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COLOR VARIATION IN THE CARIBBEAN CRAB *PLATYPODIELLA SPECTABILIS* (HERBST, 1794) (DECAPODA, BRACHYURA, XANTHIDAE)

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Introduction

Platypodiella spectabilis (Herbst, 1794) is a relatively small crab (about 10 mm carapace width) found in or near coral reefs and rocky shorelines throughout most of the Caribbean and tropical western Atlantic. Records are known from as far north as Bermuda (Chace et al. 1986, in Sterrer 1986, as *Platypodia spectabilis*) and as far south as Rio de Janeiro, Brazil, including the Fernando de Noronha Archipelago and Trinidade Island (Melo 1998: 490) and the state of São Paulo (Coelho and Ramos 1972, Fransozo et al. 2001). Thus, the range of the species is some 7,000 km from northern to southern extent. Distributional records within this range, and extending westward into the Gulf of Mexico, can be found in Rathbun (1930), Felder (1973), Powers (1977), and Abele and Kim (1986). Because of its spectacular coloration and color pattern, *P. spectabilis* is often depicted in faunistic guide books (e.g., Humann 1992, Humann and DeLoach 2002), and the species is sometimes referred to as the calico crab (e.g., Chace et al. 1986) or gaudy clown crab (Williams et al. 1989, McLaughlin et al. 2005).

The use of color in brachyuran crab systematics, and in particular the use of subtle color differences to suggest or differentiate cryptic or morphologically similar species, is now well documented (e.g., see Campbell and Mahon 1974 for species of *Leptograpsus*, Williams and Felder 1989 for species of *Menippe*, Zimmerman and Felder 1991 for species of *Sesarma*). Less clearly understood is why color patterns and intensities can sometimes vary appreciably within a species, even within narrowly restricted geographic regions. An appreciation of color patterns is critical to correctly identifying species for conservation and resource management purposes, yet often color patterns and ranges are unreported, causing confusion and sometimes misidentifications. Here we document a wide range of color patterns in a small Caribbean xanthid crab based on specimens collected in essentially the same habitat at the same time of year.

Materials and Methods

As part of a biodiversity survey of Caribbean cryptofaunal invertebrates, we sampled several habitats from shallow waters off Guana Island, British Virgin Islands, during the summers (June–August) of 1999–2002. Specimens of *P. spectabilis* collected during that survey came almost exclusively from an area of a few square meters at our North Bay collecting site, where they were found in interstices of dead coral (mostly clumps of dead *Porites*) in shallow water (≤ 1 m) (Station 65 of the Zimmerman/Martin survey of Guana Island in 2000 and 2001). Collections were made by crushing clumps of dead coral and removing by hand the invertebrates they contained. In this manner, a large number of specimens of *P. spectabilis* were collected (including all of the photographed specimens except Figure 2d), especially in the year 2001.

Similarly-sized crabs were photographed while alive or just after immersion in ice water, a technique that rapidly kills tropical crabs while preserving their color for up to 12 hr. Photography was done by T.L. Zimmerman (Figures 1a–f; Figure 2a–c) and Leslie Harris (Figure 2d). Associated field voucher numbers are listed in the figure captions.

After being photographed, crabs were preserved in either 70% or 95% ethanol for eventual transfer to and storage in the Crustacea collections at the Natural History Museum of Los Angeles County. One ovigerous female from the North Bay site (photographic voucher number Vc0-796, Figure 1b), with a carapace width 10.5 mm and carapace length 7.1 mm, was the parental female that formed the basis of the first description of larvae in this genus (Fransozo et al. 2001).

Results

As is evident from the accompanying figures (Figures 1 and 2), specimens of *Platypodiella spectabilis* collected in the British Virgin Islands (and presumably elsewhere) exhibit a wide range of color patterns. The background color varies from a light cream or beige (Figure 1a–d) to an intense yellow (Figures 1e, f; 2a–c). Regularly-spaced and nearly circular black spots ringed with white may be present on the carapace (Figure 1c, e), or the carapace can

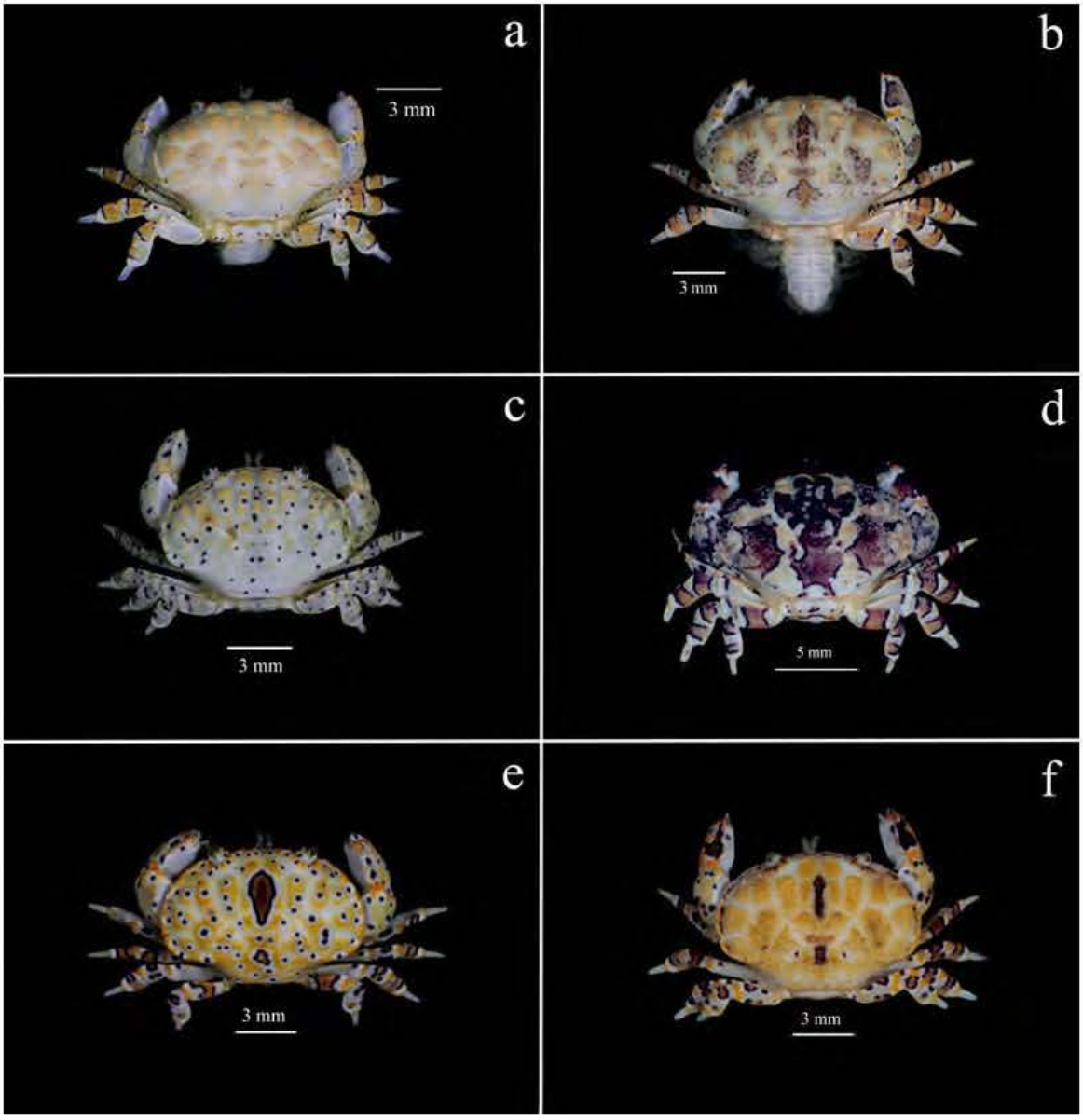

Figure 1. Color variation in the xanthid crab *Platypodiella spectabilis* (Herbst, 1794). a: muted background yellow, no spots, no brown patches (female, Vc0-799); b: muted background yellow with many muted large brown patches (female, Vc0-796); c: muted background yellow with spots, no brown patches (male, Vc0-800); d: muted background yellow with intense large brown patches, no spots (male, Vc0-792); e: intense background yellow with few small brown patches with spots (male, Vc0-798); f: intense background with few small brown patches, no spots (male, Vc0-801). All photographs by T. Zimmerman.

lack any semblance of similar-sized spots (Figures 1a; 2b). Irregularly-shaped brown patches sometimes occur on the carapace, and are often found on the cardiac and gastric regions (Figures 1d; 2a–c); in some specimens (e.g., Figure 2c) the brown patches are coalesced to form the majority of the color on the dorsal carapace, with only limited areas displaying white or yellow. Some individuals exhibited both irregular brown patches and more regularly-spaced and evenly-sized spots (Figure 1e). Pereiopods typically bear yellow, white and brown patches so as to appear banded. Usually the order of color on a given pereiopodal article is, from the proximal to distal end, yellow followed by brown followed by white, such that the distal end of the article is white or light beige (e.g., Figures 1a, b, d; 2b). However, in some specimens the segments of the legs are almost completely brown (Figure 2c), and in others the yellow area is bordered on both sides (rather than only on the distal side) by brown (Figure 1d).

Sex of the crab does not appear to have any noticeable effect on the color pattern; figures include both males (Figures 1c–f; 2a–b) and females (all others except Figure 2d, a juvenile). The juvenile we collected was lighter

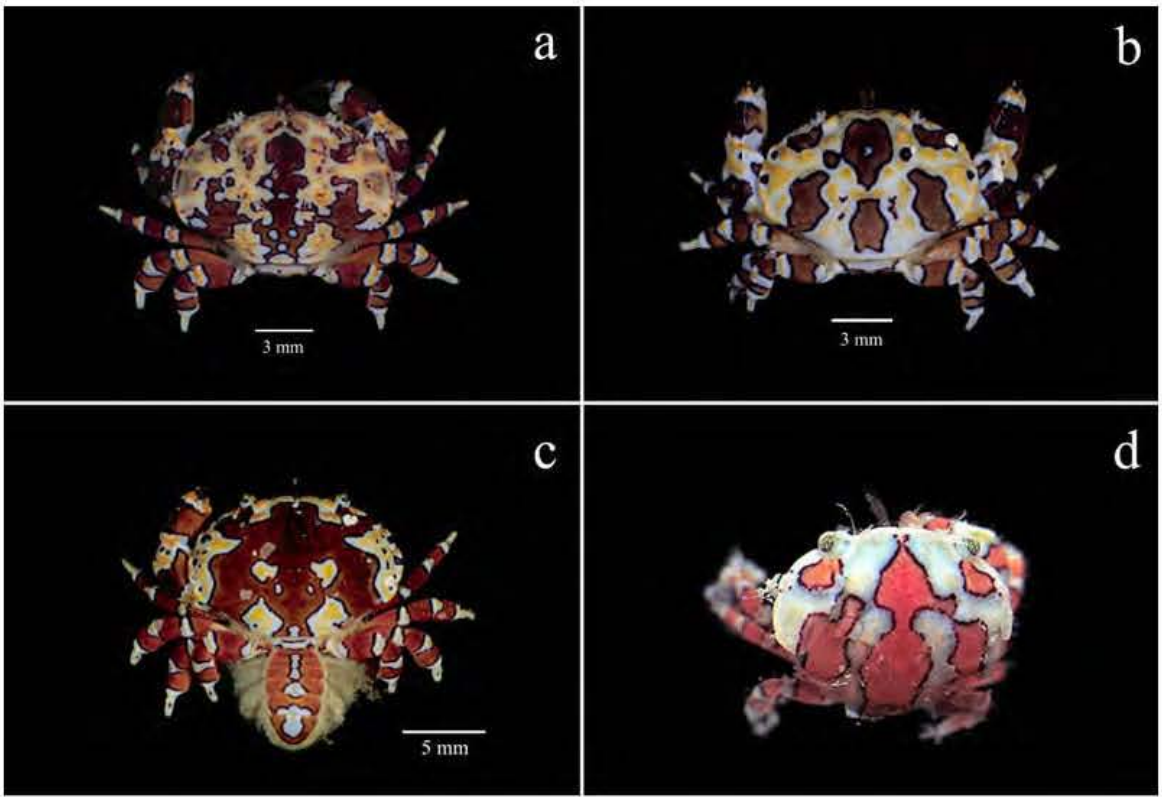

Figure 2. Color variation in the xanthid crab *Platypodiella spectabilis* (Herbst, 1794), continued. a: coalescent solid brown patches with some muted regions (and possibly spots) over diffuse intense yellow background (male, Vc0-797); b: distinct brown patches with distinct patches of intense yellow background color (male, Vc0-794); c: coalescent solid brown patches over diffuse intense yellow background (female, Vc0-793); d: coloration pattern in a juvenile (H-2037) before carapace regions are clearly demarcated. Photographs a–c by T. Zimmerman; d by Leslie Harris.

overall, with a background carapace coloration that was off-white and with a more orange (less brown) color pattern dorsally (Figure 2d).

DISCUSSION

Color plays an important role in species identification and presumably in species-species recognition among decapods. Additionally, knowledge of coloration and color variability can assist in the recognition of species by conservationists and resource managers without extensive taxonomic training. Coral-associated crabs are among the most colorful of all decapods, with trapeziids and tetralliids well known in this regard; coral-associated carpiliids and eriphiids are also often very colorful. However, few crab species exhibit coloration as striking as in *P. spectabilis*, and there are few reports of colors or color patterns that vary to the extent shown here within a known species and within a very small geographic range (in our case, within meters). A similar situation exists for a tropical hermit crab, *Calcinus gaimardi*, in the western Pacific with at least 2 distinct color morphs that occur sympatrically (C. Tudge, pers. comm., Morgan 1991, Tudge 1995).

Although it was stated earlier that the wide range of color patterns in this species might indicate a formerly unrecognized species complex (Frasozo et al. 2001), there is virtually no doubt that all specimens illustrated here belong to the same species. Even at the larval level, the widespread *P. spectabilis* does not appear to vary much across its rather large range. Fransozo et al. (2001) documented slight differences in the morphology of reared larvae of this species from the Caribbean and from Brazil, but overall, despite the geographic distance separating the parental females, larvae from the 2 areas were found to be quite similar.

The genus *Platypodiella* was erected by Guinot (Guinot 1967: 562) to accommodate 4 species formerly treated as *Platypodia*. Two of the species, *P. gemmata* (Rathbun, 1902) and *P. rotundata* (Stimpson, 1860) are known from the eastern Pacific. Garth (1991: 131), in discussing the Galapagos crab fauna, pointed out that the 2 Pacific species are possibly the adult (described as *P. rotundata*) and the juvenile (*P. gemmata*) of the same species, with the name *P. rotundata* having precedence. The other 2 species are Atlantic, with *P. picta* (A. Milne Edwards, 1869) restricted to the eastern Atlantic and *P. spectabilis* (Herbst,

1794) known from the western Atlantic. Guinot (1967) remarked on the similarities between species of this genus and those of *Platyactaea* and, to a lesser extent, to species of *Atergatis* and *Atergatopsis*, as well as to members of *Platypodia*. The latter 3 genera are sometimes considered members of the xanthid subfamily Zosiminae (e.g., see Serène 1984, Clark and Ng 1998). It would be interesting to examine the range of color patterns exhibited by species in these supposedly related genera to see if color variability has a phylogenetic component.

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