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## New record and range extension of the fiddler crab *Uca princeps* (Smith, 1870) (Brachyura, Ocypodidae) from California, USA

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### ABSTRACT

The fiddler crab *Uca princeps* (Smith, 1870) has previously been recorded along the Pacific coast of the Americas from Peru to Mexico. Here we extend its range into the United States, based on photographs posted on the iNaturalist website.

**Key Words:** amateur, citizen science, iNaturalist, *Leptuca crenulata*

*Uca princeps* (Smith, 1870), known alternatively in English as the large Mexican fiddler crab, greater Mexican fiddler crab, and princely fiddler crab, has one of the most extensive ranges of fiddler crabs in the Western Hemisphere, ranging along the Pacific coast of the Americas from the Sechura Bay in Northern Peru to Mexico (Rosenberg, 2014; [www.fiddlercrab.info](http://www.fiddlercrab.info)). Over the last 30 years our recognition of the northern edge of the species range along the Pacific Coast of Baja California, Mexico has gradually extended from Bahía Tortugas, Baja California Sur (27.67°N, 114.87°W) in 1989 (Campos & Campos, 1989) to Ensenada, Baja California (31.85°N, 116.63°W) today (E. Campos, personal communication). Some of this change appears to be an actual northward expansion of the species over the last few years, likely due to recent El Niño events, with the species now being found in well-surveyed areas where it was previously absent (E. Campos, personal communication). Here we report new observations approximately 240 km further north of the previous northernmost occurrence, extending the range of the species into the USA.

On 22 June 2018, a birdwatcher at the Bolsa Chica Ecological Reserve in Huntington Beach, CA, USA (33.70°N, 118.05°W), took photographs of fiddler crabs along the side of a trail, then subsequently posted four of them to the nature observation website iNaturalist (<https://www.inaturalist.org/observations/13824586>). Initially identified by citizen science naturalists on the site as *Leptuca crenulata* (Lockington, 1877), the photographs clearly show two species, with the large focal crab unquestionably a displaying male *Uca princeps* (Smith, 1870). This individual appears in three photographs, two of which also include a large, mud-colored female fiddler crab which is presumably the same species. In addition to this pair of individuals, numerous, significantly smaller fiddler crabs in the photos appear to be the more common (for the area) *L. crenulata*. Subsequent to the identification of this new species occurrence, additional local citizen scientists

visited the area in search of confirmation and on July 8 another observer found and photographed a large female *Uca* like the first (<https://www.inaturalist.org/observations/14189313>). On that same date, a third amateur naturalist visiting Bolsa Chica, knowing nothing of the iNaturalist discovery at the time, also spotted and photographed a displaying male *U. princeps* alongside a male *L. crenulata* (Fig. 1), later contacting the author directly about the discovery. The observer has since returned to the site and in early August 2018 an additional observation of multiple male *Uca princeps* at the San Diego Bay National Wildlife Refuge, CA, USA was posted to iNaturalist (<https://www.inaturalist.org/observations/15151795>). This location is approximately 100 km north of Ensenada and 146 km south of Bolsa Chica. The range extension of this species is noteworthy, not only because it is a few hundred kilometers farther north than previously observed, but also because it represents only the second species of fiddler crab to be found along the Pacific coast of the USA. In contrast, 14 species are found on the Atlantic and Gulf of Mexico coast of the USA (Rosenberg, 2014).

While no specimens were collected, we are confident in the identification of the large-size species as *U. princeps*. It is clearly a narrow-front species, making it a member of the genus *Uca* (*sensu* Shih *et al.*, 2016), what more traditionally would be the subgenus *Uca* (*sensu* Beinlich & von Hagen, 2006). *Uca princeps* has a carapace width approximately double that of *L. crenulata* (approximately 40 mm *versus* 20 mm; Crane, 1975; Rosenberg, 2002), a difference easily seen in the photos. The coloration and waving pose of the male are classic exemplars of *U. princeps* (Crane, 1975). Of the seven species from this (sub)genus found on the Pacific coast of the Americas, only two are found north of El Salvador (Rosenberg, 2014), and the other, *U. monilifera* Rathbun, 1915, has a completely different color and is restricted to the northern part of the Gulf of California (Brusca, 1980).

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**Figure 1.** Displaying male *Uca princeps* alongside smaller male *Leptuca crenulata* at Bolsa Chica Ecological Reserve in Huntington Beach, CA, USA. Photo provided by Al Borodayko. This figure is available in color at *Journal of Crustacean Biology* online.

It is not yet known if *U. princeps* is firmly established in southern California, will continue to spread further up the coast, or will turn out to be an ephemeral offshoot that disappears as local weather and current patterns shift with changing global temperatures. Given the apparent progression of this species up the coast of Baja California over the past decade (E. Campos, personal communication), it is possible that it is slowly invading northward, although it is not likely to extend much further up the coast of California without major changes to ocean temperatures and currents given that the current northern limit for any fiddler crab on the Pacific coast is Santa Barbara, CA (Hubbard & Dugan, 1989), only about 180 km farther along the coast (and more west than north). Garth (1960) observed in the Baja California region that the northernmost occurrence of tropical brachyuran species tended to occur in protected bays and lagoons where water temperatures were warmer than on nearby unprotected coastlines; he speculated that these protected water bodies might serve as refugia for tropical species as northern temperatures cooled. It is possible that these same types of sites serve as anchors for northward expansion as temperatures are warming. It seems unlikely that the appearance of this species in California is due to aquarium releases; as far as we know, this species is not sold for aquaria in the United States or anywhere else in the world, with the most common aquaria species in the USA, likely being the two common Atlantic coast species, *L. pugilator* (Bosc, 1802) and *Minuca pugnax* (Smith, 1870), neither of which could readily be confused with *U. princeps*. It is not entirely outside the realm of possibility that these individuals represent displaced adults captured as pets by tourists in Baja California and subsequently released in California, although this is unlikely.

The Bolsa Chica Ecological Reserve represents a successful case of wetland restoration. In the early twentieth century, a dam shifted the inner bay from a salt water marsh into freshwater ponds (<http://bolsachica.org/the-wetlands/bolsa-chica-history/>). Much of the water was drained to allow access for oil drilling in the middle of the century. It was not until 1973 that the ecological reserve was created and the dam replaced by a tide gate to allow salt water back into the inner bay. A survey conducted in 1979, shortly after the area was re-flooded, found no visible marsh, nor any crabs of any kind (M. Wicksten, personal communication).

This range extension illustrates one of the advantages of engaged citizen science and amateur naturalist observations as supported by sites such as iNaturalist. Although species identifications on such sites or collections always need to be taken with a certain degree

of skepticism until confirmed by specialists, and in many cases can never be determined with certainty without access to actual specimens, the geographic scope, sampling frequency, and quantity of the data available extends potential species observations well beyond what formal scientific surveys can accomplish. For example, we previously used informal birding lists to look at patterns of local extinction in a Peruvian rainforest (Pearson *et al.*, 2010). Over 10 years, iNaturalist has recorded over 11 million individual observations (including over 50,000 observations of crustaceans), from almost 300,000 observers, 4.7 million of which have been considered research grade and integrated in the Global Biodiversity Information Facility (GBIF) network of biogeographic data. Scientists interested in geographic (and potentially, seasonal) patterns of species observations should be aware of the potential plethora of data such citizen science sites have just waiting to be explored.

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