

## NEW RECORDS OF SNAPPING SHRIMPS (FAMILY ALPHEIDAE) FROM CALIFORNIA

Mary K. Wicksten

*Abstract.*—Thirteen species of snapping shrimps are known from California: *Automate dolichognatha*, *Alpheopsis equidactylus*, *Synalpheus lockingtoni*, *Betaeus ensenadensis*, *B. longidactylus*, *B. gracilis*, *B. harfordi*, *B. setosus*, *B. macginitieae*, *B. harrimani*, *Alpheus clamator*, *A. bellimanus*, and *A. californiensis*. *Automate dolichognatha* is reported from California for the first time. Northern range extensions are provided for *S. lockingtoni*, *B. ensenadensis*, and *A. clamator*. The range of *Alpheopsis equidactylus* is extended to the south. A key to the species is provided. Only four of the snapping shrimps range further north than Monterey Bay, California.

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Snapping shrimps (family Alpheidae) are common in warm marine waters. Thirteen species, however, range into the cooler waters of the Californian Province, south of Point Conception, California; ten of them have been recorded as far north as Monterey Bay; four extend north of San Francisco Bay; and two have their northern limits in British Columbia or Alaska. Discussions of the species have been provided by Schmitt (1921), Hart (1964), Word and Charwat (1976), Butler (1980), and Wicksten (1981).

Range extension of *Automate dolichognatha* and *Betaeus ensenadensis* were found among material collected during environmental impact surveys. The specimens were provided by Dale Straughan and Dorothy Soule, respectively. Range extensions of *Alpheopsis equidactylus* and *Alpheus clamator* were discovered among material in the holdings of the Allan Hancock Foundation (AHF), University of Southern California. The specimen of *Synalpheus lockingtoni* was studied in the collections of the California Academy of Sciences (CAS).

### Extensions of Range

#### *Automate dolichognatha* De Man

*Automate dolichognatha* De Man, 1887:529–532, pl. 22, fig. 5.—Wicksten, 1981: 1104–1105.

*Previous records.*—Pantropical; in the eastern Pacific north to Clarion Island, off Mexico (Wicksten 1981).

*Material.*—One specimen. 2.9 mi, 292° true from Church Rock, Santa Catalina Island (33°18'55"N, 118°22'46"W), 20 m, in box core, 10 Mar 1973, *Velero IV* sta 18666, AHF.

#### *Alpheopsis equidactylus* (Lockington)

*Alpheus equidactylus* Lockington, 1877:7, 35.

*Crangon equidactylus.*—Schmitt, 1921:76–77, fig. 53.

*Alpheopsis equidactylus.*—Word and Charwat, 1976:38.

*Previous records.*—Monterey to Santa Barbara (Schmitt 1921); Palos Verdes, 60 m (Word and Charwat 1976).

*Material.*—One specimen. 11 mi NW of buoy, Cortez Bank (32°32'30"N, 119°18'10"W–32°32'30"N, 119°17'50"W), 83–85 m, 11 Jun 1941, *Velero III* sta 1347-41, AHF.

*Alpheus clamator* Holmes

*Alpheus clamator* Holmes, 1900:182, pl. 2, figs. 38–40.—Holthuis, 1952:49.—Word and Charwat, 1976:45.

*Alpheus dentipes.*—Schmitt, 1921:74–75, fig. 50.

Not *Alpheus dentipes* Guérin, 1832 (eastern Atlantic species).

*Previous records.*—San Bartholome Bay, Lower California, Mexico to Farallon Islands, California (Schmitt 1921).

*Material.*—2 specimens. Horseshoe Cave, Sonoma County (38°19'N, 123°05'W), shore, 27 May 1967, R. J. Menzies AHF sta 1674-49.

*Betaeus ensenadensis* Glassell

*Betaeus ensenadensis* Glassell, 1938:416–419, pl. 28.—Hart, 1964:445–447, figs. 23–25, 28, 35, 36, 43–45.—Word and Charwat, 1976:48.

*Previous records.*—El Estero de Punta Banda, Baja California, Mexico; Mission Bay, False Bay, California (Hart 1964).

*Material.*—One specimen. Los Angeles Harbor, 10 m, 10 Apr 1978, R. V. *Van Tuna*, L. A. Harbor Project sta A 14, AHF.—One specimen. Long Beach Harbor, 3–4 m, 16 Oct 1978, R. V. *Golden West*, Harbors Environmental Projects sta D10, AHF. Both at about 33°40'N, 118°15'W.

*Synalpheus lockingtoni* Coutière

*Synalpheus lockingtoni* Coutière, 1909:21–23, fig. 1.—Schmitt, 1921:77–78, fig. 54.—Word and Charwat, 1976:64.—Standing, 1981:778.

*Previous records.*—Port Escondido, Port Mulege, and other points in the Gulf of California; Santa Monica Bay, Venice Beach, San Diego Bay, Palos Verdes, Elkhorn Slough (Word and Charwat 1976; Standing 1981).

*Material.*—One specimen. On wharf piles, Santa Cruz, (36°58'N, 122°04'W), 18 Sep 1960, John P. Strohbeen, CAS.

*Remarks.*—Rathbun (1910) and Standing (1981) reported *S. lockingtoni* from Santa Elena Bay, Ecuador. The record originally came from Nobili (1897). However, Nobili mentioned that his specimen (as *Synalpheus laeviusculus* [Lockington]) had a short rostrum, not exceeding the orbital spines. Probably, the record of *S. lockingtoni* from Ecuador is based on a misidentification.

Ranges of Snapping Shrimps in California

The ranges of snapping shrimps known from California are given in Table 1. An additional species, *Alpheus barbara* Lockington, 1878, was reported from Santa Barbara (Schmitt 1921). This species has not been seen since its description in 1878.

Table 1.—Ranges of species of snapping shrimps.

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|                                                                |                                                                                          |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Species reaching their northern limits in southern California: |                                                                                          |
| <i>Automate dolichognatha</i> :                                | circumtropical, to Santa Catalina Island, California.                                    |
| <i>Alpheus californiensis</i> :                                | Magdalena Bay, Baja California, Mexico to San Pedro, California (Schmitt 1921)           |
| <i>Betaeus ensenadensis</i> :                                  | Estero de Punta Banda, Baja California, Mexico to Los Angeles Harbor, California.        |
| Species reaching their northern limits in Monterey Bay:        |                                                                                          |
| <i>Alpheopsis equidactylus</i> :                               | Cortez Bank, California to Monterey.                                                     |
| <i>Alpheus bellimanus</i> :                                    | Islas Secas, Panama to Monterey Bay (Wicksten 1983).                                     |
| <i>Betaeus gracilis</i> :                                      | Laguna Beach to Monterey Bay (Hart 1964).                                                |
| <i>Betaeus macginitieae</i> :                                  | Santa Catalina Island to Monterey (Hart 1964).                                           |
| <i>Betaeus longidactylus</i> :                                 | Tepoca Bay, Gulf of California to Elkhorn Slough (Hart 1964).                            |
| <i>Synalpheus lockingtoni</i> :                                | Gulf of California to Santa Cruz.                                                        |
| Species reaching their northern limits in northern California: |                                                                                          |
| <i>Betaeus harfordi</i> :                                      | Magdalena Bay, Baja California, Mexico to Fort Bragg, California (Hart 1964).            |
| <i>Alpheus clamator</i> :                                      | San Bartolome Bay, Baja California, Mexico to Horseshoe Cove, Sonoma County, California. |
| Species ranging north to British Columbia or Alaska:           |                                                                                          |
| <i>Betaeus harrimani</i> :                                     | Newport Harbor, California to Sitka, Alaska (Hart 1964).                                 |
| <i>Betaeus setosus</i> :                                       | Morro Bay, California to Hecate Strait, British Columbia (Hart 1964).                    |

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Shrimps of the family Alpheidae are most diverse in tropical waters. Perhaps this is why only four species range further north than Monterey Bay, a protected area which may have warmer waters than areas to the immediate north along the coast.

Key to the Species of Snapping Shrimps in California

- 1. Triangular movable plate articulated at posterolateral angle of sixth abdominal somite lateral to base of uropod ..... 2
- No triangular movable plate articulated at posterolateral angle of sixth abdominal somite lateral to base of uropod ..... 9
- 2. Rostrum prominent, orbital hoods armed with spines. (Subtidal only) ..... *Alpheopsis equidactylus* (Lockington)
- Rostrum absent, front without spines. (Intertidal–subtidal) . . *Betaeus* spp. 3
- 3. Dactyls of walking legs slender and simple ..... 4
- Dactyls of walking legs stout and bifid ..... 6
- 4. Chelae of first legs with fingers longer than palm. Large male with gaping fingers of chelipeds ..... *Betaeus longidactylus* Lockington
- Chelae of first legs with fingers not longer than palm. Large male with heavier, stouter chelae, but without gaping fingers ..... 5
- 5. Blade of antennal scale broad distally. Fixed finger of first cheliped decreasing in width evenly to sharp curved tip . *Betaeus harrimani* Rathbun
- Blade of antennal scale narrow distally. Fixed finger of first cheliped truncate before sharp curved tip ..... *Betaeus ensenadensis* Glassell

6. Front curved, not emarginate. Commensal with sea urchins (*Strongylocentrotus* spp.) ..... *Betaeus macginitieae* Hart
- Front emarginate. Commensal with abalone, or free-living ..... 7
7. Emargination of front shallow. Telson with posterolateral spines small or missing. Commensal with abalones (*Haliotis* spp.) ..... *Betaeus harfordi* (Kingsley)
- Emargination of front deep. Telson with posterolateral spines well developed ..... 8
8. Peduncle of first antenna less than 0.5 carapace length. Merus of cheliped with lower inner ridge with long bristles, upper ridge ending in sharp tooth; chela with fingers subequal to palm; chela 3 times as long as wide ..... *Betaeus gracilis* Hart
- Peduncle of first antenna subequal to carapace length. Merus of cheliped with lower inner ridge usually tuberculate, upper ridge with tuft of hair; chela with fingers longer than palm; chela twice as long as wide ..... *Betaeus setosus* Hart
9. Eyes fully exposed dorsally. (Burrowing in soft bottoms) ..... *Automate dolichognatha* De Man
- Eyes covered by carapace. (Burrowing in soft bottoms or not) ..... 10
10. Pereopods without epipods. Dactyls of pereopods 3–5 bifid ..... *Synalpheus lockingtoni* Coutière
- Pereopods with epipods. Dactyls of pereopods 3–5 with simple tips ... *Alpheus* spp. 11
11. Dactyl of major chela closing horizontally. Merus of third pereopod with prominent inferior spine ..... *Alpheus clamator* Holmes
- Dactyl of major chela closing vertically. Merus of third pereopod without prominent inferior spine ..... 12
12. Orbital hoods with spines. Minor chela with prominent spine posterior to movable finger, movable finger flattened (lamellate) ..... *Alpheus bellimanus* Lockington
- Orbital hoods without spines. Minor chela without prominent spine posterior to movable finger, movable finger not flattened ..... *Alpheus californiensis* Holmes

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Department of Biology, Texas A&M University, College Station, Texas 77843.



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