Revision of the *Alpheus nuttingi* (Schmitt) species complex (Crustacea: Decapoda: Alpheidae), with description of a new species from the tropical eastern Pacific

ARTHUR ANKER*1, CARLA HURT1, 3, NANCY KNOWLTON1,2,4

1 Instituto Smithsonian de Investigaciones Tropicales, Apartado 0843–03092, Balboa, Ancón, Panamá, República de Panamá / Smithsonian Tropical Research Institute, Naos Unit 0948, APO AA 34002, USA

2 Center for Marine Biodiversity and Conservation-0202, Scripps Institution of Oceanography, University of California San Diego, La Jolla, CA, 92093-0202, USA

3 Present address: University of Miami, Department of Biology, Coral Gables, FL, 33124-9118, USA

4 Future address: National Museum of Natural History, Smithsonian Institution, Washington DC, 20013-7012 USA

*Corresponding author: anker@si.edu

Abstract

The *Alpheus nuttingi* (Schmitt, 1924) species complex consists of three species. The only western Atlantic species, *A. nuttingi*, occurs from the southeastern United States to Brazil. The two eastern Pacific species are *A. galapagensis* Sivertsen, 1933 (synonyms: *A. canalis* Kim & Abele, 1988; *A. cryptodentatus* Christoffersen & Ramos, 1988), which occurs from the Gulf of California to Colombia and Galapagos, and *A. millsae*, n. sp., presently known only from a few localities in Panama. The three species differ morphologically, genetically, and in color pattern. The two eastern Pacific species both can be found in the intertidal, but *A. millsae*, n. sp. occurs slightly deeper, suggesting the possibility of ecological speciation. All evidence shows that *A. nuttingi* and *A. millsae*, n. sp. are transisthmian sister species, with *A. galapagensis* forming their sister clade. Genetic differentiation between the transisthmian sister species suggests a divergence time of approximately 6 mya, well before the final closure of the Isthmus of Panama.

Key words: *Alpheus*, snapping shrimp, species complex, transisthmian taxa, color pattern, eastern Pacific, western Atlantic, sibling species, COI, barcode

Introduction

The largest and morphologically most heterogenous species group within the speciose genus *Alpheus* Fabricius, 1798 is the *A. edwardsii* (Audouin, 1826) group (Coutière, 1899), with at least 95 described species worldwide (Anker, 2001b). This group is characterized mainly by the unarmed orbital hoods and the presence of two notches on the major chela: one on the dorsal margin and one on the ventral margin of the palm (e.g., Banner & Banner, 1982). However, based on molecular data, Williams et al. (2001) suggested that this configuration of the major chela may have evolved independently more than once within *Alpheus*, i.e., the *A. edwardsii* group may be polyphyletic. One of these clades contains the majority of species of the *A. edwardsii* group, including the western Atlantic *A. nuttingi* (Schmitt, 1924) and an eastern Pacific taxon that has had several names (see below), including *A. galapagensis* Sivertsen, 1933 and *A. canalis* Kim & Abele, 1988. These two closely related species differ from all the other American species of the *A. edwardsii* group by the sharply carinate rostrum; the deep adrostral furrows, not abruptly delimited from the orbital hoods or rostrum; the simple conical dactyli on the walking legs; the merus of the major cheliped with a minute distomesial tooth; the minor cheliped with fingers neither expanded nor balaeniceps, and with sharp, proximally some-