the vertebrates which are the base of the construction of the lines exists what concerns the Arachnida.

Key words: lines, Arachnozoogeography, Wallacea, Indomalayan Region, Australian Region

Evaluation of Wallace’s Line and the other lines in South East Asia according to the Arachnida

Ref.: AUDLEY-CHARLES (1981), AUDLEY-CHARLES, HURLEY & SMITH (1982), AUDLEY-CHARLES, CARTER & MILSON (1972), CLOUSE & GIRIBET (2007), DARLINGTON (1957), GEORGE (1981), GRESSITT (1956, 1959, 1967, 1982), HACHISUKA (1936), HALL (1997, 1998, 2001, 2002, 2009), HALL & HOLLOWAY (eds)(1998), HOOIJER (1975), KARIG (1974), KATILI (1971, 1975, 1978), KAYASHIMA (1955), KRIZHANOVSKIJ (1980, 2002), LOPATIN (1980, 1989), LYDEKKER (1896, 1911), MAYR (1939, 1944, 1945), MERTENS (1950), SIMPSON (1977), STODDART (1992), SZYMKOWIAK, GÓRSKI & BAJERLEIN (2007), TIKADER & BASTAWADE (1983), UDVARDY (1975), VORIS (2000), WALLACE (1860, 1869, 1876), WHITMORE, ed. (1981, 1987).

“La frontière, en biogéographie, n’est pas, en général, une ligne, mais une zone complexe dont l’emplacement et la topographie ont subi de multiples variations au cours des temps

géologiques... On peut cependant affirmer que la ligne Wallace – pour certaines formes de Scorpions – est une frontière réellement existante”.

Max VACHON (1953)

Wallace’s Line

In result of his studies of the nature of Australasia, WALLACE (1860) concluded that “We may consider it established that the Strait of Lombok [between Bali and Lombok] (only 15 miles wide) marks the limit and abruptly separates two of the great zoological regions of the globe”. This famous line, called by HUXLEY (1868) “Wallace’s line”, runs through Makassar Strait between Borneo and Sulawesi and than ... The line was based mostly on mammals, but MAYR (1944) made the remark that “An equally pronounced faunal difference exists among birds, insects, and other groups of animals in the two regions”.

When crossing the famous line in 1994 and 1995, I asked myself: “Is this statement true also for such zoogeographically interesting animals as Arachnida?”. Meanwhile, a lot of new information was accumulated on the taxonomy of such groups

as Schizomida, Opiliones, Scorpiones and others and time has come to check how this zoogeographical “rift” (the term belongs to Prof. Vachon) reflects the past and present distribution of the various Arachnida. Some orders (the Ricinulei, almost the Solifugae) are not known in this area.

Lydekker’s Line

The line proposed in 1895 by the British naturalist Richard Lydekker (1849-1915) separates Wallacea from the shelf of Australia – New Guinea.

Weber’s Line

Max Weber (1852-1937) proposed a line passing between Sulawesi and Halmahera and marks the balance of the Indomalayan and Australian elements in the fauna. It is a line based on mammals and should be tested what concerns the invertebrates (Arachnida and others).

Wallacea

Observing for a long time the strange transition in the animal world of the islands of Malay Archipelago, Wallace presumed, “such facts could be explained only by major changes in the Earth’s surface”. Now we know that in the Pleistocene the major continental islands Borneo, Java, Sumatra and Bali have been connected with the Asian mainland. The rainforest existed by this time and the sea level was lower by 180 m. That is why on these islands we find the same animals like in Malaya (sometimes other subspecies) – elephants, rhinos, tapirs, tigers, leopards, primates. Some of them meanwhile have disappeared on the continent, but still live on the islands (the orangutans).

Crossing the narrow (only 25 km) Lombok Chanel between Bali and Lombok all these animals disappear. Cockatoo parrots appear, as well as some marsupials, different reptiles.

During his research between 1854 and 1862 Wallace found that the birds on Bali and Java are almost the same (97%), as soon as we cross the 25 km straight the picture changes abruptly – Bali and Lombok have only 50% of their bird species in common, one may think that the others were not capable to fly over this distance. Starts Wallacea, most interesting territory of a mix of fauna.

The ancestors of the present day animals and plants of Wallacea as a whole originate either from Asia or from Australia – New Guinea, but on the bigger islands occurred an active autochthonous speciation and there are many endemics. Some of the emblematic Indonesian endemics are actually inhabiting Wallacea (anoa, babirusa, “Komodo dragon”). Most islands have not been interconnected, they are

separated by deep straights and this was important to explain the high endemism.

According to Conservation International, Wallacea has more than 10 000 species of plants, including ca. 1500 (15%) endemic. Among the terrestrial vertebrates the endemism is even higher: from 1142 species almost half (529) are endemics. In Wallacea live 223 species of native mammals, 126 of them endemics. Only bats count 124 species – almost one tenth of the world’s bats.

The birds of Wallacea are extremely diverse (650 species, including 265 endemic). More than half of them live on Sulawesi alone (356 species, 96 endemic).

In Wallace’s time the area has been covered by lush tropical forests. Only small fraction of them remains – 45% of the surface is covered by some sort of forest, but only on 52,017 km², or 15%, the forest is in its pristine state. From the total surface of Wallacea (347,000 km²) ca. 20,000 km² are protected (at least legally). The remaining forest is most often under concessions of powerful western or Japanese companies, which destroy not only the irreplaceable rainforest, but also hundreds of its described, semi-described and undescribed inhabitants.

SIMPSON (1977) critically reviewed the seven biogeographical lines assigned in the Malay Archipelago to mark the boundary of Indomalayan and Australian zoogeographic regions. In his conclusion, he suggested to (1) keep Huxley’s line and Lydekker’s line as they were clear-cut boundaries of Oriental, or Indomalayan (Sunda shelf) region and Australian (Sahul shelf) region respectively, and (2) not assign the intervening islands to any region or transitional zone.

For the invertebrates the importance of the “lines” seems less explored. One of the recent studies (BOUDOURESQUE, 2011) shows that “patterns of species diversity and diversity measured at higher taxonomic levels are not concordant”.

Development of Wallacea and the surrounding lands of Southeast Asia and the Malayan archipelago

Principal geological events important to Wallace’s line (partly after AUDLEY-CHARLES, 1981)

years	Million Period
10	Pleistocene
20	Pliocene
30	Miocene
40	Oligocene
50	Eocene
60	Palaeocene
70	

Q – Quaternary

1. Australia/New Guinea splits from Antarctica (c. 53 Ma).
2. Formation of Philippines by collision of Asian continental fragment with an island arc (Oligocene)
3. Possible land connection(s) across Makassar Strait (mid-Miocene)
4. Collision between New Guinea and a Tertiary island arc (c.15 Ma).
5. Collision between Gondwana (Sula Peninsula) and Laurasia at or near east Sulawesi (c. 15 Ma) but submarine.
6. Island chain established between east Sulawesi and Australia (late Miocene to late Pliocene)
7. Collision between parts of Gondwanic Outer Banda Arc and Laurasian (volcanic) Inner Banda Arc (latest Miocene to early Pliocene).
8. Probable land connection(s) across south Makassar Strait (from late Pliocene).

The analysis of MOSS & WILSON (1998) concerning the biogeographic implications of the Tertiary palaeogeographic evolution of Sulawesi and Borneo are worth quoting. Wallacea, according to them, is a biogeographic region, situated between areas with Asiatic and Australian floras and faunas, where organisms show a high degree of endemism. A land connection between Borneo and mainland SE Asia may have existed throughout much of the Tertiary and would have allowed migration of terrestrial biota. Western Sulawesi had been connected to eastern Borneo by the late Cretaceous and by the early Eocene with possibilities of dispersal of fauna between Borneo and western Sulawesi. The East Sulawesi ophiolite was accreted onto Sulawesi during or after the late Oligocene and resulted in the formation of more extensive land areas of Sulawesi. “Microcontinental fragments accreted onto eastern Sulawesi in the Miocene to Pleistocene may have been emergent as they drifted towards Sulawesi and allowed island hopping or rafting for biota of Australian affinity. Island hopping routes for the dispersal of organisms between Borneo-Sulawesi and the Philippines may have existed along volcanic arcs, such as the long-lived North Sulawesi arc, the Sulu and Sangihe arcs, and the Cagayan arc” (MOSS & WILSON, 1998).

If we analyse the paleogeographical maps of Australasia in HALL (1998), we can make several observations. If we quote this article: “The period 30-0 Ma is of most interest to biogeographers; before then the separation between Asia and Australia was greater and the tectonic reconstructions are also more uncertain”. More realistic and of importance for the recent fauna is the time of the last 20 Ma.

20 Ma (Early Miocene) Continent including most of Borneo. Only small parts of Sumatra, Java and Sulawesi were dry land as islands. Australia and New Guinea interconnected. Eastern New Guinea and Taiwan under water, Hainan part of the continent. Makassar Strait existed.

15 Ma (Middle Miocene) Similar situation. The Barisan of Sumatra cut into several islands, the remaining Sumatra, Java, Bali and Lombok under water, as well as Taiwan. Torres and Makassar Straits existing. Borneo part of continent, Sulawesi isolated.

10 Ma (Late Miocene) The Sumatran Barisan, Java, Timor, Sulawesi and the central part of New Guinea land. Strait between the larger Australia and central New Guinea existing. Continent largely connected with Borneo and very narrowly connected with Sumatra. Hainan part of the continent, Taiwan under water.

5 Ma (Early Pliocene) – in Continental Southeast Asia the land mass is almost as present, but is connected with Borneo and Sumatra. The shape of Borneo, Java and Sumatra is almost as it is now, the northern coast of Sumatra is covered by shallow sea between Sumatra and Malakka. In New Guinea only the northern part is land, Northern Australia reaches more to the north, but between northern New Guinea and the enlarged land on the present day Carpentaria Bay there was a large strait, much wider than than the Torres Strait. Hainan was under shallow water, Taiwan was connected with mainland China.

Arachnida and the lines

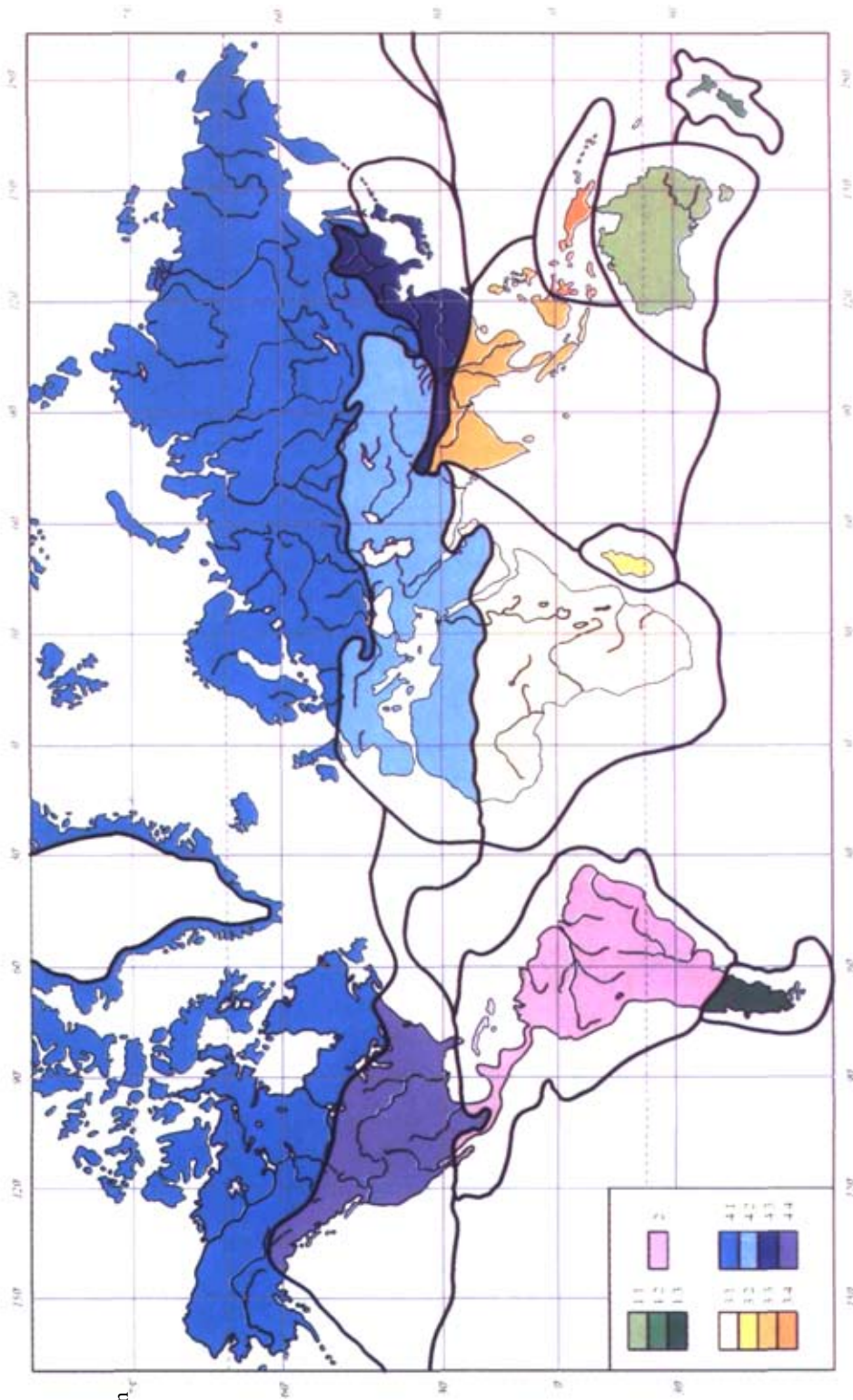
The order Ricinulei does not live in Southeast Asia and has no relations with the “lines”. Solifugae is represented only by one species (*Dinorhax rostrumppittaci* Simon) in Vietnam and Maluku Islands (both sides of Wallace’s Line, but only on the West side of the Lydekker’s Line). Practically the order is missing from both Indomalayan and Australian regions.

Palpigradi

Ref.: CONDÉ (1980, 1981, 1984, 1988, 1989, 1990, 1992a, 1992b, 1994, 1996)

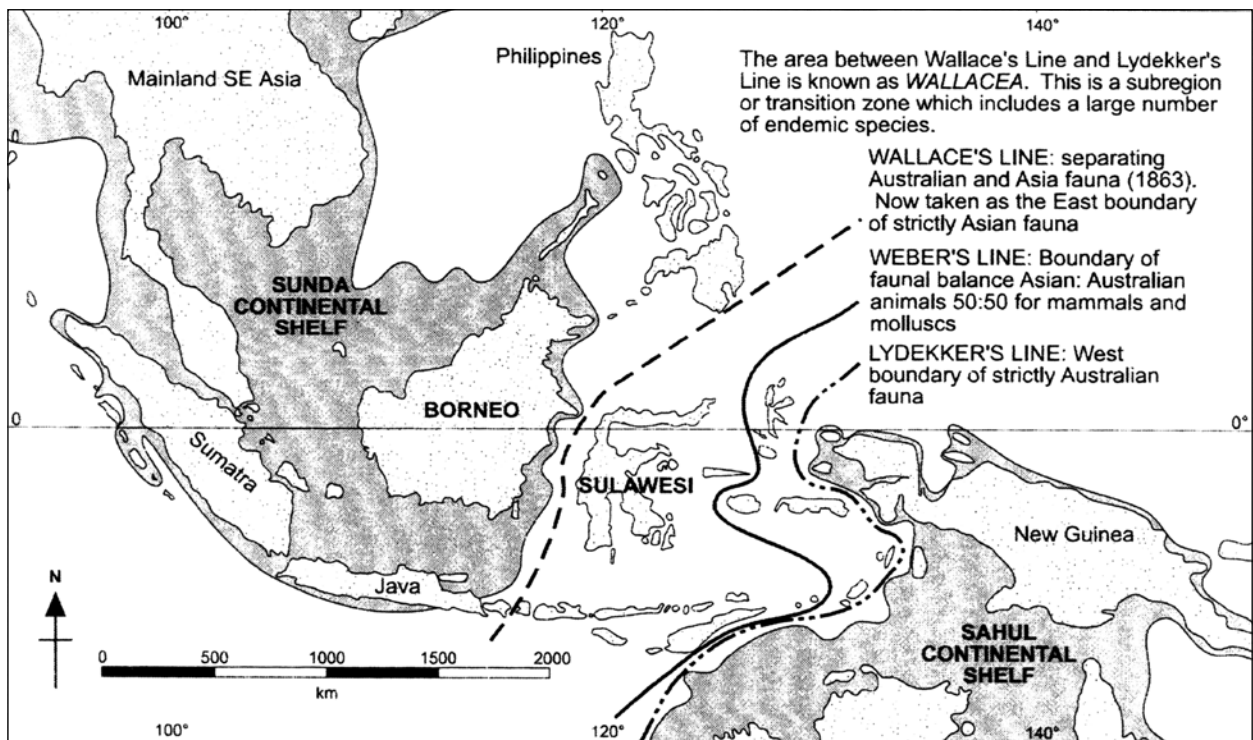
Two families (Eukoeneriidae and Prokoeneriidae) are represented in the area.

Only West of Wallace’s line: In Thailand were found 8 sp. of Palpigradi: *Prokoeneria asiatica* Condé, 1994 (Prokoeneriidae), and 6 sp. of Eukoeneriidae – *Eukoeneria angusta* (Hansen, 1901), *E. deleta* Condé, 1992, *E. lyrifer* Condé, 1992, *E. siamensis* (Hansen, 1901) *E. thais* Condé, 1988, *Koeneriodes leclerci* Condé, 1992, and *K. spiniger* Condé, 1984. All of them are known only from this country (endemics). CONDÉ (1992) recorded *Koeneriodes made-*



- 1 – Notogean Kingdom
- 1.1 – Australian Region
- 1.2 – New Zealand Region
- 1.3 – Chilean-Patagonian Region
- 2 – Paletropical Kingdom
- 2.1 – Indo-Malayan Region
- 2.2 – Papuan Region
- 2.3 – Afrotropical Region
- 2.4 – Madagascan Region

Zoogeographical subdivision of the Earth (after KRIZHANOVSKIY, 2002)



SE Asia and the continental shelves (in grey) after Moss & Wilson, 1998

cassus from Hong Kong (the first Palpigradi known from China).

Prokoenia javanica Condé, 1991, is known from Java, *P. celebica* Condé, 1994.

After CONDÉ (1996), “La région orientale semble avoir été un foyer d'évolution important dans l'histoire des Palpigrades: tous les genres actuels y sont représentés et leur dispersion, jusque dans la région madecasse, en particulier, est un fait bien établi”.

Only West of Wallace's Line remain the family Prokoeniidae and the genus *Prokoenia*.

Only East of Wallace Line: In Papua New Guinea have been recorded only two sp.: *Eukoenia* cf. *lawrencei* and *Koeneniodes* cf. *frondiger* (fam. Eukoeniidae).

Both sides: fam. Eukoeniidae (genera *Eukoenia* and *Koeneniodes*).

Amblypygi

Ref.: BASTAWADE et al. (2005), BLICK & HARVEY (2011), CAPORIACCO (1947), FAGE (1939, 1954), GIUPPONI & MIRANDA (2012), GRAVELY (1911, 1915), HARVEY (2002, 2003, 2013), HARVEY & WEST (1998), KARSWCH (1879), KRAEPELIN (1895, 1899), POCOCK (1894), QUINTERO (1981, 1983, 1986), RAHMADI & HARVEY (2008), RAHMADI et al. (2010), ROEWER (1928), ROWLAND (1973), SEITER et al. (2015), SIMON (1892), THORELL (1888, 1889).

Two families are widely represented in the area: Charinidae and Charontidae, both on both sides of the Wallace's Line. Special case is the only species of *Phrynus* (from the American family Phrynidae) from a cave on Flores (Indonesia). According to WEYGOLD et al. (2010): “.. some details and other characters suggest that *P[hrynus] exsul* has no close relation with any of the Neotropical species of *Phrynus* Lamarck, 1793, probably having been evolutionary distinct for a long time from the Neotropical species of *Phrynus*. Its occurrence on the Indonesian Island Flores thus remains an enigma; is *P. exsul* a relic from a more global distribution of the genus *Phrynus* in the past or the result of prehistoric rafting across the ocean?”.

Only West of Wallace's line: *Catageus* Thorell, 1889 – Burma

Only East of Wallace's line – none.

Both sides:

Charinus Simon, 1892 (= *Charinides* Gravelly) – Australia, Andaman Isls, India, W. Samoa, Vanuatu, Indonesia (Java, Borneo), Singapore, Malaysia, Papua New Guinea, New Caledonia, Solomon Isls

Sarax Simon, 1892 (= *Phrynichosarax* Gravelly) – Solomon Isls, Malaysia, Singapore, Philippines (Luzon), Indonesia (Java, Kalimantan), India, Andaman Isls, Papua New Guinea, New Britain, Vietnam, Laos, Cambodia, Borneo

Charon Karsch, 1879 – Australia (Northern Territory, Queensland, Christmas Isl.), Indonesia (Java, Maluku, Sumbawa), Malaysia (incl. Borneo), Palau, Papua New Guinea, Philippines, Singapore, Solomon Islands

Stygophrynus Kraepelin, 1895 – Solomon Islands (Guadalcanal), Burma, Thailand, Vietnam, Malaysia, Indonesia (Java, Sumatra, Kalimantan)

Uropygi (Thelyphonida)

Ref.: HAUPT (2004, 2009a), KREHENWINKEL et al. (2009), POCOCK (1894), ROWLAND (1973), SPEIJER (1936), STRAND (1928), THORELL (1889)

Many species of the two subfamilies of Uropygi are known from the area (from both sides of the Wallace's line): Thelyphoninae and Hypoctoninae.

Only West of Wallace's line:

Chajnus Speijer, 1936 – Sunda Islands (Lombok)

Ginosigma Speijer, 1936 – Sunda Islands, Thailand

Hypoctonus Thorell, 1889 – Burma (Myanmar), South China, Malaysia, Thailand, Bangladesh, Java, India

Typopeltis Pocock, 1894 (= *Teltus* Speijer, 1936) – China, Russia, Taiwan, Hainan, Japan, Thailand, Vietnam

Only East of Wallace's line:

Glyptoglutus Rowland, 1973 – Philippines (Panay)

Thelyphonoides Krehenwinkel et al., 2009 – Philippines (Panay)

Mimoscorpis Pocock, 1894 – Philippines

Both sides:

Thelyphonus Latreille, 1802 (= *Abaliella* Strand, 1928 = *Minbosius* Speijer, 1936 = *Tetrabalius* Thorell, 1889, fide HAUPT, 2009a) – Indonesia, Singapore, Philippines, Vanuatu (New Hebrides), Fiji, Rennell, Solomon Islands, New Guinea, New Britain, Burma, Sri Lanka, India, Thailand, W. Samoa, Borneo, Mollucas

Schizomida

Ref.: COKENDOLPHER (1988), COKENDOLPHER & REDDELL (2000), COKENDOLPHER et al. (1988), FERNANDO (1957), GRAVELY (1911a, 1911 b, 1911c, 1912, 1915), HARVEY (1992, 2002, 2003), PICKARD-CAMBRIDGE (1972), POCOCK (1900), REDDELL & COKENDOLPHER (1995), SHIMOJANA (1981), SISSOM (1980).

One family (Hubbardiidae) is represented in the area.

Only West of Wallace's Line:

Schizomus Pickard-Cambridge, 1872

Clavizomus Reddell et Cokendolpher, 1995 – Java, West Malaysia, Singapore

Trithyreus Kraepelin, 1899 – Burma (= Myanmar)

Zomus Reddell et Cokendolpher, 1995 – Malaysia (incl. Sarawak), Singapore; England (Kew Garden)

Only East of Wallace's Line:

Julattenius Harvey, 1992 – 2 sp. in Australia (Queensland)

Notozomus Harvey, 1992 – 17 sp. in Australia (Queensland)

Orientzomus Cokendolpher et Tsurusaki, 1994 – Philippines (Luzon), Japan, Bonin Isl.

Hubbardiidae indet. – New Guinea, New Britain, New Ireland; "*Schizomus*" *modestus*

Both sides:

Apozomus Harvey, 1992 – Australia, Japan, Papua New Guinea, Taiwan, Sabah (Borneo), W. Malaysia, Vietnam

Bamazomus Harvey, 1992 – Thailand, Hong Kong, W. Malaysia, Ryukyu Isls, Papua New Guinea, Australia, Hawaii

Ovozomus Harvey, 2001 – Seychelles, Comoro Isl., Cook Isl., Ceylon, India, Christmas Isl., Reunion

From Sri Lanka are known the first Schizomid ever described: *Schizomus crassicaudatus* Pickard-Cambridge, 1872, and also several other "*Schizomus*" needing further study (*buxtoni* Gravelly, *formicoides* Fernando, *greeni* Gravelly, *perplexus* Gravelly, *vittatus* Gravelly). The species *Schizomus peradeniyensis* Gravelly has been assigned to the genus *Ovozomus* by HARVEY (2011). *Trithyreus suboculatus* Pocock is declared nomen dubium.

Scorpiones

Ref.: DI et al. (2011, 2013), FAGE (1933, 1946), FET (1988, 2003), KOCH (1977, 1981), KOPSTEIN (1921, 1923, 1926), KOVARIK (1995), LOURENÇO (2003, 2007), LOURENÇO & DINH-SAC PHAM (2010), MONOD (2011), MONOD & PRENDINI (2015), NENILIN & FET (1992), SHI & ZHANG (2005), TAKASHIMA (1941, 1945, 1948, 1950), VACHON (1953, 1972, 1982), ZHU et al. (2004)

Seven families of scorpions are known from the area.

Only West side of Wallace's Line:

Fam. Chaerilidae – Bangladesh, India, Indonesia, Malaysia, Nepal, Singapore, Sri Lanka, Vietnam

Fam. Pseudochactidae – caves of Laos and Vietnam

Fam. Scorpiopidae – Southeast Asia, India, Indonesia, Malaysia

Fam. Scorpionidae – South and Southeast Asia, Indonesia

Only East side of Wallace's Line:

Fam. Urodacidae – Australia

Both sides:

Fam. Buthidae – all continents, tropical, subtropical countries and in some countries with moderate climate

Fam. Liochelidae – Australia, Southeast Asia, Pacific islands, Indian Ocean Islands

Pseudoscorpiones

Ref.: BEIER (1940, 1951, 1965, 1966a, 1966 b, 1973, 1981), ELLINGSEN (1911A, 1911b), HARVEY (1981, 1985, 1990, 1993, 1998, 2013), MURTHI & ANANTHAKRISHNAN (1977), REDIKORZEV (1938), SCHAWALLER (1994, 1995)

In the area have been registered representatives of 20 families. Most of them (18) are represented from both sides of Wallace's line, and usually also on other continents or worldwide.

Only West side of Wallace's Line:

Fam. Ideoroncidae – Malaysia, India, Cambodia, Thailand, Vietnam, Indonesia (Sumatra)

Only East side of Wallace's Line:

Fam. Pseudogarypidae – Tasmania (one extant species)

Both sides:

Fam. Chthoniidae – cosmopolitan

Fam. Tridenchthoniidae (= Dithidae) – Australia, New Caledonia, Lord Howe Isl., Caroline Islands, India, Vietnam, Philippines, Indonesia (Mollucas, Sumatra, Java), New Guinea, Japan, Palau Isl., Bhutan, Nepal, Laos, Marcus Isl., Malaysia

Fam. Lechytiidae – Vietnam, Marshall Is., Marcus Island

Fam. Hyidae – Philippine Islands, Indonesia (Java, Sumatra), Australia

Fam. Neobisiidae – Philippines, Vietnam, Thailand, Japan, Burma, China, Taiwan

Fam. Syarinidae – Bhutan, India, Sri Lanka, Nepal, Tuvalu, Philippines – Solomon Is., New Zealand, New Caledonia, New Guinea

Fam. Parahyidae – Caroline Islands, Singapore

Fam. Garypidae (= Synsphyronidae) – India, Japan, Indonesia (Krakatau, Nicobar Isl.), Maldives Isl., Sri Lanka – Marshall Is., Australia (incl. Tasmania), New Zealand

Fam. Geogarypidae – Indonesia (Java), Malaysia, India, Sri Lanka, Thailand, Australia, New Guinea

Fam. Menthidae – Socotra; Australia (one endemic genus and species)

Fam. Cheiridiidae – China, Taiwan, Nepal, Philippines, Japan, Hawaii – Papua New Guinea, Solomon Is., Mariana Is., Australia, New Zealand

Fam. Olpiidae – Australia, New Zealand, Norfolk Is., Indonesia, India, Burma, Japan, Cambodia, Vietnam, Papua New Guinea, New Caledonia, Solomon Is., Tuvalu, Samoa, Caroline Is., Mariana Is., Marshall Is.

Fam. Garypinidae – Solomon Is., Australia, New Guinea, Hawaii, Indonesia, Thailand, Cambodia, Vietnam

Fam. Sternophoridae – Australia, Papua New Guinea, India, Sri Lanka, Laos, Cambodia, Vietnam

Fam. Withiidae – New Zealand, Lord Howe I., Vietnam, Indonesia, Christmas Isl., India, Cambodia, Malaysia, Thailand, Philippines, Solomon Is., Nepal, China, Taiwan, Mariana Is., Marshall Is., Papua New Guinea

Fam. Cheliferidae – Indochina, India, China, Indonesia – Australia, New Zealand, Papua New Guinea,

Fam. Atemnidae (= Miratemnidae) – South East Asia, Philippines, Bhutan, Nepal, India, Nicobar Is., Solomon Islands, Sri Lanka, Indonesia, China – New Caledonia, Lord Howe Isl., Caroline Is., Mariana Is., Christmas Island, Marquesas Is., Marshall Is., Papua New Guinea

Fam. Chernetidae (= Myrmochernetidae) – New Guinea, Solomon Is.,

Opiliones

Ref.: ŠILHAVÝ (1974a, 1974 b), RAMBLA (1994, 1991), SCHWENDINGER (1992, 2006), SCHWENDINGER & GIRIBET (2005), SHARMA et al. (2012), THORELL (1876, 1883, 1889, 1891 b, 1891b)

All suborders are represented in the area (Dyspnoi is practically missing).

Cyphophthalmi

Only West of Wallace's Line: none

Only East of Wallace's Line:

Fam. Troglosironidae – New Caledonia

Both sides:

Fam. Stylocellidae – SE Asia (from India to New Guinea)

Fam. Pettalidae – New Zealand, Australia – Sri Lanka

Eupnoi

Only West of Wallace's Line:

Fam. Phalangiidae – Borneo

Only East of Wallace's Line:

Fam. Caddidae – Australia (incl. Tasmania), New Zealand (but also in North America, South America and South Africa, not living in Southeast Asia)

Fam. Sclerosomatidae – Europe, Asia, Africa, South, Central and North America, Antilleans, Australia, New Guinea, Solomon Isl. (not living in Southeast Asia)

Fam. Neopilionidae – Australia, New Zealand (but also in South Africa and South America, not living in Southeast Asia)

Both sides: none

Dyspnoi

Only West of Wallace's Line:

Fam. Nemastomatidae (Ortholasmatinae, *Cladolasma* Suzuki – Thailand (1 sp.)

Only East of Wallace's Line: none

Both sides: none

Laniatores

Only West of Wallace's Line:

Fam. Stygnommatidae – ? Neotropical family with two doubtful sp. from Malaya of genus *Stygnomimus* Roewer, 1927

Fam. Biantidae (*Biantes*, *Probianthes*) – Nepal, India, Burma, Sumatra, Malaya

Only East of Wallace's Line:

Fam. Synthetonychiidae – New Zealand (14 sp.)

Fam. Triaenonychidae – Australia, Tasmania, New Zealand, New Caledonia (but also in Madagascar, South Africa, South America)

Both sides:

Fam. Assamiidae – southern Asia; subfam. Dampetrinae to Indonesia, New Guinea and Australia

Fam. Samoidae – Australia (New South Wales), Samoa, Indonesia

Fam. Podoctidae (incl. Erecananiinae and Ibaloniinae) – Palau, Taiwan, Indonesia, Malaysia, New Guinea, India, Philippines, Vanuatu

Fam. Sandokanidae [= Oncopodidae, praeoccup.] – Philippines, Sumatra, Borneo, Burma, Nepal, India, Malaysia, Singapore, Thailand

Fam. Epedanidae (incl. Dibuninae, Acrobuninae, Sarasiniciinae, Sarasinellinae) – Philippines, New Guinea, Thailand, Sulawesi, Borneo, Sumatra, Japan, Malaysia, India, Taiwan, China, Vietnam

Fam. Zalmoxidae (= Stygnoleptinae) – New Guinea, Solomon Islands, Fiji, Bismarck Archipelago, Philippines, Java, Sulawesi, Moluccas, Australia, Marianas, New Caledonia, Marshall Islands, Caroline Islands, Polynesia

Remarks concerning Opiliones. It seems strange that families, widespread in other parts of the world (Triaenonychidae s.str., Caddidae, Neopilionidae) are not represented in South Asia, but live East of Wallace's line (New Guinea, Australia, New Zealand, New Caledonia). What concerns the Laniatores (the dominant Opiliones in the tropical countries), they are well represented in tropical Asia, but much less East of Wallace's line. Exceptions are the Triaenonychidae (lacking in SE Asia), a few species of families living from both sides of the «lines» (Zalmoxidae, Assamiidae, Samoidae, Epedanidae, Podoctidae), and the endemic family in New Zealand Synthetonychiidae.

Araneae

Ref.: BAEHR & BAEHR (1987), BAEHR & BAEHR (1993), BAERT (1979, 1980, 1982, 1984), BEATTY et al. (2008), BERLAND (1928, 1930A, 1930 B, 1935, 1937, 1939, 1942), BOURNE (1980), BRIGNOLI (1981), DEELEMEN-REINHOLD (1980, 1995, 2000), DIMITROV et al. (2013), FORSTER (1949, 1955a, 1955b, 1962, 1967, 1970a, 1970b, 1971, 1973, 1975, 1977, 1995), FORSTER & BLEST (1979), FORSTER & FORSTER (1973, 1999), FORSTER & GRAY (1979), FORSTER & PLATNICK (1977, 1984, 1985), FORSTER et al. (1987), FORSTER & WILTON (1968, 1973), GILLESPIE et al. (2000), GRAY (1994), HICKMAN (1957, 1958, 1969), HILL (2010), HUBER (2001, 2003, 2005), JÄGER & YIN (2001), JÄGER & PRAXAYSOMBATH (2009), JOCQUÉ (1991, 1993), KAYASHIMA (1955), LEGENDRE (1977, 1979), LEHTINEN (1978, 1993), LEHTINEN & SAARISTO (1980), MAIN (1981a, 1981b, 1982), MARPLES (1955), MENG & MURPHY (2008), PAIK (1967), PAQUIN et al. (2010), PLATNICK (1976, 1977a, 1977b, 1981, 2000a, 2000b), PLATNICK & GERTSCH (1976), PLATNICK & FORSTER (1993), POCOCK (1903), PROSZINSKY (1980, 1996), PUGH (2004), RAVEN (1976, 1978, 1979, 1980a, 1980b, 1981a, 1981b, 1985, 1994), RAVEN & PLATNICK (1981), RIX (2006), RIX & HARVEY (2010, 2011, 2012a, 2012b, 2012c), RIX & ROBERTS (2010), ROBINSON (1982), ROEWER (1942), SHEAR (1978), SHINOYANA (1977), SIMON (1890), TAYLOR (2013), TICADER (1970, 1977), VERSTEIRT et al. (2010), WANG et al. (2010), WANG & MARTENS (2009)

Only West of Wallace's Line (especially in Southeast Asia):

Suborder Mesothelae – Southeast Asia, China, Japan (87 species)

Fam. Liphistiidae – Southeast Asia, China, Japan (87 species)

Suborder Mygalomorphae – both sides

- Fam. Atypidae** – Asia
Suborder Araneomorphae – both sides
Fam. Eresidae – Eurasia
 Subfam. Eresinae – Eurasia
Fam. Palpimanidae – South Asia, Sri Lanka
 (incl. many from S. America, Africa, etc.)
 Subfam. Chediminae – South Asia, Sri Lanka
 (also many from Africa and the Seychelles)
Fam. Phyxelididae – Sumatra, Borneo (2 sp.)
 (plus another 62 from Africa and Madagascar)
Fam. Cithaeronidae – Africa, India, Malaysia,
 Greece, introduced to Australia and Brazil (6 sp.)
**Only East of Wallace’s line (not living in SE
 Asia):**
Fam. Migidae – Australia, New Zealand
 Subfam. Calathotarsinae – Australia
 Subfam. Miginae – New Zealand, Australia
Fam. Actinopodidae – Australia
Fam. Austrochilidae – Tasmania (1 sp.) (but
 the other 8 sp. live in Chile and Argentina)
 Subfamily Hickmaniinae 1967 (as family
 Hickmaniidae)
Fam. Gradungulidae – New Zealand, Australia
 (A.C.T., Queensland, New South Wales, Victoria) (16
 sp.)
Fam. Perigopidae – Australia (Queensland),
 New Zealand (2 sp.)
Fam. Orsolobidae – Australia, New Zealand,
 Tasmania (but living also in Africa and South
 America)
Fam. Lamponidae – Australia, New Zealand,
 New Caledonia (genus *Centrocalia*)
 Subfam. Centrothelinae – Australia, New
 Caledonia
 Subfam. Lamponinae – Australia, New
 Zealand
 Subfam. Pseudolamponinae – Australia
Fam. Holarchaeidae – Tasmania, New Zealand
 (2 sp.)
Fam. Mecysmaucheniidae – New Zealand
 Subfam. Mecysmaucheniinae Simon, 1895 –
 New Zealand
 Subfam. Zearchaeinae Forster et Platnick, 1984
 – New Zealand
Fam. Micropholcommatidae – New Zealand,
 Australia, Tasmania, New Guinea
Fam. Pararchaeidae – Australia (incl.
 Tasmania), New Zealand, New Caledonia
Fam. Huttoniidae – New Zealand (1 sp.)
Fam. Malkaridae – Australia, incl. Tasmania
 (one genus in Argentina and Chile)
Fam. Cyatholipidae – Australia, New Zealand,
 Lord How I. (but also Africa, Madagascar and
 Jamaica)
- Fam. Synotaxidae** – Australia, Tasmania, New
 Zealand
 Subfam. Pahorinae – endemic to New
 Zealand
 Subfam. Physogleninae – Australia, Tasmania,
 New Zealand
 Subfam. Synotaxinae – Australia
Fam. Amphinectidae – Australia, Tasmania,
 New Zealand, Chile, South America
Fam. Nicodamidae – Australia, Tasmania, New
 Zealand, New Guinea
Fam. Tengellidae – New Zealand (one ge-
 nus *Haurokoa* Koçak et Kemal, 2008 with one sp.),
 but living also in North and South America and
 Madagascar
Fam. Ammoxenidae – Australia, Tasmania,
 southern Africa
Both sides:
Suborder Mygalomorphae
Fam. Hexathelidae – New Zealand, Australia,
 Tasmania, Asia (*Macrothele*)
 Subfam. Hexathelinae – Australia, New
 Zealand
 Subfam. Macrothelinae – Asia, New Zealand
Fam. Dipluridae – Australia, Oceania, Taiwan,
 Thailand, New Caledonia
 Subfam. Euagrinae – Australia, Taiwan, New
 Caledonia
 Subfam. Masteriinae – Oceania, Australia
Fam. Nemesiidae – Burma, India, China,
 Australia, New Zealand, Ryukyu Islands, SE Asia
Fam. Theraphosidae – Australia, South and SE
 Asia, New Guinea
Fam. Barychelidae – Australia, New Caledonia,
 SE Asia, New Guinea, Sri Lanka, Oceania, Fiji
 Subfam. Barychelinae – Australia, New
 Caledonia
 Subfam. Sasoninae – Australasia
Fam. Cyrtaucheniidae – Australia, Thailand
 Subfam. Aporoptychinae – Australia
Fam. Idiopidae – Australia, New Zealand,
 India, Sri Lanka, South Asia, Thailand,
 Subfam. Arbanitinae – Australia (9 genera),
 New Zealand (1 genus)
Fam. Ctenizidae – Taiwan, China, Thailand,
 Australian region, New Guinea,
 Subfam. Ctenizinae – Thailand, China, Taiwan,
 Australian region
 Subfam. Ummidiinae (repl. name for
 Pachylomerinae praeocc.) – SE Asia
Suborder Araneomorphae
Fam. Filistatidae – Australia, New Guinea,
 Europe, Asia, North and South America

- Fam. Scytodidae** – worldwide, except of the Far North
- Fam. Sicariidae** – worldwide, except of the Far North
- Fam. Ochyroceratidae** – South Asia, China, Pacific Islands, New Guinea
- Fam. Telemidae** – Sumatra, Malaysia, China, Vietnam, New Caledonia, New Guinea
- Fam. Pholcidae** – worldwide
- Fam. Tetrablemmidae** – Southeast Asia, Borneo, India, Indonesia (Sulawesi), Samoa, Caroline Islands
- Fam. Dysderidae** – *Dysdera* – worldwide
Subfam. Dysderinae – *Dysdera* – worldwide
- Fam. Oonopidae** – Philippines, Southeast Asia, Australia, Tasmania, New Zealand, New Caledonia, Hawai'i, Sri Lanka
Subfam. Gamasomorphinae – Bhutan, Nepal, China, Philippines, Southeast Asia, Australia, New Zealand, Hawai'i
Subfam. Oonopinae – New Caledonia, Tasmania, Sri Lanka
- Fam. Segestriidae** – Asia, Australia, New Zealand
- Fam. Lamponidae** – Australia, New Zealand, New Caledonia (genus *Centrocalia*)
Subfam. Centrothelinae – Australia, New Caledonia
Subfam. Lamponinae – Australia, New Zealand
Subfam. Pseudolamponinae – Australia
- Fam. Prodidomidae** – all continents
- Fam. Hersiliidae** – Australasia, India, Sri Lanka, Australia, Borneo
- Fam. Oecobiidae** – Asia; *Oecobius* is cosmopolitan (102 sp.)
- Fam. Stenochilidae** – Thailand, Malaysia, Singapore, Burma, Philippines, Bali, New Guinea, Fiji, Borneo, Vietnam, India
- Fam. Mimetidae** – Palearctic, Africa, Principe, Central and South America, USA, Asia, Australia; *Ero* and *Mimetus* – worldwide
Subfam. Mimetinae – worldwide
- Fam. Deinopidae** – all continents, except Europe and Antarctica
- Fam. Uloboridae** – Philippines, Samoa, Fiji, Vanuatu, New Guinea, Oceania, Australia, New Zealand; *Uloborus* is spread worldwide, *Zosis* is pan-tropical
- Fam. Anapidae** – New Caledonia, Australia, Tasmania, New Zealand, New Guinea, China, Taiwan
- Fam. Araneidae** – worldwide
- Fam. Linyphiidae** – worldwide
- Fam. Mysmenidae** – Samoa, New Caledonia, Tasmania
- Fam. Nesticidae** – worldwide
- Fam. Sinopimoidae** – China (1 sp.)
- Fam. Symphytognathidae** – in the tropics of Central and South America and the Australian region (with Oceania), with three species (*Anapistula benoiti*, *A. caecula*, *Symphytognatha imbulunga*) found in Africa and one (*Anapistula ishikawai*) in Japan. *Anapistula jerai* occurs in Southeast Asia
- Fam. Nephilidae** – Pantropical,
- Fam. Theridiidae** – cosmopolitan
- Fam. Theridiosomatidae** – Australia, China, Malaysia, Sri Lanka, Philippines, Sumatra, Samoa, Taiwan
- Fam. Ctenidae** – Australia, China, Sumatra, New Guinea
- Fam. Lycosidae** – cosmopolitan
- Fam. Oxyopidae** – cosmopolitan
- Fam. Pisauridae** – Africa, South America, North America, Asia, New Caledonia, Canary Isls, Madagascar, New Guinea, Cuba, Chatham Islands, Australia, etc. (328 sp.)
- Fam. Psechridae** – China, India, Nepal, Sri Lanka, South East Asia, Nicobar Islands, Philippines, Australia
- Fam. Stiphidiidae** – Australia, Tasmania, New Zealand, Madagascar, Mauritius
- Fam. Trechaleidae** – South and Central America, Mexico, U.S.A.
- Fam. Zoridae** – Central and South America, Australia, Tasmania, New Zealand, Israel, Guatemala; *Zora* – Palearctic
- Fam. Zorocratidae** – Sri Lanka, Madagascar, Africa, U.S. to Panama
- Fam. Zoropsidae** – Australia, New Zealand, Sri Lanka, China, Korea, Japan, Cyprus, Mediterranean, South Africa
- Fam. Agelenidae** – Mediterranean, Europe to Central Asia, U.S.A. to Chile, New Zealand, Socotra, Himalaya, Cuba, Bahamas, Cyprus, China; *Tegenaria* – worldwide
- Fam. Amaurobiidae** – Russia, Korea, China, Japan, Argentina, Paraguay, Chile, Taiwan, Australia, New Zealand, U.S.A., Canada, Falkland Islands, India, Laos, Thailand, Vietnam, Balkans, Greece, Crete, Germany, Switzerland, Italy, Micronesia, Ethiopia, Lybia, Nepal, Bhutan, Pakistan, Tajikistan, etc.
- Fam. Anyphaenidae** – Australia, New Zealand, India, etc.
- Fam. Cybaeidae** – America, Europe, Japan,

Korea, China, Turkmenistan, Tadjikistan, Uzbekistan, Sumatra, Venezuela, Colombia

Fam. Desidae – Australia, Tasmania, New Zealand, New Caledonia, Oceania, Korea, Japan, USA, Paraguay, Chile

Fam. Dictynidae – Europe, China, Mongolia, India, Algeria, Kazakhstan, Canary Islands, New Zealand, Australia, Sri Lanka, South Africa, USA, Canada, Mexico, Kyrgyzstan, West Indies, Hawaii, South America, St. Helena, Andaman Islands, Galapagos Isl., New Caledonia, etc.

Fam. Hahniidae – Oceania, Australia, Tasmania, New Zealand, India, Philippines, Sumatra

Fam. Sparassidae – worldwide, except of the Far North

Fam. Selenopidae – Asia (incl. India, Philippines and Thailand), Africa, Australia and South America

Fam. Zodariidae – Australia, New Zealand, New Guinea, SE Asia and worldwide

Fam. Clubionidae – Lord Howe Island, Asia, Australia, Oceania, Sri Lanka

Fam. Cycloctenidae – New Zealand, Australia, Indonesia (Java)

Fam. Miturgidae – Thailand, Indonesia, Australia, New Zealand, New Guinea

Subfam. Eutichurinae – Australia, Thailand, Indonesia (both sides)

Subfam. Miturginae – Australia, New Guinea, Africa, Mediterranean, North and South America (both sides)

Subfam. Systariinae – Southeast Asia (only West)

Subfam. Diaprogaptinae – Timor, Australia, New Zealand (only East)

Fam. Titanoecidae – India, Sri Lanka to China, New Guinea, Marquesas Islands, Europe, Mexico, South America

Fam. Gallieniellidae – Australia, Argentina, Madagascar, South Africa, Kenya

Subfam. Meedoinae – Australia (only East of the Line)

Fam. Gnaphosidae – worldwide

Fam. Trochanteriidae – Australia, Sulawesi, Christmas Island, China, India, New Caledonia, New Guinea, South America, Africa, Madagascar

Fam. Philodromidae – India, New Guinea, Southeast Asia, and worldwide

Fam. Thomisidae – worldwide

Fam. Salticidae – worldwide

Fam. Corinnidae – all continents, incl. Australia

Fam. Liocranidae – Burma, Thailand, Borneo, Sumatra, Australia, Sri Lanka, New Guinea and all continents

Remarks concerning Araneae. From the three suborders of spider one (Mesothelae) does not live east of Wallace's Line, but is known from SE Asia. From 112 families of spiders in the world 19 are known from Australasia east of this line, but not from SE Asia. Some are endemic for Australia, New Zealand or New Caledonia, others live also in far away parts of the world, mostly in South Africa, Chile or Argentina. Typical are Austrochilidae, Orsolobidae, Malkaridae, Cyatholipidae, Amphinectidae, Tengellidae, Ammoxenidae, also subfam. Prithinae of fam. Filistatidae (one genus in New Guinea, two in Australia, seven in Africa, North and South America). Some subfamilies of widespread families are endemic for the area east of Wallace's Line: Hexathelidae (Hexathelinae), Dipluridae (Masteriinae), Cyrtaucheniidae (Aporoptychinae), Idiopidae (Arbanitinae), Miturgidae (Diaprogaptinae), Gallieniellidae (Meedoinae), and others.

Opilioacarida (both sides of the "Line")

Ref.: BERON (1914), DAS & BASTAWADE (2007), LECLERC (1989), WALTER & PROCTOR (1998)

Only one family (Opilioacaridae) in the world.

Only West side of Wallace's line:

End. genus *Indiacarus* DAS & BASTAWADE, 2007 – India

End. genera *Siamacarus* Leclerc, 1989 and *Vanderhammenacarus* Leclerc, 1989 – Thailand (caves)

East side of Wallace's line:

Indet. Opilioacarida from Australia (WALTER & PROCTOR, 1998).

Holothyrida (both sides of the Line)

Ref.: BERLESE (1923), BERON (1914), DOMROW (1955), LEHTINEN (1981, 1991, 1995), THORELL (1882), VAN DER HAMMEN (1961, 1983), WOMERSLEY (1935)

Only West side of Wallace's line: none in Southeast Asia

East side of Wallace's line:

Fam. Allothyridae – Australia, New Zealand (2 gen., 3 sp.)

Both sides:

Fam. Holothyridae – New Guinea, Seychelles, New Caledonia, Mauricius, Sri Lanka, Lord-Howe Isl. (23 sp.)

Remarks: it seems interesting that in New Caledonia and Lord-Howe Is. live Holothyrids of genera (*Lindothyrys* Lehtinen, 1995 and *Haplothyrys* Lehtinen, 1995) of fam. Holothyridae and not of Allothyridae.

The Arachnida and the Wallace's Line (family level)

Only West of the Line

(living in Southeast Asia)

Only East of the Line

(not living in Southeast Asia)

Only West of the Line

(living in Southeast Asia)

Only East of the Line

(not living in Southeast Asia)

Palpigradi	
Prokoeneniidae	none
On both sides	
Eukoeneniidae	
Amblypygi	
none	none
On both sides	
Charinidae	
Charontidae	
Uropygi	
none (different genera)	none
On both sides	
Theliphonidae	
Schizomida	
None	none
On both sides	
Hubbardiidae	
Scorpiones	
Chaerilidae	Urodacidae
Pseudochactidae	
Scorpiopidae	
Scorpionidae	
On both sides	
Buthidae	
Liochelidae	
Pseudoscorpiones	
Ideoroncidae	Pseudogarypidae
On both sides	
18 families	
Chthoniidae	
Tridenchthoniidae	
Lechtyiidae	
Hyidae	
Neobisiidae	
Syarinidae	
Parahyidae	
Garypidae	
Geogarypidae	
Menthidae	
Cheiridiidae	

Olpiidae	
Garypinidae	
Sternophoridae	
Withiidae	
Cheliferidae	
Atemnidae	
Chernetidae	
Opiliones	
Cyphophthalmi	
None	Troglosironidae
On both sides	
Stylocellidae	
Pettalidae	
Eupnoi	
Phalangidae	Caddidae
	Sclerosomatidae
	Neopilionidae
On both sides	
none	
Dyspnoi	
Nemastomatidae	none
On both sides	
none	
Laniatores	
Stygnommatidae	Synthetonychidae
Biantidae	Triaenonychidae
On both sides	
Assamiidae	
Samoidae	
Podoctidae	
Sandokanidae	
Epedanidae	
Zalmoxidae	
Araneae	
Mesothelae	none
Liphistiidae	
On both sides	
none	
Mygalomorphae	
Atypidae	
Hexathelidae	

On both sides

Dipluridae
Nemesiidae
Theraphosidae
Barychelidae
Cyrtaucheniidae
Idiopidae
Ctenizidae

Suborder Araneomorphae**Araneomorphae**

Eresidae
Palpimanidae
Phyxelidae
Cithaeronidae

Migidae
Actinopodidae
Austrochilidae
Gradungulidae
Periogopidae
Orsolobidae
Lamponidae
Holarchaeidae
Mecysmaucheniidae
Micropholcommatidae
Tengellidae
Amoxenidae

On both sides:

(59 fam.)
Filistatidae
Scytodidae
Sicariidae
Ochyroceratidae
Telemidae
Pholcidae
Tetrablemmidae
Dysderidae
Oonopidae
Segestriidae
Lamponidae
Prodidomidae
Hersiliidae
Oecobiidae
Stenochilidae
Mimetidae
Deinopidae
Uloboridae

Anapidae
Araneidae
Linyphiidae
Mysmenidae
Nesticidae
Sinopimoidae
Symphytognathidae
Nephilidae
Theridiidae
Theridiosomatidae
Ctenidae
Lycosidae
Oxyopidae
Pisauridae
Psechridae
Stiphidiidae
Trechaleidae.
Zoridae
Zorocratidae
Zoropsidae
Agelenidae
Amaurobiidae
Anyphaenidae
Cybaeidae
Desidae
Dictynidae
Hahniidae
Selenopidae
Zodariidae
Clubionidae
Cycloctenidae
Miturgidae
Titanocidae
Gallieniellidae
Gnaphosidae
Trochanteriidae
Philodromidae
Thomisidae
Salticidae
Corinnidae
Liocranidae

Exemple among Acari**Holothyrida**

none (in SE Asia) Allothyridae

On both sides:

Holothyridae

Some Arachnida and the Lydekker's Line.

Palpigradi – both sides of Lydekker's Line (LL)

Amblypygi – Charinidae and Charontidae live on both sides (usually the same genera), the only species of Phrynidae from Flores is west of LL.

Uropygi – only one widespread genus (*Thelyphonus* Latreille s. lato) is found East of LL (in New Guinea), species of seven genera live in Southeast Asia, Indonesia or the Philippines.

Schizomida – the only family (Hubbardiidae)

and some of its genera are represented on both sides of LL, with some endemic genera on either side.

Pseudoscorpiones – as with the Wallace's Line, only one family (Ideoroncidae) is known only from the West side, one family (Pseudogarypidae, relict in Tasmania) – only from the East side and 18 families of Pseudoscorpiones live on both sides of LL.

Opiliones Cyphophthalmi – only the relict family Trogloniridae is known from the East side of LL (New Caledonia), no family is known only from the western side, two families (Stylocellidae and Pettalidae) have been recorded from both sides (as with Wallace's Line).

Opiliones Dyspnoi – practically missing in the area (one sp. in Thailand)

Opiliones Eupnoi – Fam. Neopilionidae is found in Australia, New Zealand (but, similarly to Triaenonychidae, also in South Africa and South America)

Opiliones Laniatores – Synthetonychiidae is endemic for New Zealand, Triaenonychidae is known East of LL, but has representatives also in South Africa, South America and Madagascar. Six families are distributed on both sides of LL.

Scorpiones – as with the Wallace's Line, only one family (Urodacidae) is typical for the Australian side, four families are known only on the West and two (Buthidae and Ischnuridae) live on both sides.

Araneae – suborder Mesothelae lives only West of all "lines". Suborders Mygalomorphae and Araneomorphae are crossing all "lines", many families are restricted to the land East of Lydekker's Line (see the comments above).

Acari – all orders are found on both sides of Lydekker's Line. Allothryidae (Holothyrida) is confined to Australia and New Zealand.

The "Lines" and some other groups

In their Atlas of Diplopoda SHELLEY & GOLOVATCH (2011) conclude that "From present records, the hypothetical borders separating Asian and Australian faunas in Indonesia (Wallace's, Weber's, and Lydekker's "lines") hold little relevance for diplopods. Of the four exclusively Laurasian orders, only Glomerida and Platydesmida (...) expand into the East Indies/Indonesia, as Julida and Callipodida (...) terminate on the southeast Asian continent. In the north, Glomerida spread eastward to Weber's line, between Sulawesi and Halmahera, while the southern edge conforms roughly to Wallace's line. Platydesmida, however, extend to Wallace's line between Borneo and Sulawesi while the southern border passes between Sumatra/Java and corresponds to nothing. We would not expect

these "lines" to be operative for the Gondwanan representatives, which were carried passively to southeast Asia by the terranes, and this is indeed the case. The only taxon conforming precisely to one of these hypothetical boundaries is Spirostreptida, derived from Gondwana I, whose eastern border matches Lydekker's line completely. While future discoveries may alter East Indian taxon borders, hypotheses like these lines may not apply to low vagility organisms like millipeds, whose geographies are so dependent on geological events; conformity of Spirostreptida may therefore be coincidence".

In a recent analysis of the caddisflies (Trichoptera) of Lombok, Bali and Java MALICKY et al. (2014) conclude that "The caddisfly fauna of the three islands is of Asiatic origin, no Australian influence was noted. The well-known Wallace's line does not act as a faunistic border between Bali and Lombok for Trichoptera".

It is interesting to compare this analysis with our data concerning the Arachnida – other non-insect group of relatively small animals with (mostly) low vagility. Of course, there are differences – almost all Arachnida are predators, not living so much in rotten logs, some are ballooning, other are small and relatively easy to be dispersed by air or otherwise (at least, it seems so).

Conclusions

From the orders of Arachnida some (Ricinulei and almost Solifugae) are missing from the analyzed area (Indomalayan and Australian regions). The situation with the other orders is as follows.

Palpigradi – fam. Eukoeneriidae is found on both sides (the same genera), fam. Prokoeneriidae found in Thailand, not living East of Wallace Line

Amblypygi – endemism on species level, all families and almost all genera are found on both sides.

Uropygi (Thelyphonida) – low level of endemism (only genera), one family on both sides.

Schizomida – low level of endemism (only genera), one family on both sides.

Scorpiones – four families live only West of the "Line", only one (Urodacidae) is known only East of it. Two families are known on both sides.

Solifugae is represented only by one species (*Dinorhax rostrumsittaci* Simon) in Vietnam and Maluku Islands (both sides of Wallace line).

Pseudoscorpiones – one family (Ideoroncidae) only West of Wallace's Line, one family (Pseudogarypidae) only East of the

Line (relict in Tasmania), 18 families on both sides.

Opiliones – Cyphophthalmi

Two families live on both sides, one (the relict Troglosironidae in New Caledonia) – only on East side, none only on West side

Opiliones – Eupnoi

One widespread family (Phalangiidae) is known on West side (Borneo), three families live on the East side, but are recorded also from far away countries.

Opiliones – Dysnoi

One family (Nemastomatidae) is represented in Thailand with one species, none is known from the East side or from both sides (practically the suborder is absent in the whole area)

Opiliones – Laniatores

Two families are known only from the West side, two others are known only from the East side, but one of them (Triaenonychidae) is recorded also from Madagascar, South Africa, South America (but not found in Southeast Asia). The other (Synthetonychiidae) is endemic for New Zealand. Six families live on both sides.

Araneae

Mesothelae – only West of the "Lines".

Mygalomorphae – both sides of the "Lines".

Araneomorphae – worldwide distributed suborder, living on both sides of the "Lines".

Only on the West side of Wallace's Line are known five families.

Only on the East side are known 19 families. Some are endemic for Australia, New Zealand or New Caledonia, others live also in far away parts of the world, mostly in South Africa, Chile or Argentina, but not in Southeast Asia.

On both sides are recorded at list 70 families (out of the 112 families of spiders in the world), mostly widespread.

Opilioacarida – the only family of the order Opilioacaridae is known from both sides of the „Line“. Two endemic genera live in India and Thailand, from Australia the order is recorded, but without further data.

Parasitiformes – we shall consider here only the zoogeographically interesting suborder Holothyrida, living on both sides of „Line“. The family Holothyridae is known with endemic genera from both sides of the „Line“ (not recorded in Southeast

Asia, but living in India, Seychelles, Mauricius and Sri Lanka). Only East of the „Line“ (Australia and New Zealand) is known the family Allothyridae.

None of the higher groups of Acari (Opilioacarida, Sarcoptiformes, Prostigmata, Acaridida, Oribatida, Parasitiformes, Mesostigmata, Ixodida and Holothyrida) is limited by the „lines“.

According to LEHTINEN (1980), in a paper on the „Arachnological zoogeography of the Indo-Pacific Region“, dealing only with spiders. His conclusion was that: „Various lines limiting and dividing the Wallacea seem to have no equivalents in the arachnological zoogeography“. This very experienced author thinks also that „The spider fauna of Melanesia, Micronesia, and Polynesia, with the exception of New Caledonia, Lord Howe Island and surrounding small archipelagoes, is simply an impoverished Oriental fauna“.

In general, as a whole the analysis of the Arachnida on both sides of Wallace's Line confirms the conclusion of SHELLEY & GOLOVATCH (2011), that „... the hypothetical borders separating Asian and Australian faunas in Indonesia (Wallace's, Weber's, and Lydekker's "lines") hold little relevance for diplopods“. The "lines" seem to „hold little relevance“ also for the Arachnida. There is no order of Arachnida living only of one side of the "lines". Only the spider suborder Mesothelae seems limited to the Western side. Some confirmation of the Vachon's opinion („On peut cependant affirmer que la ligne Wallace – pour certaines formes de Scorpions – est une frontière réellement existante“) could be confirmed what concerns the scorpions. There are families and genera, known only on one side, but the level of endemism is relatively low. Within Arachnida we cannot detect anything similar to the endemic orders and even subclasses in the vertebrates which are the base of the construction of the „lines“.

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Арахногеографията и „линиите“ (на Уолес, Лидекер и Вебер)

Петър БЕРОН

(Резюме)

Обект на настоящия преглед е да се види как разпространението на зоогеографски важни животни като разредите на Arachnida се отнася към прокараните въз основа на разпространението на гръбначните животни линии на Уолес, Лидекер и Вебер.

От разредите на Arachnida някои (Ricinulei и почти изцяло Solifugae) не се срещат в анализирания район (Индомалайската и Австралийската области). При другите разреди положението е следното.

Palpigradi – сем. Eukoeneriidae се среща от двете страни на Уолесовата линия (едни и същи родове), сем. Prokoeneriidae е намерено в Тайланд, но не и на изток от Уолесовата линия (УЛ).

Amblypygi – ендемизмът е на ниво вид, всички семейства и почти всички родове се срещат от двете страни

Uropygi (Thelyphonida) – ниско ниво на ендемизъм (само родове), едно семейство от двете страни на УЛ.

Schizomida – ниско ниво на ендемизъм (само родове), едно семейство от двете страни на УЛ.

Scorpiones – четири семейства живеят само на запад от УЛ, само едно (Urodacidae) е познато само на изток от нея. Две семейства са познати от двете страни.

Solifugae е представен само от един вид (*Dinorhax rostrumpsittaci* Simon) във Виетнам и Молукските острови (от двете страни на Уолесовата линия, но само на запад от Линията на Лидекер).

Pseudoscorpiones – едно семейство (Ideoroncidae) само на запад от Уолесовата линия, едно семейство (Pseudogarypidae) е само на изток от УЛ (реликт в Тасмания), 18 семейства от двете страни.

Opiliones – Cyphophthalmi

Две семейства живеят от двете страни на УЛ, едно (реликтните Troglосironidae в Нова Каледония) – само от източната страна, никое само от западната страна.

Opiliones – Eupnoi

Едно широко разпространено семейство (Phalangiidae) е познато то западната страна (Борнео), три семейства живеят от източната страна, но също и в далечни континенти, без да се срещат в ЮИ Азия.

Opiliones – Dyspnoi

Едно семейство (Nemastomatidae) е представено в Тайланд с един вид, никое не е познато от източната страна или от двете страни (практически подразредът Dyspnoi липсва в целия район)

Opiliones – Laniatores

Две семейства са познати само от западната страна, две други се срещат само от източната страна, но едно от тях (Triaenonychidae) е съобщено от Мадагаскар, Южна Африка, Южна Америка (но не са намерени в Югоизточна Азия). Друго семейство (Synthetonychiidae) е ендемично за Нова Зеландия. Шест семейства живеят от двете страни.

Araneae

Mesothelae – Само западно от Уолесовата линия.

Mygalomorphae – от двете страни на „линиите“.

Araneomorphae – световно разпространен подразред, разпространен от двете страни на „линиите“.

Само западно от Уолесовата линия са известни шест семейства.

Само източно са познати 19 семейства. Някои от тях са ендемични за Австралия, Нова Зеландия или Нова Каледония, други живеят също и в далечни краища на света, главно в Южна Африка, Чили или Аржентина, но не и в Югоизточна Азия.

От двете страни са съобщени поне 70 семейства (от общо 109 семейства паяци в света), повечето от тях широко разпространени.

Opilioacarida – единственото семейство в разреда (Opilioacaridae) е познато от двете страни на „линиите“. Два ендемични рода се срещат в Индия и Тайланд, в Австралия разредът е съобщен, без по-нататъшни данни.

Parasitiformes – тук разглеждаме само зоогеографски интересния разред Holothyrida, който се среща от двете страни на „линиите“. Семейство Holothyridae е познато с ендемични родове от двете страни на „линиите“ (не е известно от Югоизточна Азия, но ги има в Индия, Сейшелските острови, Мавриций и Шри Ланка). Само на изток от „линиите“ (Австралия и Нова Зеландия) е познато семейството Allothyridae.

Никой от разредите на Acari (Opilioacarida, Prostigmata, Acaridida, Oribatida, Mesostigmata, Ixodida и Holothyrida) не е ограничен от „линиите“.

Като цяло, анализът на Arachnida от двете страни на Уолесовата линия потвърждава заключението на SHELLEY & GOLOVATSH (2011), че "... хипотетичните граници, които разделят азиатската и австралийската фауни в Индонезия ("линиите" на Уолес, Лидекер и Вебер) имат малко отражение върху диплоподите". Няма разреди от Arachnida, които да живеят само от едната страна на "линиите". Само подразред Mesothelae от паяците изглежда ограничен до Западната страна на УЛ. По отношение на скорпионите, както отбелязва VASNON (1953), се наблюдава известно значение на линиите. Има семейства и родове, познати само от едната страна, но това е относително ниско ниво на ендемизъм. Разликата е голяма с ендемичните разреди и даже подкласове на гръбначните, въз основа на които е възникнала самата идея за тези "линии".