The challenge of Wallacea

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There are numerous unresolved issues in biogeography for both uniformitarian and creation scientists.[1] Biogeography is "The science that deals with the geographic distribution of all living organisms."[2] Probably the most challenging biogeographic issue, the one that initiated the science of biogeography, is how the marsupials made it to Australia. Skeels *et al.* note:

> "Faunal turnover in Indo-Australia across Wallace's Line is one of the most recognized patterns in biogeography and has catalyzed debate about the role of evolutionary and geoclimatic history in biotic interchanges."[3]

It is presumed the Australian animals and plants had to pass through Southeast Asia and Wallacea to Australia and New Guinea.

Wallacea

Wallacea is a biogeographic region situated between Southeast Asia and the offshore islands of western Indonesia on the one side and the Australian/New Guinea areas on the other, being separated by shallow water. The former is called 'Sunda' and the latter 'Sahul'. The transition area between is named Wallacea, after Alfred Russell Wallace, who first called attention to it.[4] Wallacea, covering an area of 347,000 km^2, lies between the original Wallace Line, the western edge of the red area, as drawn by Wallace, and the Lydekker or Heilprin-Lydekker Line, on the eastern edge of the red area (figure 1). Wallace later redrew his line east of Sulawesi because the island consists of mostly Asian species, with only a few marsupials.[5] Various other 'lines' have been proposed since Wallace's time.

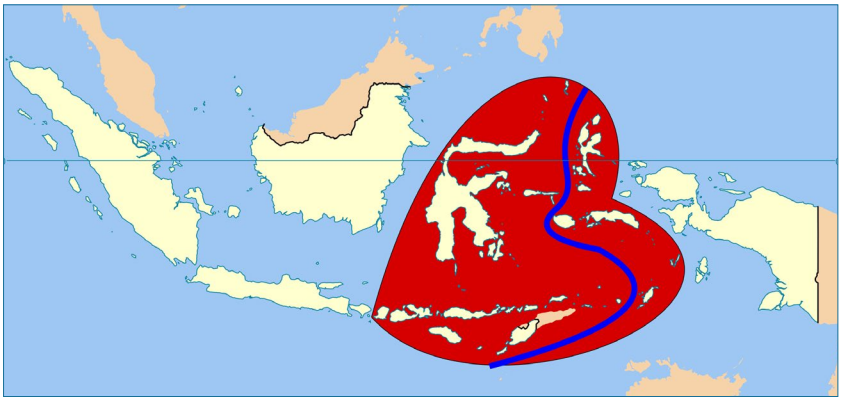

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Figure 1. Wallacea is the group of islands within the red area. The Weber Line (in blue) partitions Wallacea into a western part, pertaining to Southeast Asia, and an eastern part, pertaining Australia and New Guinea.

The Philippines were not included in Wallacea until later. The Weber Line, the blue line on figure 1, is the midpoint where Asian and Australian fauna are equally represented.

How did the fauna make it to Sahul?

Wallacea generally separates the fauna and flora of Sunda from Sahul. The mammals on Sunda and Sahul are mostly endemic (i.e., they only occur at that location). To the west of Wallacea are tigers, rhinoceros, and apes, whereas marsupials are common east of Wallacea. Wallace noted that mammals and birds west of the Wallace Line were of Southeast Asian origin, while those east of Lydekker's Line were Australian.[4] Wallace noted that his line was not absolute, and others have noted that the transition across Wallacea is gradual.[6,7] For instance, marsupial fossils have been discovered in Wallacea, such as the cuscus on Sulawesi and marsupials found in a cave on the Indonesian Island of Halmahera, between New Guinea and Sulawesi.[8] Holt *et al.* confirm that birds generally conform to Wallace's Line.[9] However, these faunal divisions are not seen with the flora.[10,11] The only animals that successfully exchanged between Sunda and Sahul were vagile (free to move) rodents and bats.[3]

The main unsolved challenge is explaining how the animals made it to Sahul when they do *not* show up in Sunda. The islands of Indonesia are separated by deep straits that are sometimes wide. For instance, the distance between Timor and Australia is about 150 km.[12] So, the idea of a land bridge between Sunda and Sahul is unlikely, especially when considering the spread of land snails[13] and other poorly-dispersing animals and insects (see below). Also, if there was such a land bridge, the fauna and flora would be more homogenous between Sunda and Sahul.

It is possible that humans transported marsupials across Wallacea, as well as to other remote places.[14] It is known that humans have introduced animals to many locations. But I shy away from this idea because humans likely did not transport some particular animals, such as carnivorous marsupials, poisonous snakes of various kinds, and some of the other fauna observed on Sahul. It is more likely all of these animals had to be (and were) transported on log mats.

A new solution

A new proposed solution tries to explain the disjunction across Wallacea by paleoclimatology and dispersal ability.[15] Skeels *et al.* analyzed 20,000 species within 227 families

of terrestrial vertebrates in the area and believed the disjunction could be explained by the drier climate in southern Wallacea millions of years ago and the dispersal ability of the mammals. Most of Sunda, northern Wallacea, and northern Sahul have a wet tropical climate, while Australia is mostly arid. The islands of southern Wallacea are believed to have been semi-arid. Skeels *et al*. claimed a minimum of 381 colonization events for terrestrial mammals across Wallacea. Those mammals that have broad environmental tolerances in passing from a wet environment to a semi-arid environment would be good dispersers.

However, the proposal of Skeels *et al.* has several problems. First, a significantly drier climate is required for southern Wallacea than what exists today, since it receives substantial rainfall (although not as much as Sunda, northern Wallacea, and New Guinea). Such a drier climate is an assumption of uniformitarianism. Second, dispersal ability is defined as the ability of those animals that can tolerate a broader range of environments, especially those affected by drier climates. Just because some animals were better able to adapt to a drier climate, they would not necessarily thrive living in Australia. Third, even if they were adapted to a drier climate, the researchers do not tell us how the animals physically made the journey. Fourth, there is still the problem of how the snakes, insects, frogs, etc. were able to migrate.

Figures 2 and 3. Plants growing from horizontal logs on the Willamette River, near its mouth at the Columbia River, Oregon, USA.

Possible creation science solution

Creation scientists face additional challenges. We must explain how the marsupials left the Ark in the Middle East and arrived in Australia with little or no sign of them in between.[16] One thing is for certain, the marsupials did not have to migrate from Australia *to* the Ark, since they could have lived close to the Ark, and a supercontinent likely existed before the Flood.[17]

Another challenge is the location of the Flood/post-Flood boundary. We need to determine what fossil animals are post-Flood. For instance, we know that Ice Age animals, such as the mammoths (probably part of the elephant kind), left the location of the Ark and spread throughout the North Hemisphere. But Cenozoic animals such as the brontothere, a type of rhinoceros, lived during the early Cenozoic. Did this animal also need to leave the Ark and spread to North America after the Flood? This, and other similar questions, would call for a lengthy discourse, so, for the purpose of this brief paper, I will consider only living animals.

The only viable solution for the arrival of marsupials to Australia seems to be transport on log mats after the Flood.[15] Uniformitarians have the

same problem. Evidence for log mat transport also includes the existence of placental rodents,[18] frogs, lizards, snakes, and soft-bodied arthropods in Australia.[19] The insects include millipeds, ants, beetles, weevils,[20] slaters, and possibly cicadas—all of which could be transported on substantial log mats. It would have been difficult for these organisms to have spread from the Ark to Australia, even with a land bridge.

Transport on log mats raises many questions. How would marsupials quickly make it to the Indian Ocean and remain together, so as to hop onto a log mat? Would the log mat be substantial enough and fulfil the requirements for animals to survive a journey? Would the currents and wind be able to transport the animals to Australia?

Creation scientists lack the data to answer these questions completely, but we have several advantages for explaining things via vegetation mats that uniformitarian scientists do not have.[15] First, pictographs that look like kangaroos have recently been found in India, suggesting that the marsupials passed through India to the Indian Ocean.[21] Nonetheless, it is unlikely migrating animals would leave a fossil record. Second, log mats after the Flood would likely have been substantial; they could have been over 100 km^2 and 10 m thick! There also could have been numerous log mats floating on the oceans.

Uniformitarian scientists, on the other hand, rely on vegetation ripped up by storms that make it to the open ocean. Such vegetation mats would be puny, and organisms would not be expected on them. If a vegetation mat was transported down a river to the ocean, it would have to pass through the surf. It would be torn up, and any organisms caught on it would drown.

Third, the Creation Model has a significantly different climate after the Flood. Precipitation would be heavier because of greater evaporation from the warmer water. The rain could provide drinking water during the voyage on a thick log mat. Plants and trees likely would grow on the log mat, as observed on some floating islands and logs today (figures 2 and 3). Fourth, ocean currents and wind would likely be different from today, and so it is possible for a log mat carrying marsupials to bypass Sunda and land in Sahul.

References

1. Oard, M.J., Land bridges after the Flood, *J. Creation* **34**(3):109–117, 2020.
2. Neuendorf, K.K., Mehl, Jr, J.P., and Jackson, J.A., *Glossary of Geology*, 5th edn, American Geological Institute, Alexandria, VA, p. 68, 2005.
3. Skeels, A., Boschman, L.M., McFadden, I.R., Joyce, E.M., Hagen, O., Robles, O.J., Bach, W., Boussange, V., Keggin, T., Jetz, W., and Pellissier, L., Paleoenvironments shaped the exchange of terrestrial vertebrates across Wallace's Line, *Science* **381**:86, 2023.
4. Wallace, A.R., *The Malay Archipelago*, Macmillan, London, 1863.
5. Hausdorf, B., Beyond Wallace's Line—dispersal of Oriental and Australo-Papuan land-snails across the Indo-Australian Archipelago, *Zoological J. Linnean Society* **185**:66–76, 2019.
6. Lohman, D.J., de Bruyn, M., Page, T., von Rintelen, K., Hall, R., Ng, P.K.L., Shih, H.-T., Carvalho, G.R., and von Rintelen, T., Biogeography of the Indo-Australian Archipelago, *Annual Review of Ecology, Evolution, and Systematics* **42**:205–226, 2011.
7. Lomolino, M.V., Riddle, B.R., Whittaker, R.J., and Brown, J.H., *Biogeography*, 4th edn, Sinauer Associates, Inc., Sunderland, MA, p. 195, 2010.
8. Flannery, T., Bellwood, P., White, P., Moore, A., Nitihaminoto B., and Nitihaminoto, G., Fossil marsupials (Macropodidae, Peroryctidae) and other mammals of Holocene age from Halmahera, North Moluccas, Indonesia, *Alcheringa* **19**:16–25, 1995.
9. Holt, B.G. *et al.*, An update of Wallace's zoogeographic regions of the world, *Science* **339**:74–78, 2013.
10. Crayn, D.M., Costin, C., and Harrington, M.G., The Sahul–Sunda floristic exchange: dated molecular phylogenies document Cenozoic intercontinental dispersal dynamics, *J. Biogeography* **42**:11–24, 2015.
11. Van Welzen, P.C., Parnell, J.A.N., and Slik, J.W.F., Wallace's Line and plant distributions: two or three phytogeographical areas and where to group Java? *Biological J. Linnean Society* **103**:531–545, 2011.
12. Shipton, C., O'Connor, S., and Kealy, S., The biogeographic threshold of Wallacea in human evolution, *Quaternary International* **574**:1–12, 2021.
13. Hausdorf, B., Beyond Wallace's line—dispersal of Oriental and Australo-Papuan land-snails across the Indo-Australian Archipelago, *Zoological J. Linnean Society* **185**:66–76, 2019.
14. Woodmorappe, J., Causes for the biogeographic distribution of land vertebrates after the Flood; in: Walsh, R.E. and Brooks, C.L. (Eds.), pp. 361–370, 1990.
15. Skeels *et al.*, ref. 3, pp. 86–92.
16. Oard, M.J., When and how did the marsupials migrate to Australia? *J. Creation* **36**(2):90–96, 2022.
17. Oard, M.J., Australian marsupials: there and back again? *J. Creation* **36**(1):99–106, 2022.
18. Rowe, K.C., Achmadi, A.S., Fabre, P.-H., Schenk, J.J., Steppan, S.J., and Esselstyn, J.A., Oceanic islands of Wallacea as a source for dispersal and diversification of murine rodents, *J. Biogeography* **46**:2752–2768, 2019.
19. Archer, M., Hand, S.J., and Godthelp, H., *Riversleigh: The story of animals in ancient rainforests in inland Australia*, Reed books, Chatswood, Australia, 1991.
20. Toussaint, E.F.A., Tanzler, R., Rahmadi, C., Balke, M., and Riedel, A., Biogeography of Australian flightless weevils (Curculionidae, Celeuthetini) suggests permeability of Lydekker's and Wallace's Lines, *Zoological Scripta* **44**(6):632–644, 2015.
21. Robinson, P., Kangaroos in India? *Creation* **42**(3):36–37, 2020.