

GEOGRAPHIC ANALYSIS ON THE BODY
PIGMENTATION CHANGES BETWEEN
POPULATIONS OF THE CLEANER SHRIMP

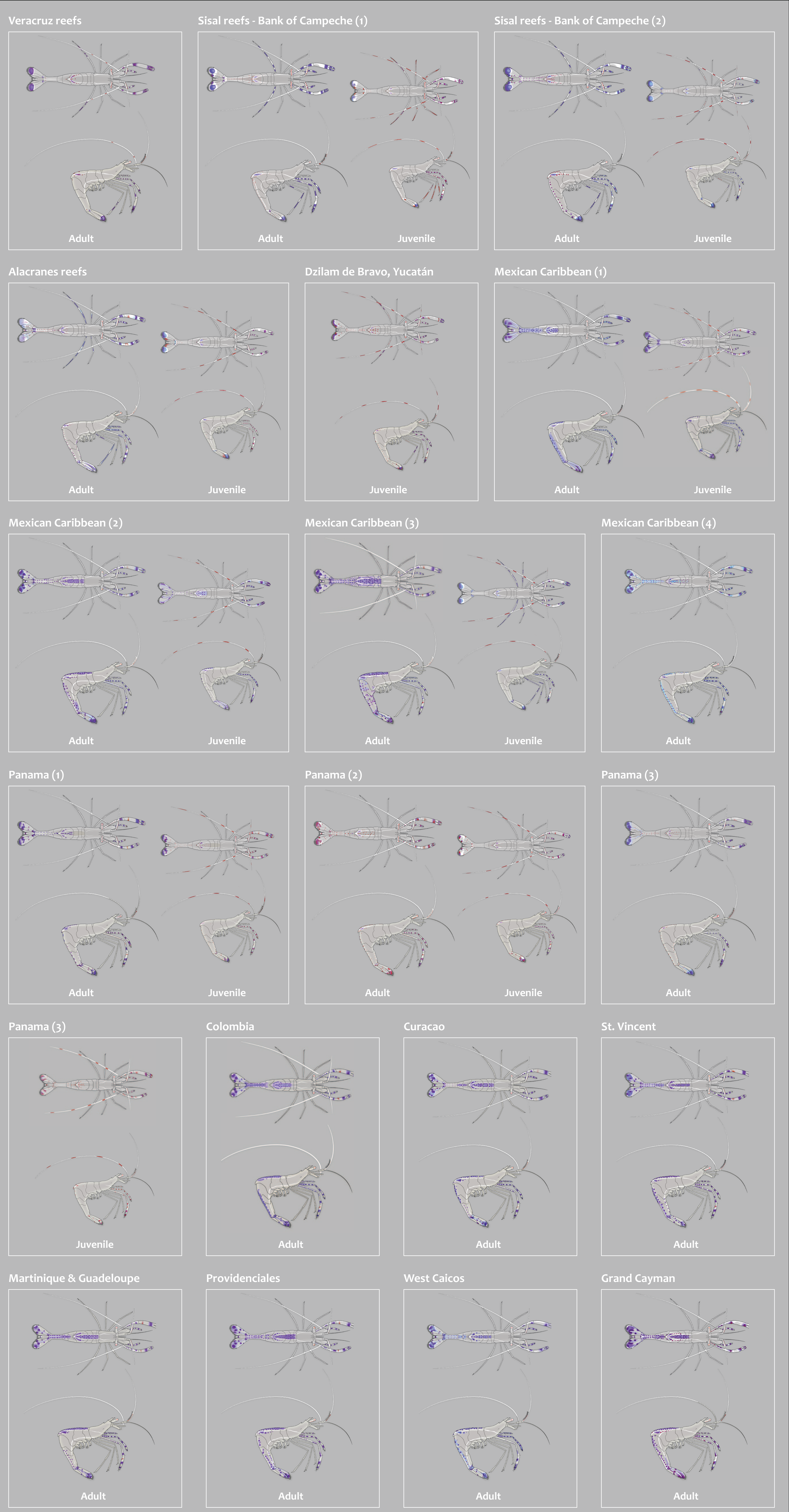
Ancylomenes pedersoni

Espinosa, A. ¹; Argáez, J. ²; Simões, N. ¹

¹Programa de Investigaciones en Ecología y Cultivo de Especies Marinas de Ornato (PIECEMO). Unidad Multidisciplinaria de Docencia e Investigación, Facultad de Ciencias, UNAM. Puerto de Abrigo, Sisal, Yucatán, México. Email: ns@ciencias.unam.mx
²Facultad de Matemáticas, Universidad Autónoma de Yucatán. Mérida, Yucatán, México.

Introduction

Pederson’s cleaner shrimp (*Ancylomenes pedersoni*) (Fig. 1) exhibits variable pigmentation patterns depending on the geographic zone, throughout its range of distribution, from the Florida Keys, across the Gulf of Mexico and the Caribbean. The objective of the present study was to determine whether each pattern is representative of a given geographical area.



Material and methods

A total of 632 pictures, representing 159 individuals from 23 locations on 13 different geographic zones were examined (Fig. 2). Data was classified and analyzed based on the pigmentation pattern of five distinct body characters (Size, red bands in the antennae, pigmented fifth pair or pereopods, round spots on the uropods, quantity of dorsal pigmentation), reproductive condition, depth and host species. First we investigate whether individuals that conform the sample could be separated into groups (cluster analysis), followed by whether such groups were associated with regions in which the specimens were collected (chi-square). Drawings from lateral and dorsal view depicting representative patterns from each geographic zone were generated based on detailed visual inspection.

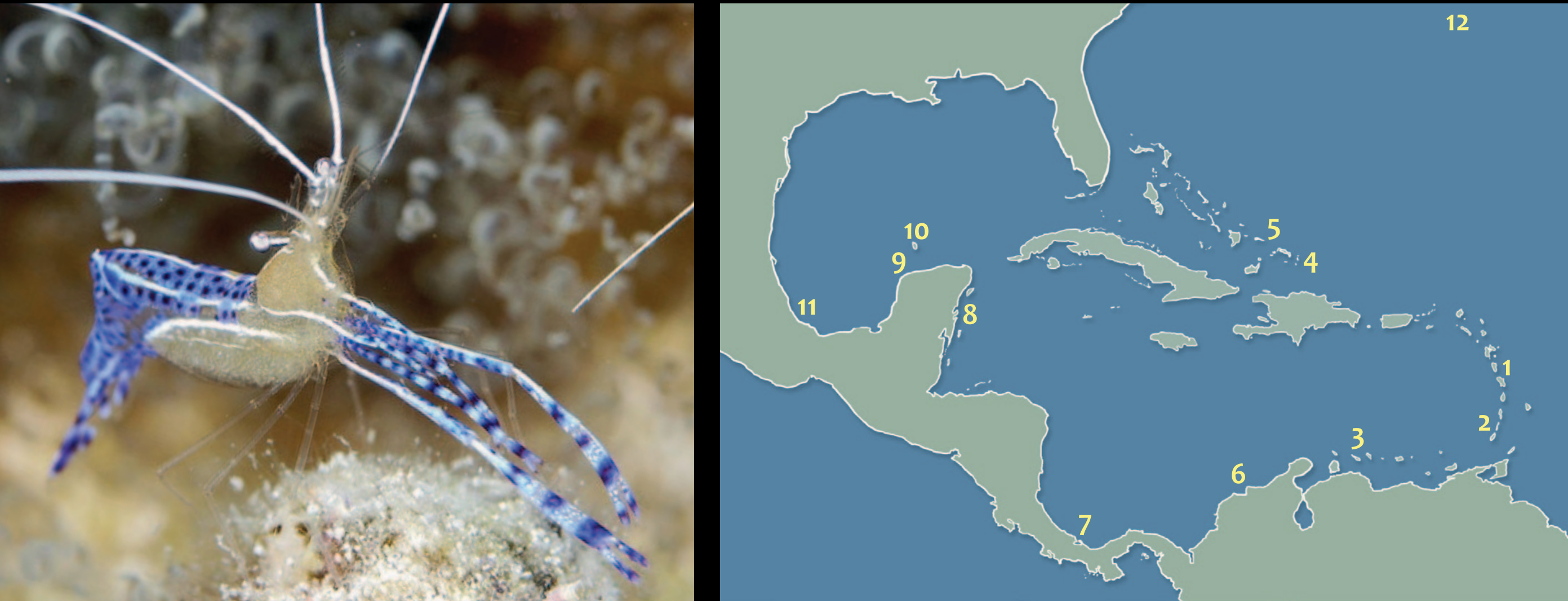


Fig. 1: Pederson’s cleaner shrimp (*Ancylomenes pedersoni*).
Fig. 2: Map of the geographic zones from which the pictures were taken, including the location of *A. anthophilus*. 1 = Martinique and Guadeloupe, 2 = St. Vincent, 3 = Curacao, 4 = West Caicos, 5 = Providenciales, 6 = Colombia, 7 = Panama, 8 = Mexican Caribbean, 9 = Sisal Reefs (Bank of Campeche), 10 = Alacranes Reef, 11 = Veracruz Reefs, 12 = Bermudas.

Results

There were five geographic zones which presented the most significant data (Fig. 3). Those were evaluated, and two main pigmentation pattern groups, Gulf of Mexico and Caribbean, were clearly differentiated (group 1 and 2, and group 3 and 4, respectively) (Fig. 4), based primarily on two present/absent characters: red bands in the antennae and pigmented fifth pair of pereopods (Fig. 5). Nevertheless, individuals from Panama exhibited marked differences from the rest of the Caribbean group (Fig. 6). Subtle and less marked differences were observed within those two main groups. Interesting shifts on the predominance of anemone hosts and/or specificity to a particular host were also observed.

	Martinique & Guadeloupe	Panama	Mexican Caribbean	Sisal Reefs	Alacranes Reefs
Group 1	0	6	3	22	20
Group 2	0	0	0	4	20
Group 3	3	10	14	0	0
Group 4	4	10	9	0	0
Total	7	26	26	26	40

Fig. 3: Five geographic zones which presented the most significant data.

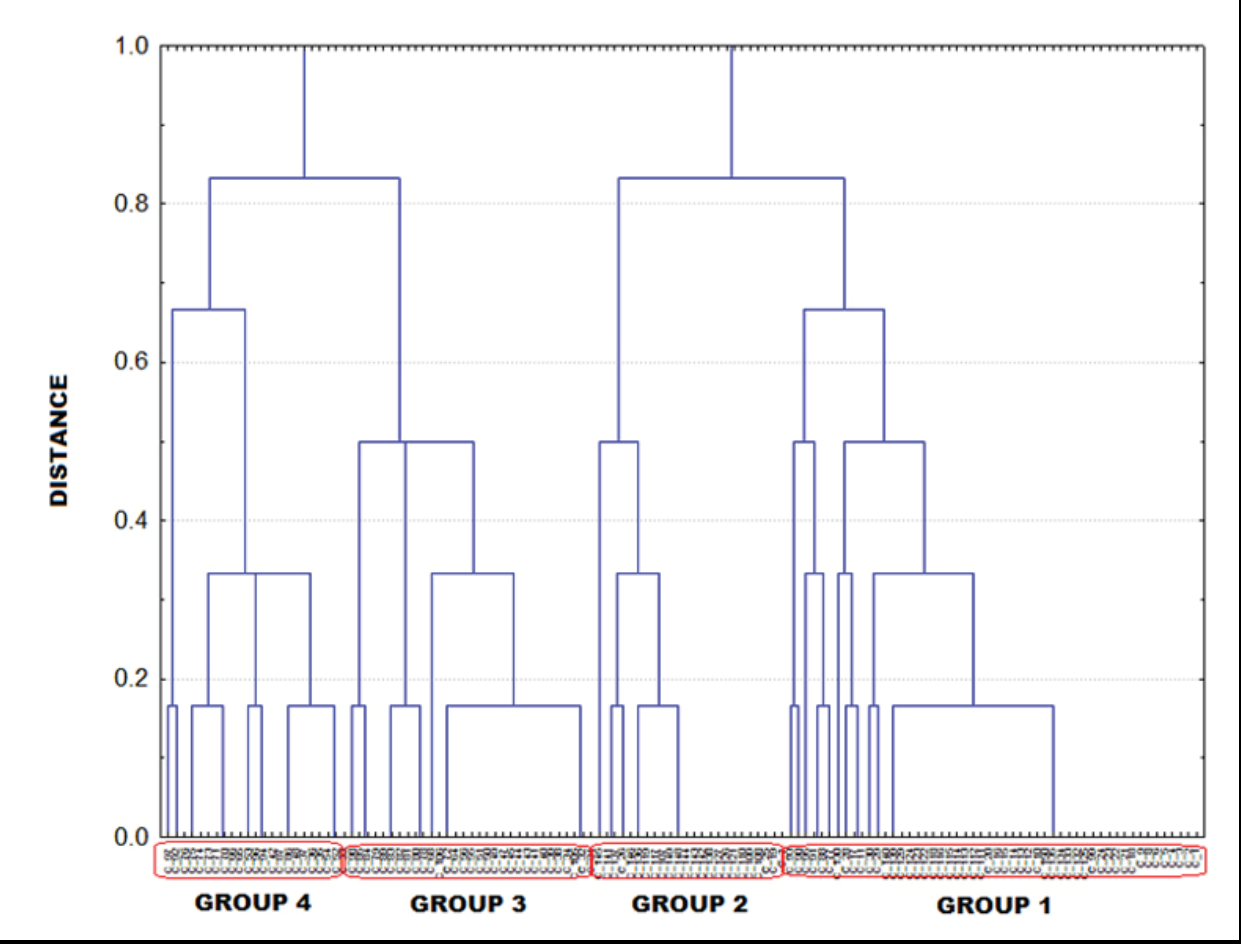


Fig. 4: Tree diagram presenting the main groups (1 and 2: Gulf of Mexico; 3 and 4: Caribbean).

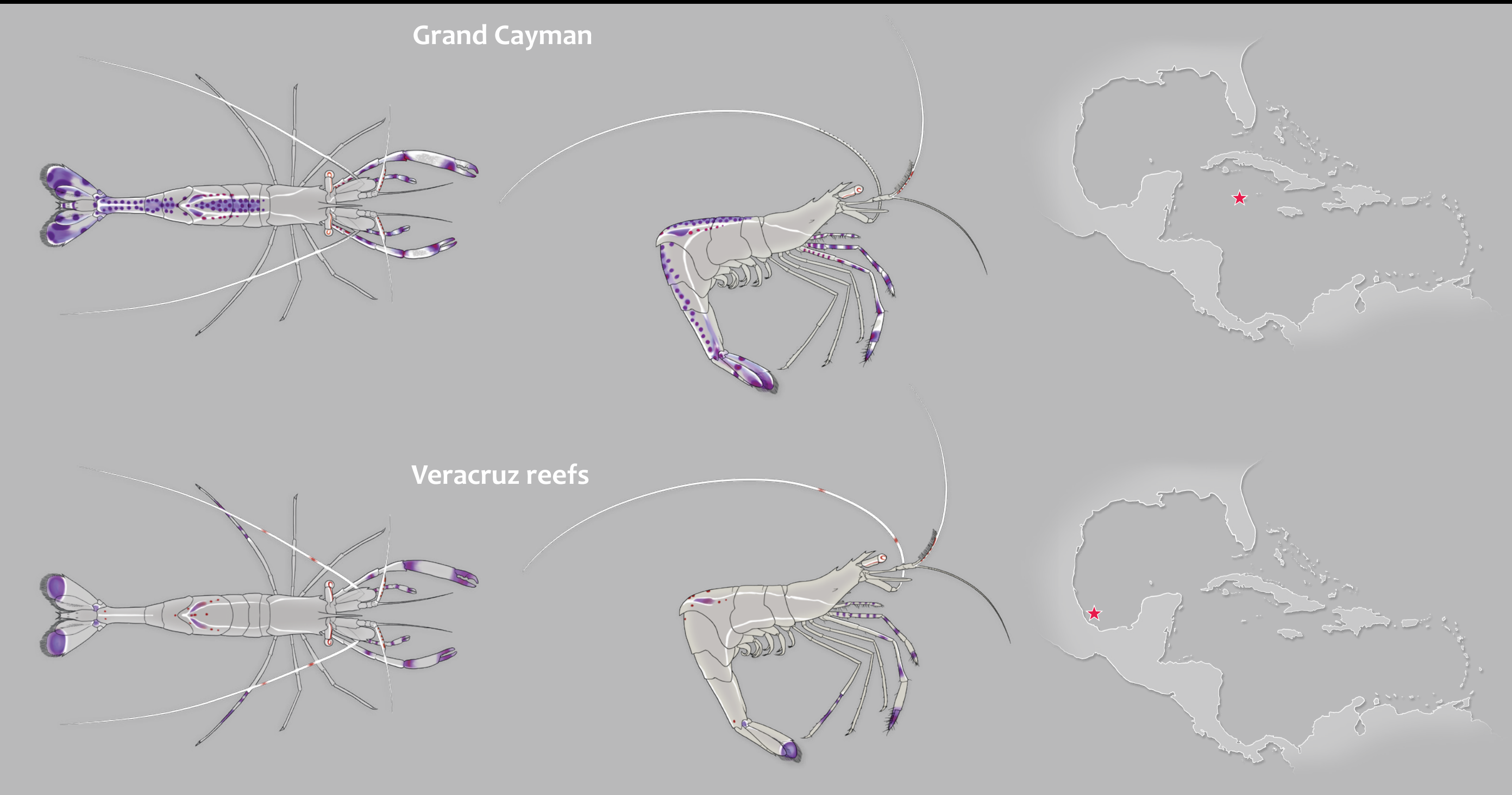


Fig. 5: Representative pigmentation patterns from the Caribbean (top) and the Gulf of Mexico (bottom), with location maps. Differences of pigmentation in antennae and fifth pair of pereopods.

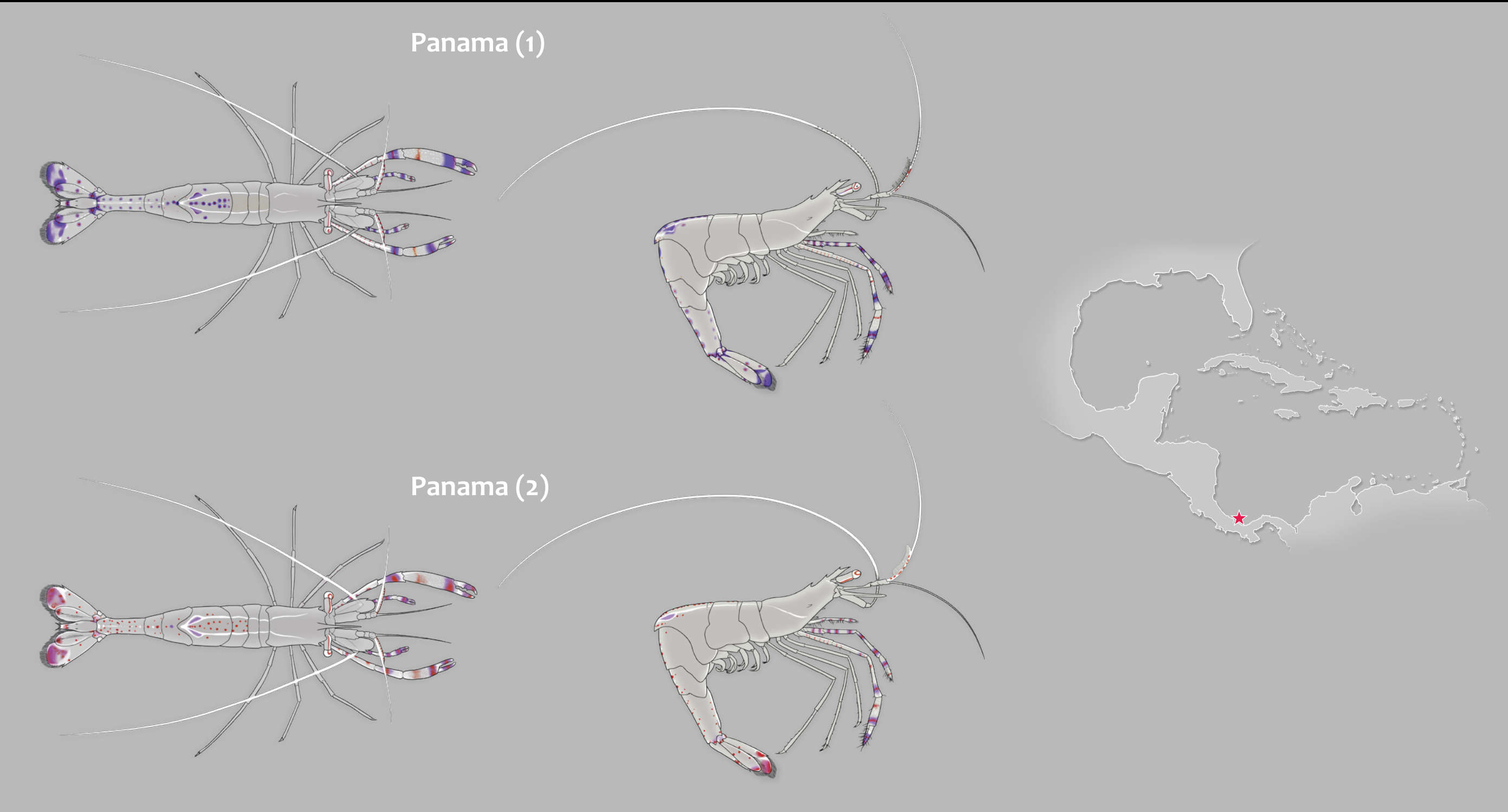


Fig. 6: Differences between the individuals of the same Panama population.

Discussion

As the *Ancylomenes pedersoni* metapopulation is distributed in patches, the currents present throughout the Caribbean and Gulf of Mexico may be acting as barriers between populations. This may be the main factor differentiating between these pigmentation groups, and also between the Panama’s group from the rest of the Caribbean (due to the Panama-Colombia gyre). Such consistent differences in distribution of body pigmentation patterns may help to elucidate the *A. pedersoni* vs. *A. anthophilus* same vs. different species ongoing debate (Fig. 7).

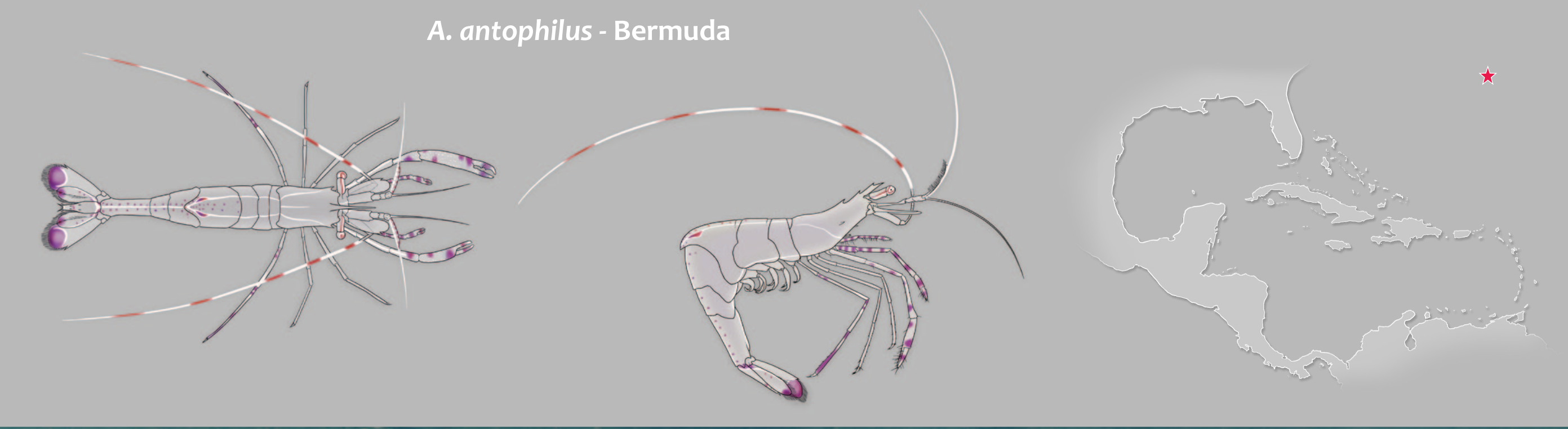


Fig. 7: *A. anthophilus* and a map of location. Presents similarities with *A. pedersoni* from the Gulf of Mexico.

Acknowledgements
To Alberto Guerra, for the illustrations of the color patterns.
To José Luis Tello Musi, Salvador Zarco Perelló, Manuel Oseguera, Sven Zea, Veronique Lamare, Anne Prouzet, Alain Goyeau, Patrick Thomas, Vincent Maran and Tom Doeppner, for the photographs used during the data collection.