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Curating a Global Collection of Fiddler Crabs for the American Museum of Natural History, NYC

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Curating a Global Collection of Fiddler Crabs for the American Museum of Natural History, NYC

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Abstract

A collection of approximately 1000 jars of preserved fiddler crabs was received from Dr. F.H. Barnwell, Ecology, Evolution and Behavior, University of Minnesota–Twin Cities. It contained jars of crabs from Africa, the Americas, and the Indo-Pacific. Specimens in each jar were sorted by species and gender and then counted. An *Excel*® spreadsheet recorded collecting data while *Google Earth*® determined the GPS of each recovery site. The collection was reduced to 569 jars containing 68 species representing seven genera. The entire collection consists of 7804 crabs with 5925 males and 1879 females. New labels with up-dated information were made for each jar. Barnwell's scientific legacy is now ready for transport to the American Museum of Natural History in New York City.

Question

Can preserved specimens be properly curated and prepared by UNI Biology undergraduates for transfer to the research collection of a major natural history museum?

Background

All organismic classification is based on comparing specimens representing different species and populations. Collections containing many specimens and different species are indispensable in accurately assessing the taxonomy, ecology, and evolution of species (Mayr 1969). Museums are important centers of biological documentation. Collections are reference materials, and in that respect, are necessary for research progress in many facets of organismic biology. They contain materials that my be inaccessible due to geographic remoteness, politics, environmental catastrophes, and/or extinction.

Most museums are restricted to local species or a specific geographic region. Due to space, maintenance cost, and economy, there are only a few large museums that can maintain a world-wide collection of many organisms. In the United States there are currently six major museums of natural history that maintain sufficiently diverse collections for research. One is the American Museum of Natural History (NYC) with over 35 million specimens. Based on exhibits and collections, currently, the AMNH is rated second in the world by *World Atlas Travel* magazine. Since1869, the AMNH has sponsored collecting expeditions to all regions of the planet to recover specimens for research. Its stated mission is "To discover, interpret, and disseminate—through scientific research and education—knowledge about human cultures, the natural world, and the universe."

Frank H. Barnwell was a zoologist and the chair of Ecology, Evolution and Behavior at the University of Minnesota-Twin Cities. His specialization was studies of intertidal shore crabs. He collected land crabs and fiddler crabs from many tropical areas around the world. From 1962 until 1999 he assembled a collection of more than 2000 jars of specimens preserved in 70% ethanol. After his retirement these specimen laid dormant, many drying and deteriorating in the UM Ecology Building. In the spring and summer of 2021, the Barnwell collection was moved to the Department of Biology at UNI. Here, it is being curated for transfer to the Department of Invertebrate Zoology at AMNH where it will become part of their permanent research collection.

Methods

1. The Barnwell Fiddler Crab Collection was transferred by truck from UM -Twin Cities to McCollum Science Hall in two installments, April and June 2021.
2. Jars of crabs were sorted by species. Aliquots of 80% ethanol were added to evaporated jars along with new sealing lids. Specimens serve as vouchers for collecting locales. Desiccated specimens were discarded except those from unique locations.
3. Each jar received a unique number and its contents were counted and sorted by sex. Species identities were verified using Crane (1974) and Rosenberg (2014).
4. Species names were assigned using the system of Shih et al. (2016). The latitude and longitude of each collecting site were pin-pointed to nearest 0.000001° using *Google Earth*®.
5. An *Excel*® spreadsheet was used to record lot numbers, species name and authority, total number of crabs, number of females, number of males, collecting site GPS, and a geographic description of the habitat.

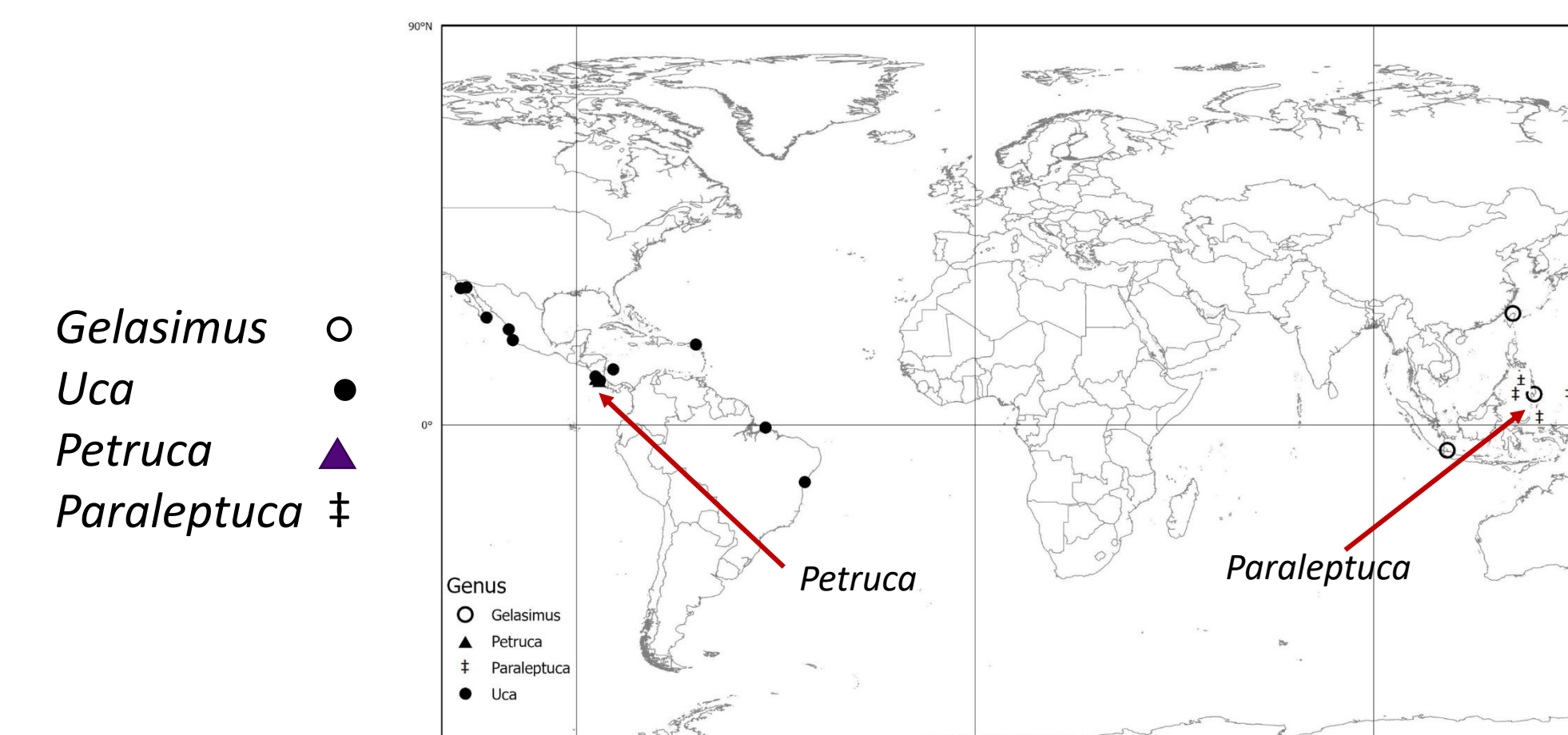
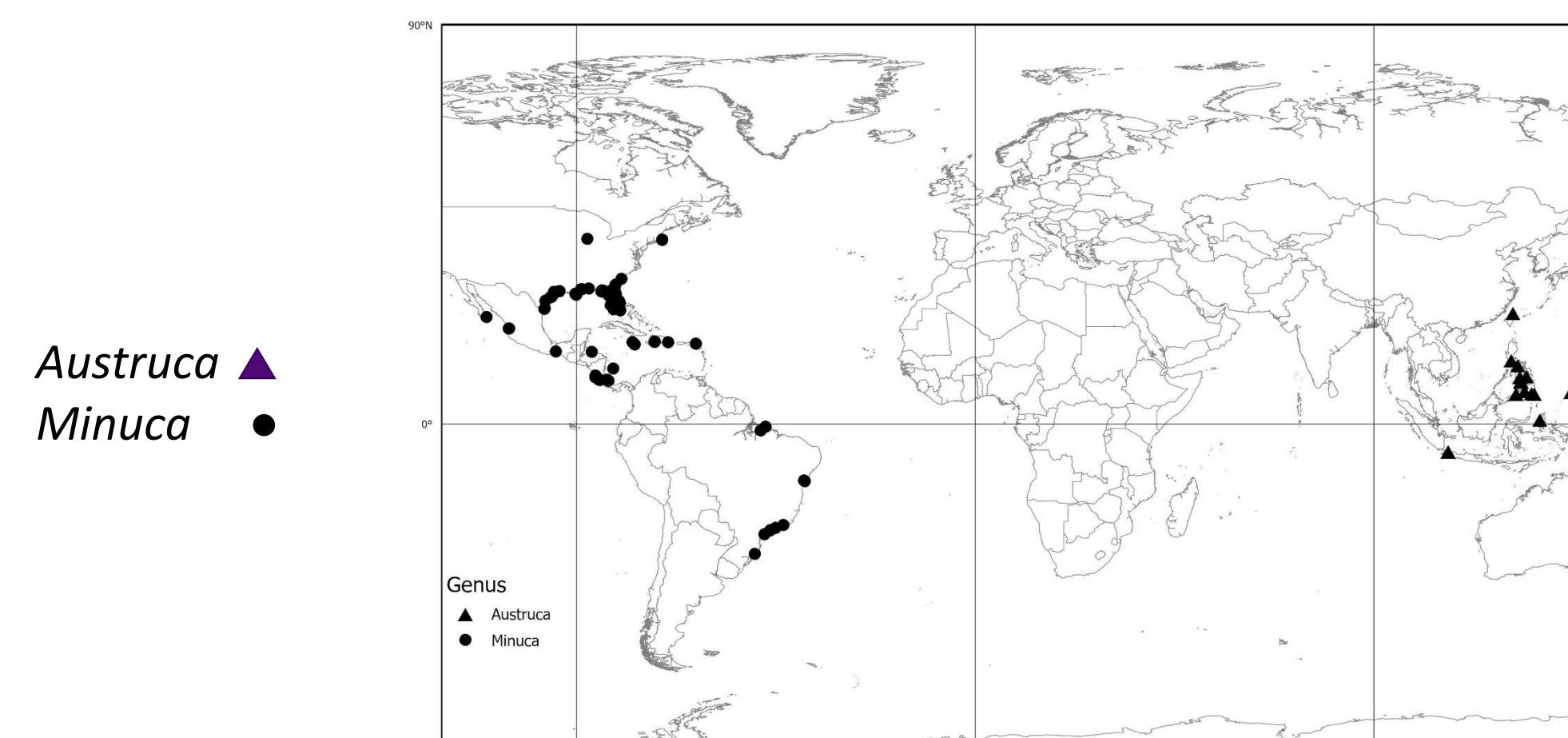
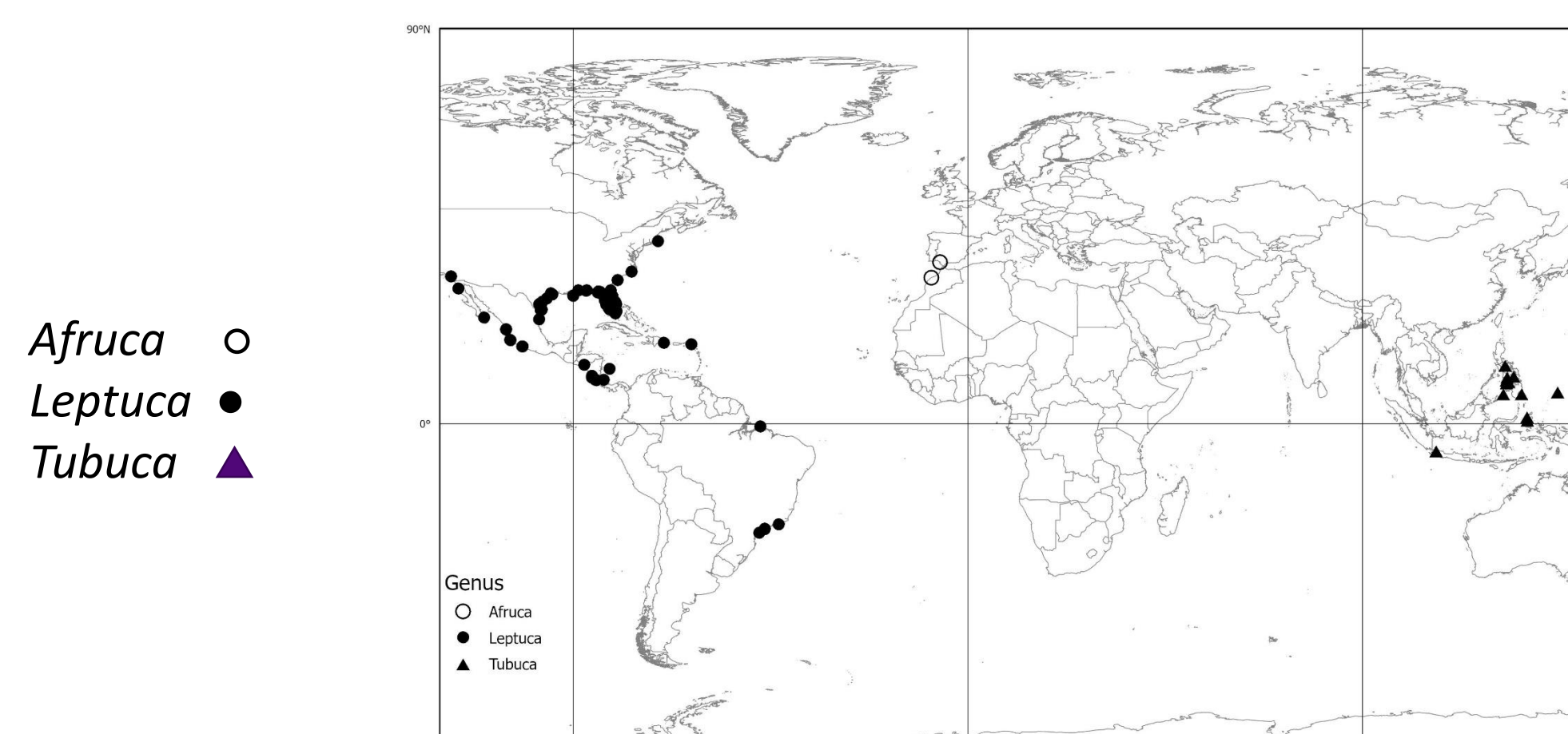
Results

The April portion of the collection contained 950 jars of fiddler crabs. These were initially sorted into species using contemporary nomenclature. The quality of specimens in each jar was assessed visually. Dried were separated from wet specimens in 80% ethanol and discarded unless their collecting location was unique. The residual jars were assigned unique "lot numbers" resulting in 569 lots (59.9% recovery). Specimens within each lot were counted.

Table 1. Numerical Representation.

Number of Females	1879	Number of Genera	9 (of 11 known)
Males	5925	Number of Species	68 (of 105 known)
Total	7804	Undescribed species	1
Species/genus	<i>Africa</i> – 1 (2)	<i>Leptuca</i> – 28 (90)	<i>Petruca</i> – 1 (1)
(locations)	<i>Austruca</i> – 4 (26)	<i>Minuca</i> -11 (108)	<i>Tubuca</i> - 6 (18)
	<i>Gelasimus</i> - 5 (14)	<i>Paraleptuca</i> -1 (10)	<i>Uca</i> -7 (17)

Fig. 1. Geographic Distribution of Genera.



Conclusions

Fig 2. Phylogeographic Distribution.

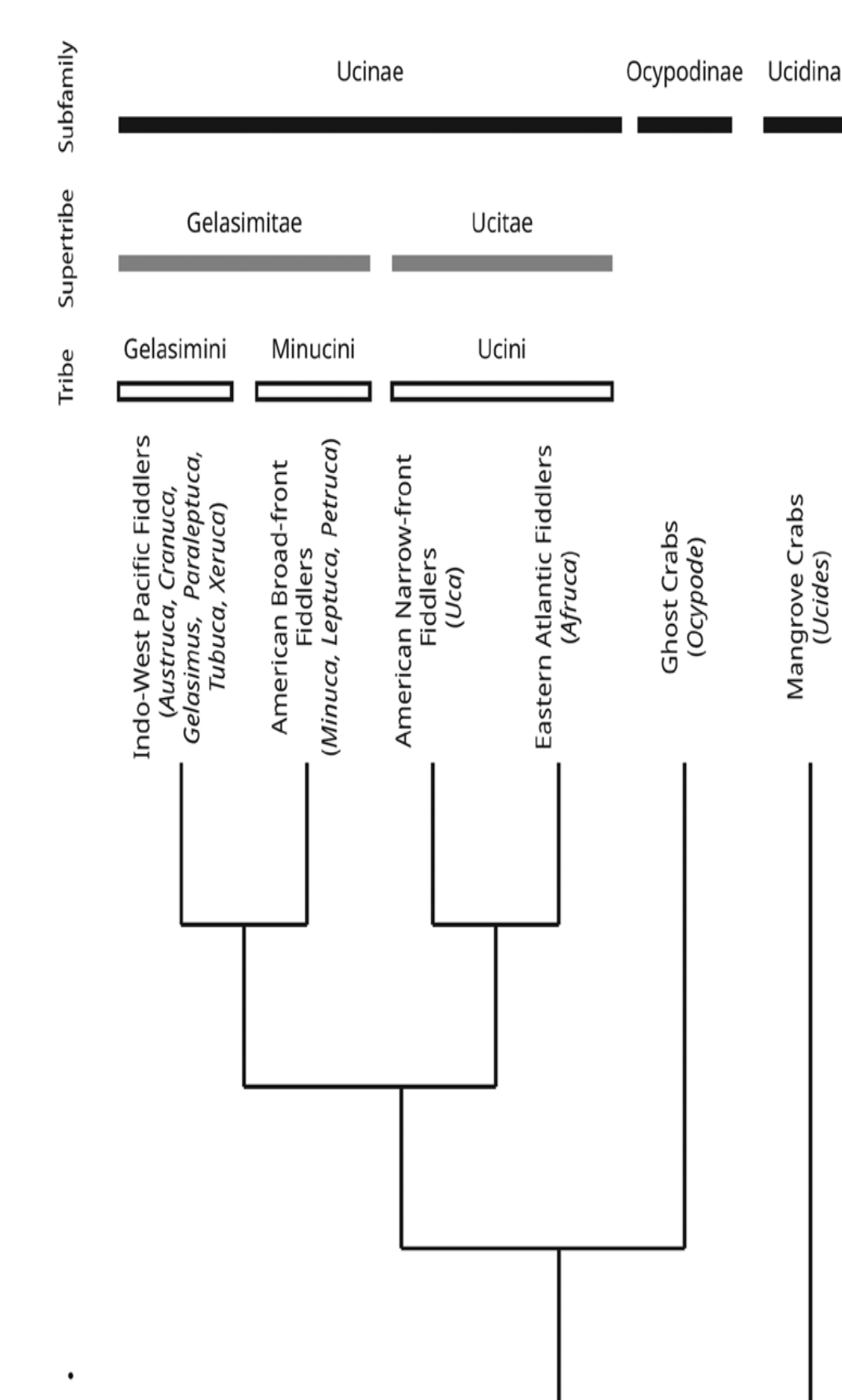
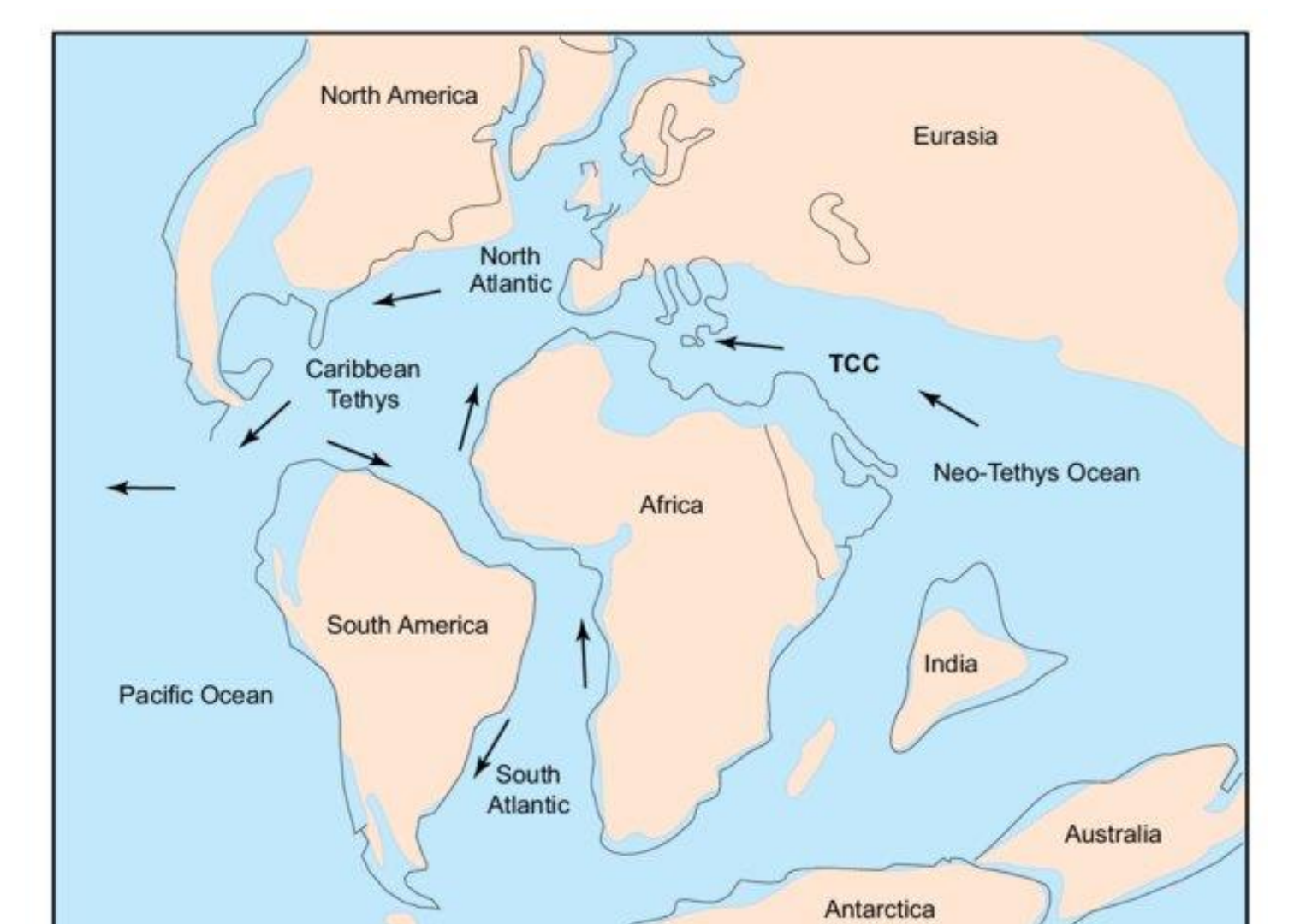


Fig. 3. Paleogeography of Oceans 65 MA. The Tethy's Seaway



We have rescued a declining collection of preserved *Ucinæ* (Fig. 1). New labels and a digital spreadsheet allow the extraction of data important for crab systematics and biogeography. At the AMNH, these lots will be available to future investigators. The digital spreadsheet will facilitate the harvesting of precise information on the genera and species in the collection. The spreadsheet can be used both locally or online by any interested party.

A quick analysis of the collection from the spreadsheet is shown in Table 1. Digital latitudes and longitudes from the files permit a biogeographic perspective of the seven genera (Fig. 1). A similar treatment could be used to examine species-specific distributions. Over-laying the distribution of genera with phylogeny (Shih et al. 2016), we see a phylogeography (Fig. 2) that suggests the evolution of taxa by vicariance and tectonic drift. It would appear that a common ancestor of the *Ucinæ* populated the margins of the Tethy's seaway (Fig. 3).

Citations

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