Biodiversity Gaps of Big Continental Islands

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Hypotheses

Small, oceanic islands: primarily volcanic geology, small (less climatic diversity, easy to explore), comparably young (oldest Hawaiian island is 5.5 Myr)

Big, continental islands: all sorts of geology, big (climatic diversity), can get very old (Spitsbergen: > 550 Myr) → they accumulate geologic variety in Earth history, undergo tectonics & orogenesis, have shifted through climate zones, are long-term isolated (Madagascar: > 117 Myr) and can be accreted by continents

→ **Big continental islands are underrepresented as a spatial category in macroecology though they cover a large part of global biodiversity**

Material and Methods

➤ **Breakpoint analysis** for evaluation of 'big' islands, list of 22,471 entries from SAYRE et al. (2019)

➤ **Statistical analyses** of most of the parameters: climate, geomorphology, pedology, time for evolution

➤ **Analyses** are done in **R, calculations** in **Excel**

➤ **Maps** created in **ArcMap** 10.8.1

→ **Which other analytical methods can be recommended?**
→ **Which additional data sources are appropriate?**
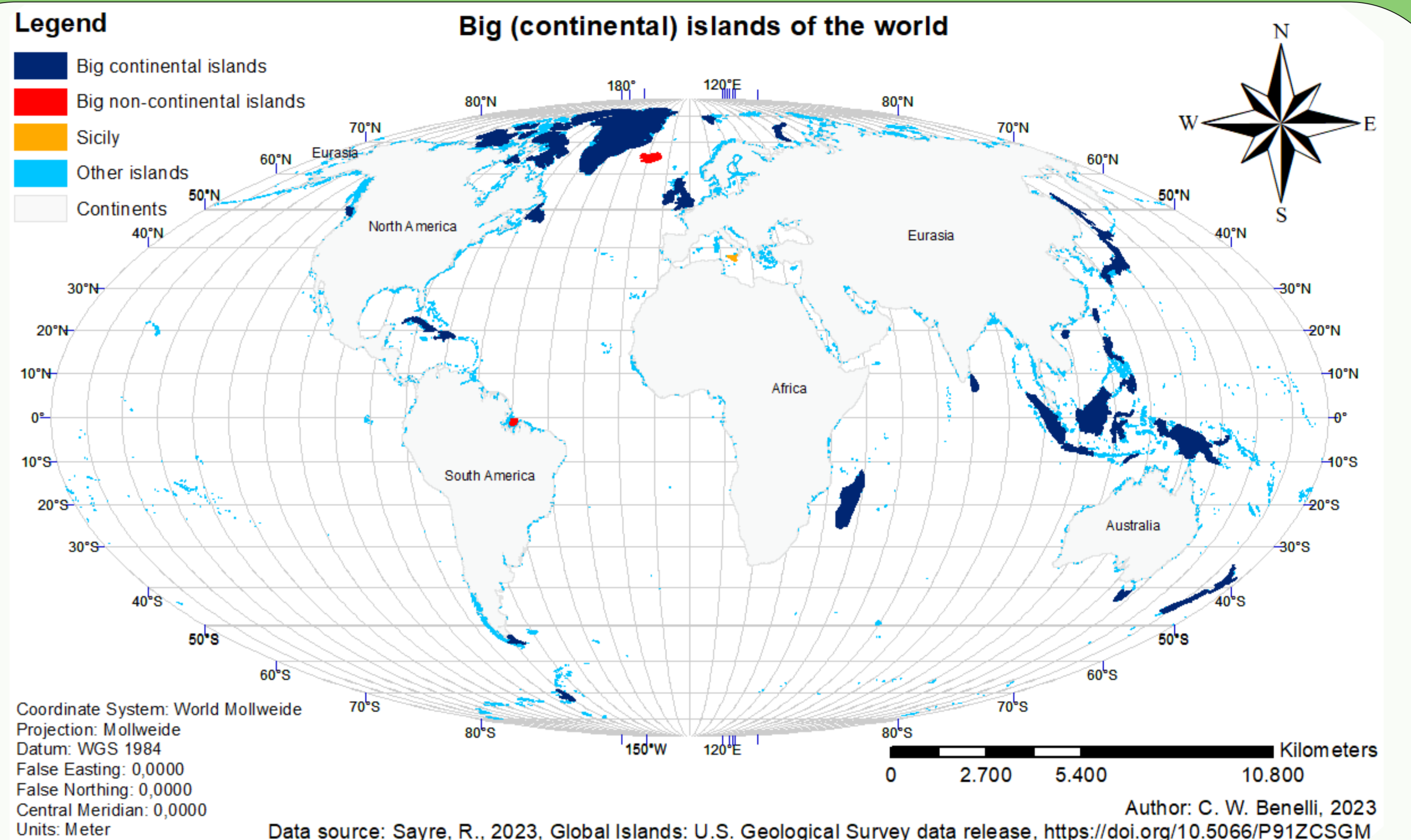→ **How to define "big islands" adequately?**

Fig. 1. Map of all big islands of the world, continental islands shown in dark blue, non-continental in red, Sicily in orange (the biggest medium sized island but included in the analysis because it is within the error margin), and all other islands in light blue (datasource: SAYRE 2023).

Coordinate System: World Mollweide
Projection: Mollweide
Datum: WGS 1984
False Easting: 0,0000
False Northing: 0,0000
Central Meridian: 0,0000
Units: Meter
Data source: Sayre, R., 2023, Global Islands: U.S. Geological Survey data release, https://doi.org/10.5066/P91ZCSGM
Author: C. W. Benelli, 2023

Legend
- Big continental islands
- Big non-continental islands
- Sicily
- Other islands
- Continents

Results

➤ **Big islands** cover an area of **> 25,582.268 km² (± 1,016.485 km²)** → we consider **43 big islands** (see Figure 1), list of islands next to Figure 2

➤ There are **41 big continental islands** (Iceland is oceanic and Marajó a river island)

➤ **Sicily** is within the error margin but is more similar in size to Somerset (no big island) than to Timor (smallest big island)

➤ Between **small islands** and **big islands** there should be at least the category of **medium sized island** (limit not defined)

➤ Big islands are **distributed all over the globe** (see Figure 2)

  ➤ UTM Zone Map: only band E (~ 60° S) has no big island

  ➤ UTM zones: 28% have no big island

➤ Analysis finds 72% of all possible latitudes occupied with big islands

List of big (continental) islands (large to small)

Greenland (Kalaallit Nunaat), New Guinea, Borneo, Madagascar, Baffin Island (Qikiqtaaluk), Sumatra, Honshū, Victoria Island (Kitlineq), Great Britain, Ellesmere Island, Sulawesi, South Island (Te Waipounamu), Java, North Island (Te Ika-a-Māui), Newfoundland, Cuba, Luzon, Iceland, Mindanao, Ireland, Hokkaidō, Hispaniola, Sakhalin, Banks Island, Sri Lanka, Tasmania, Devon Island (Tatlurutit), Alexander Island, Isla Grande de Tierra del Fuego, Severny Island (Novaya Zemlya north), Southampton Island (Shugliaq), Melville Island, Axel Heiberg Island, Spitsbergen, Kyūshū, Taiwan, New Britain, Hainan, Prince of Wales Island, Yuzhny Island (Novaya Zemlya south), Vancouver Island, Marajó, and Timor

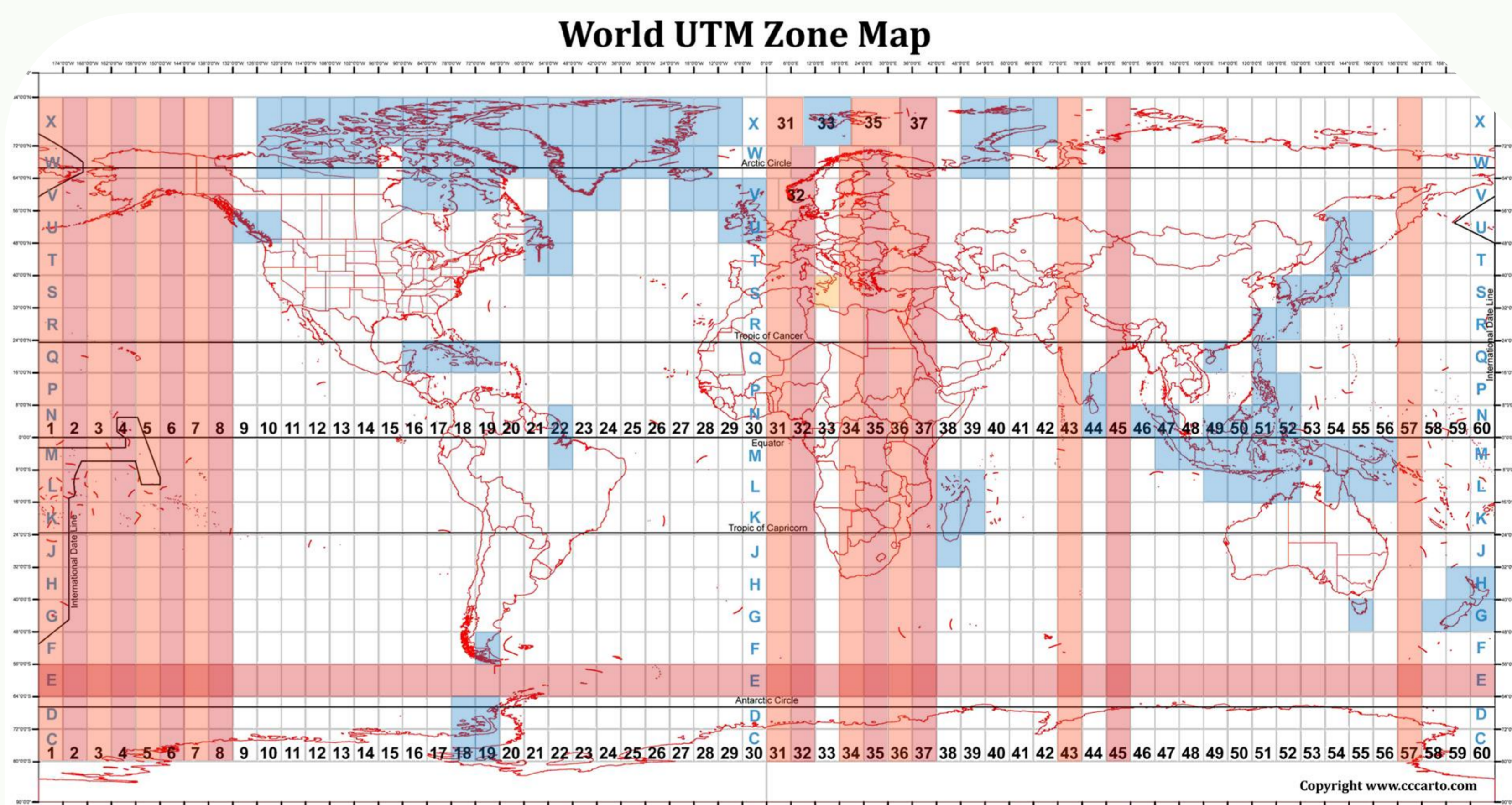

Fig. 2. Distribution of big (blue), contiental (without Iceland and Marjaó) islands (additionally Sicily in orange) on a World UTM Grid Zone Map (source of map: https://www.cccarto.com/crfphotos/utmzonemap.gif 20.04.2023)

World UTM Zone Map

Open questions

➤ Is **biodiversity on islands** ([a] in general, [b] big islands, [c] big continental islands) **bigger** per square kilometer **than on the continents**?

➤ Which **biodiversity measure identifies differences between long-isolated islands** (e.g. New Zealand) and those **connected in Pleistocene** (e.g. Borneo)?

➤ Are there **differences on the kind of island** (pure continental or with volcanism)?

➤ Which factors are **most important influences** on biodiversity across the globe: geology, variety of climate/geomorphology, time of evolution?

➤ Where are **cold spots** of (the known) biodiversity that should **statistically not exist**, therefore where should be more biodiversity?

As this thesis is about to evolve, feedback is very welcome!

SAYRE, R., NOBLE, S., HAMANN, S., SMITH, R., ..., REED, A. (2019): *A new 30 meter resolution global shoreline vector and associated global island database for the development of standardized ecological coastal units*, Journal of Operational Oceanography, **12** (2), pp. 47 – 56.