Introduction of the Siberian prawn *Exopalaemon modestus* to the Sacramento-San Joaquin Delta

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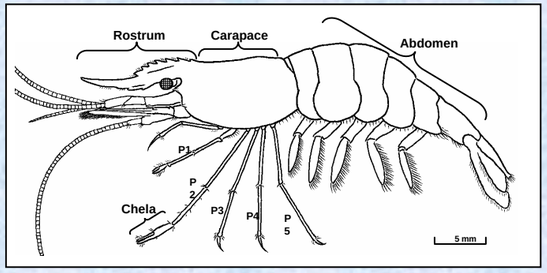
The freshwater Siberian prawn, *Exopalaemon modestus,* was recently introduced into the Sacramento-San Joaquin Delta, and has since become established. This poster presents some basic life history, distribution, and identification information for *E. modestus.* Additionally, identification information for shrimp that may be confused with *E. modestus* is provided. The development of good distributional and abundance data begins with identification, and will be essential in understanding the ecological role of *E. modestus* in the Delta.

Life History Information of *Exopalaemon modestus*

- Ecologically important in native habitat (serves as both predator of meiofauna and prey for fishes)
- Economically important in native habitat (subsistence fisheries for bait and food, in addition to larger-scale commercial farming)
- Life cycle is completed in fresh water (does not need brackish water at any life stage), but it can tolerate brackish water
- Native to fresh waters of Asia (Korea, China, Taiwan, and Amur and Ussur Rivers in Siberia)

Figure 1. *Exopalaemon modestus*



P1-P5 = Pereiopods 1 through 5 Drawing by Tom Greiner, CDFG

Exopalaemon modestus in the Delta

- First documented collection in September 2000 in lower Sacramento River by California Dept. of Fish and Game (CDFG) San Francisco Bay Study
- Method of introduction unknown
- Was well established in the Delta by 2002
- Usually found in fresh water, but has been caught in brackish water (up to 18 ppt)
- Downstream catches declined slightly in 2004-2005, but increased in upstream areas (i.e. Knights Landing and San Joaquin River upstream of Stockton)

Potential effects of *Exopalaemon modestus*

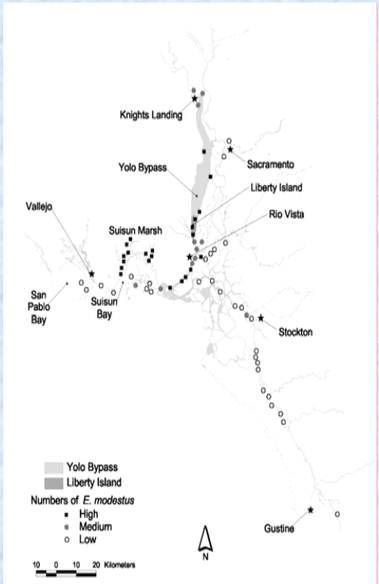
- Long term effects still unknown
- Potential food web effects, could alter abundance or species composition of prey items
- Potential competition with native shrimp and fish for food and habitat
- Could spread to other freshwater areas and watersheds in California through aqueducts, canals, or human-mediated dispersal (i.e. dumping of *E. modestus* collected for bait)

Figure 2. Photo of live *Exopalaemon modestus* from the Delta.

Photo by Steven Slater, CDFG

Note: The larger shrimp shows signs of bacterial spot disease (the large brown spots on the tail). This is not part of the typical pigmentation. The disease, however, is not uncommon, and can appear anywhere on the shrimp.

Figure 3. *Exopalaemon modestus* distribution in the Delta and watershed, showing relative numbers of shrimp.



Map by Ken DeVore, CDFG

Drawing by Tom Greiner, CDFG

Photo by Steven Slater, CDFG

***Exopalaemon modestus* (family Palaemonidae)**

- **Introduced to fresh and brackish waters of Sacramento-San Joaquin Delta and nontidal fresh water upstream of Delta; established.**
- **Rostrum with 5-11 dorsal teeth (usually 7-9 in CA) and 2-4 ventral teeth; rostral base with high crest.**
- **Fingers of chelae about equal in length to palm.**
- **Mandibular palp present.**
- **No dorsal abdominal carinae.**
- **No gastric spine.**
- **No supraorbital spine.**

Drawing from CDFG San Francisco Bay Study

Photo by Steven Slater, CDFG

***Palaemon macrodactylus* (family Palaemonidae)**

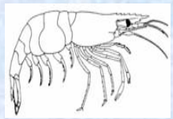
- **Introduced to marine and brackish waters of San Francisco Estuary, occasionally in tidal freshwater; established.**
- **Rostrum with 9-15 dorsal teeth (usually 10-12 in CA) and 3-5 ventral teeth; rostral base without high crest.**
- **Fingers of chelae shorter in length than palm.**
- **Mandibular palp present.**
- **Gastric spine present on dorsal side of carapace, directly posterior to last rostral tooth.**
- **No dorsal abdominal carinae.**
- **No supraorbital spine.**

Drawing modified from Wicksten 1997

Photo modified from Cha et. al. 2001

***Exopalaemon carinicauda* (family Palaemonidae)**

- **Introduced to marine waters in south San Francisco Bay; 2 separate collections in the 1990s; not established.**
- **Rostrum with 6-9 dorsal teeth and 3-8 ventral teeth; rostral base with high crest.**
- **Fingers of chelae longer in length than palm.**
- **Mandibular palp present.**
- **Dorsal abdominal carinae present.**
- **No gastric spine.**
- **No supraorbital spine.**

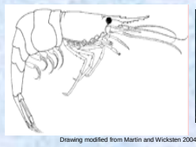


Drawing modified from www.itsofauna.org

Photo by Dave Ostendorf, Missouri Dept. of Conservation

***Palaemonetes kadiakensis* (family Palaemonidae)**

- **Introduced to nontidal fresh water in California; several documented collections from Cosumnes River in 2005 and 2006; possibly established.**
- **Rostrum with 7 dorsal teeth and 3 ventral teeth; rostral base without crest.**
- **Fingers of chelae about equal in length to palm.**
- **Mandibular palp absent.**
- **No dorsal abdominal carinae.**
- **No gastric spine.**
- **No supraorbital spine.**



Drawing modified from Martin and Wicksten 2004

Photo by Larry Serpa, The Nature Conservancy

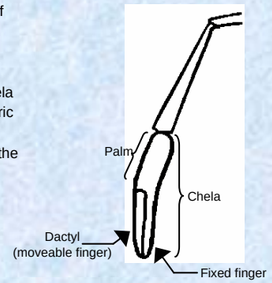
***Syncaris pacifica* (family Atyidae)**

- **Native to low elevation perennial freshwater streams in Napa, Sonoma, and Marin counties; remaining in 17 stream segments; state and federal endangered species.**
- **Rostrum with 0-3 dorsal teeth and 3-10 ventral teeth; rostral base without high crest.**
- **Terminal tufts of setae on chelae of pereiopods I and II (no setae on chelae in family Palaemonidae).**
- **Supraorbital spine present.**
- **No gastric spine.**
- **No dorsal abdominal carinae.**

Definitions of Important Morphological Characters
(referencing above table)

1. **Carapace:** shell covering anterior portion of body
2. **Carina (plural carinae):** a ridge or keel
3. **Chela (plural chelae):** a claw or pincer
4. **Dactyl:** smaller, moveable finger of the chela
5. **Gastric spine:** a spine located on the gastric (stomach) region of the carapace
6. **Mandibular palp:** small, inner segment of the mandible (jaw)
7. **Rostrum:** anterior projection of carapace between eyes
8. **Seta (plural setae):** hairs or bristles
9. **Supraorbital spine:** spine located on the carapace above the eye

Figure 4. Diagram of generalized shrimp second pereiopod



Citations for Image References

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Martin, J.W., and M. K. Wicksten. 2004. Review and re-description of the freshwater atyid shrimp genus *Syncaris* Holmes, 1900, in California. Journal of Crustacean Biology 24(3): 447-462.

Wicksten, M.K. 1997. Introduction of the ridgetail prawn, *Exopalaemon carinicauda*, into San Francisco Bay, CA. California Fish and Game 83: 43-44.

Acknowledgements

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