ALFRED RUSSEL WALLACE OR ALEXANDER VON HUMBOLDT: WHO "INVENTED" BIOGEOGRAPHY?

LORIS GALLI[1]*

[1]DISTAV, Università degli Studi di Genova, Corso Europa 26, I-16132 Genova, Italy

* Correspondence: loris.galli@unige.it

ABSTRACT

Alfred Russel Wallace (1823–1913) is traditionally regarded as the father of Biogeography. Thanks to his holistic approach to nature, however, Alexander von Humboldt (1769–1859) laid the methodological foundations of Ecology and Phytogeography. His attention to the collection of as many data as possible on environmental parameters in order to understand which factors influence species distribution and characters can be considered extremely modern. Therefore, some authors today believe that it would be legitimate to attribute the authorship of biogeography to von Humboldt.

KEYWORDS: Alfred Russel Wallace, Alexander von Humboldt, Biogeography, data collection, species distribution

SHORT NOTE

Biogeography is that branch of Biology that studies the distribution in space and time of plants and animals, and other forms of life and the causes that determine it. It deals with investigating the evolution over time of the species ranges. In a nutshell, the biogeographical approach to the analysis of a species range involves the study of those factors which are responsible for its modeling in space and time: historical factors (paleoclimatic and paleogeographic) and current ecological ones (biotic and abiotic). To these, the contribution of man as an agent of species dispersal and habitats' alteration must often be added.

Alfred Russel Wallace (1823–1913) gave a seminal contribution to Biogeography mainly through his books (Wallace, 1869, 1876, 1880). In particular, he developed the analysis of the regionalization scheme proposed by Sclater (1858) for birds, promoting the use of his regions as a general organizing principle of zoogeographical approach. Although with some adjustments and even though often criticized, this regionalization system is still in use today. Therefore, thanks to his enduring legacy within Biogeography, Wallace is widely regarded as one of the founding fathers of this science (see Whittaker et al., 2013).

For further information on Wallace's contribution to Biogeography and on some critical issues inherent in the biogeographical regions he advocates, I suggest consulting the papers collected in the virtual issue (2019) of Journal of Biogeography entitled "100 Years after Alfred Russel Wallace".

Alexander von Humboldt (1769–1859; see Wulf, 2015) trained as naturalist in the second half of the eighteenth century, when the holistic approach spread in the field of Natural History (Linder et al., 2019). Zoologists and botanists, rather than merely listing animals and plants like their predecessors, began trying to establish interconnections between them and their environment. Humboldt fully developed this way of approaching to the study of nature during his

trip to the Andes (1799–1804). Here he matured the view of nature as an organic whole in which biota, climate, geography and geology influence each other. His Essay on the Geography of plants (Humboldt & Bonpland, 1807) is full of observations on plants and data on their respective environments, summarized in the Tableau Physique. Here Humboldt depicted the altitudinal distribution of plant species in the equatorial Andes accompanied by a considerable amount of detailed ecological data. Moret et al. recently (2019) reviewed Humboldt's Tableau Physique and, beyond some inconsistencies, they stressed the modernity of his scientific thinking and methods. He continuously refined his theory of plant geography as a dynamic framework, laying the foundations of phytogeography.

Moreover, Keppel & Kreft (2019) put in evidence as von Humboldt introduced the concept of collecting high-quality quantitative data across continents. His inter-disciplinary research, data-driven studies, and global comparative syntheses, according to them, helped to lay the foundations of Biogeography and Ecology. They conclude their paper pointing out that the recent development of computer science and the numerous complex environmental challenges facing our planet (e.g. climate change and global effects of human activities) are revitalizing Humboldt's scientific philosophy and approach to multi-disciplinary data integration and synthesis.

Dassow Walls (2005), furthermore, ascertained that "*The rise of environmental thinking in America began […] in the writings of the German explorer and scientist Alexander von Humboldt*" and she evidenced his fundamental role in originating a vision of nature as a "*network of mutually interdependent elements with humans as full participants*".

As I briefly pointed out at the beginning of this note, the influence of man on habitats and, consequently, on the distribution of the species related to them is another important component of the biogeographical analysis approach. Therefore, this aspect of Biogeography too can be traced in the thought of von Humboldt.

To those who wish to deepen the impact of von Humboldt's method on Biogeography, as well as some examples of modern biogeographical analyzes especially in his beloved South America, I recommend the papers published in "Humboldt Special Issue" (volume 46, issue 8, 2019) of Journal of Biogeography entitled "The legacy of Alexander von Humboldt: Exploring the links between geo- and biodiversity".

For obvious reasons, neither Wallace nor von Humboldt had knowledge of plate tectonics (Wegener, 1915), a theory that is of fundamental importance today in the interpretation of the geographical distribution of organisms. They also could not benefit from some of the modern tools and methods used in the various areas of Natural History: from statistical analysis of data to computerized cartography. Both these great naturalists, however, with their own work managed to create a fertile substrate for the future development of Biogeography.

Let me conclude my note quoting the words of Linder et al. (2019): "*Although the very concept that any discipline has a founder may be disputed, von Humboldt's contributions are, without a doubt, enormous, integrative and global. His lucid writing was widely read, he built up a huge network of correspondents, he assisted many young researchers, and engaged the general public generating curiosity and enthusiasm about the natural world. By the end of his long life, he had stimulated a new kind of research, similar to what we now call biogeography*".

REFERENCES

Dassow Walls L., 2005. Rediscovering Humboldt's environmental revolution. Environmental History 10: 758–760.

Humboldt A. von. & Bonpland A., 1807. Essai sur la géographie des plantes, accompagné d'un tableau physique des régions équinoxiales. Levrault & Schoell, Paris.

Keppel G. & Kreft H., 2019. Integration and synthesis of quantitative data: Alexander von Humboldt's renewed relevance in modern biogeography and ecology. Frontiers of Biogeography e43187.

Linder H.P., Aspinall R., Bonaccorso E., Guayasamin J.M., Hoorn C. & Ortega-Andrade H.M., 2019. Editorial. "Humboldt Special Issue: The legacy of Alexander von Humboldt: Exploring the links between geo- and biodiversity". Journal of Biogeography 46 (8): 1625–1626.

Moret P., Muriel P., Jaramillo R. & Dangles O., 2019. Humboldt's Tableau Physique revisited. Proceedings of the National Academy of Sciences 116 (26): 12889–12894.

Sclater P.L. 1858. On the general geographical distribution of the members of the class Aves. Journal of the Proceedings of the Linnean Society of London: Zoology 2: 130–145.

Wallace A.R., 1869. The Malay Archipelago. Macmillan, London.

Wallace A.R., 1876. The geographical distribution of animals. 2 vols. Macmillan, London.

Wallace A.R., 1880. Island life. Macmillan, London.

Wegener A., 1915. Die Entstehung der Kontinente und Ozeane. Vieweg, Braunschweig.

Whittaker R.J., Riddle B.R., Hawkins B.A. & Ladle R.J., 2013. The geographical distribution of life and the problem of regionalization: 100 years after Alfred Russel Wallace. Journal of Biogeography 40 (12): 2209–2214.

Wulf A., 2015. The invention of nature: the adventures of Alexander von Humboldt, the lost hero of science. John Murray Press (Hodder & Stoughton), London.

DOI: 10.15167/2612-2960/BELS2020.2.1.1211