

Introduction of the Siberian prawn, *Exopalaemon modestus*, to the San Francisco Estuary: Ten years later

Tiffany Brown
California Dept. of Water Resources

Kathy Hieb
California Dept. of Fish and Game

***Exopalaemon modestus*:**
The Siberian freshwater prawn



E. modestus: Significance and Potential Impacts

- **Important ecological role**
 - Predators of meiofauna
 - Prey for larger fishes
- **Potential food web impacts**
 - May compete with other shrimp and planktivorous fish for food
- **Potential extirpation/extinction of species it competes with**
 - Introduction of *E. modestus* into one Chinese lake led to extirpation of an endemic shrimp species

Life History

- **Spawning season approximately May to September; temperature-dependent**
- **Larvae are planktonic**
- **Growth is sexually dimorphic**
- **“True” freshwater shrimp**

Life History cont.

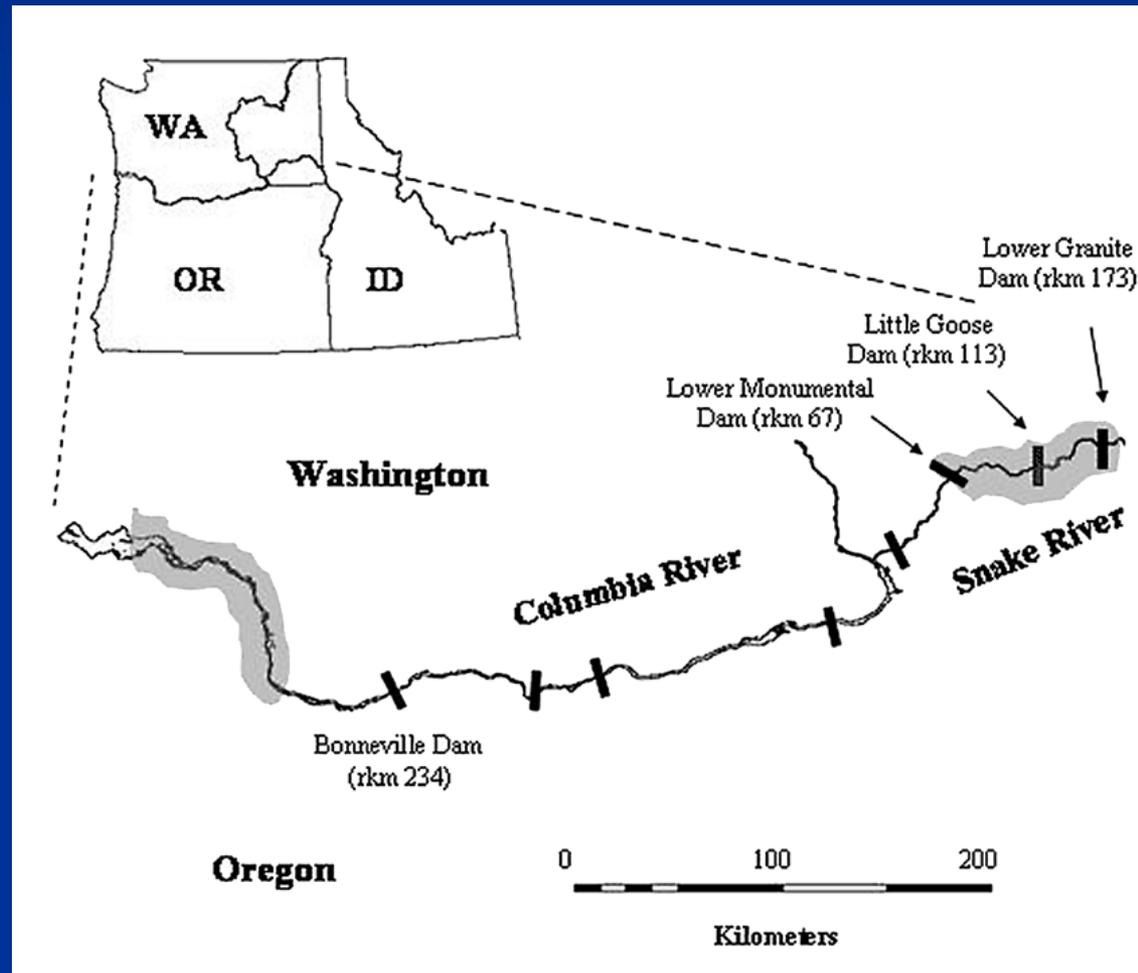
- **Prefers epibenthic habitats**
- **Life span is approximately 1 to 1 ½ years**
- **Size of adults is approximately 60 mm to 80 mm total length (including rostrum)**

Other Info

- **Important food fishery in native range; also serve as forage for sport fish**
- **Can bioaccumulate microcystins**
- **Still poorly studied in native habitat**

E. modestus in North America

- Discovered in lower Columbia River in 1995; now established there and in the Snake River



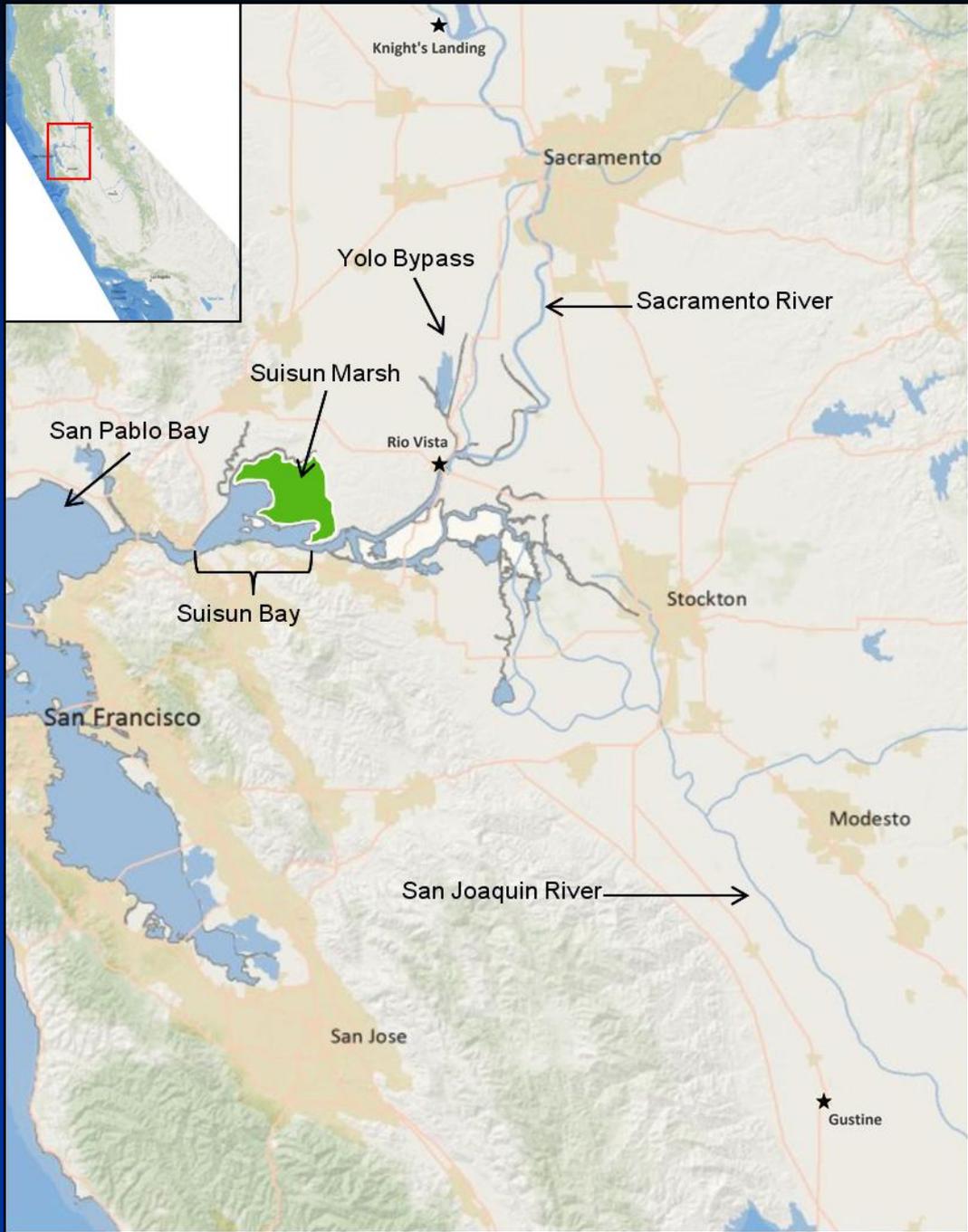
Map modified
from Haskell
et. al. 2006

E. modestus in California

- **Discovered in the Sacramento-San Joaquin Delta in 2000**
- **Source of introduction unknown**
- **Established by 2002; exact population total and distribution are unknown**

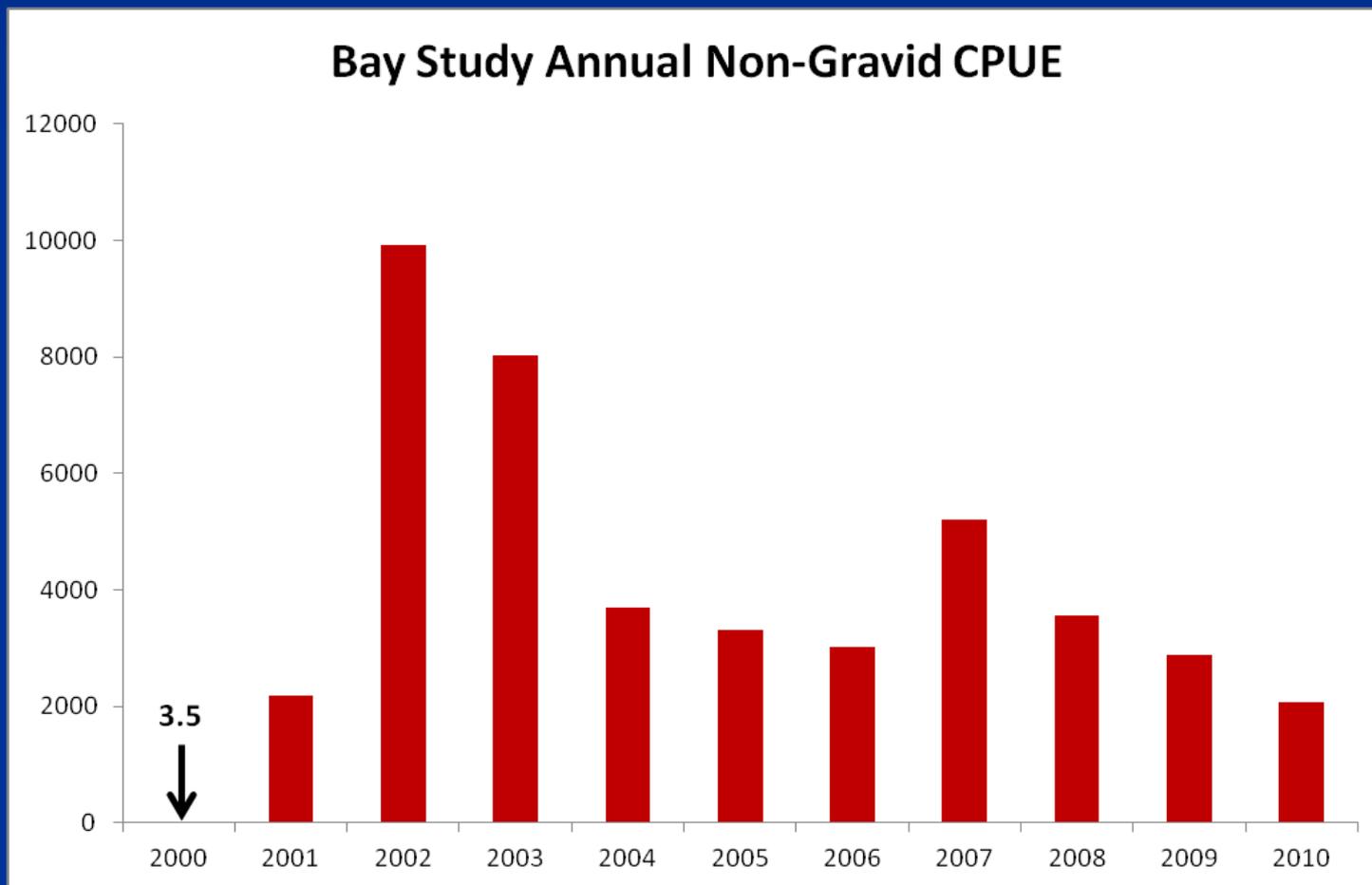
E. modestus in California cont.

- **Tolerates a wide range of salinity (0-24 ppt) and temperature (4-32°C)**
- **Spring-summer spawners in the Delta**
- **Highest numbers seen from 2002 through 2004 in the Delta**



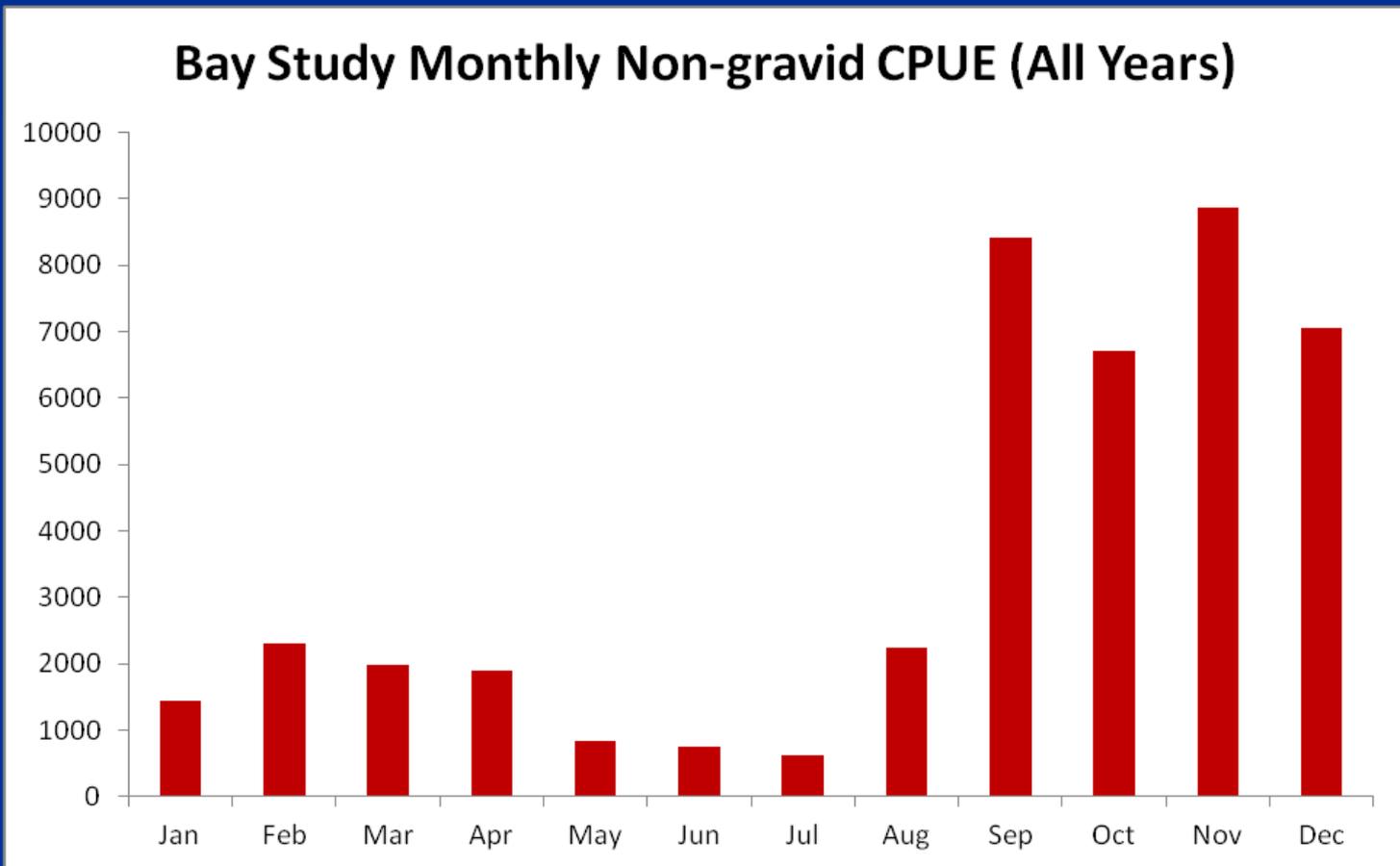
E. modestus in California cont.

- **Bay Study Data: numbers in Delta highest in 2002-2003; now stabilized**



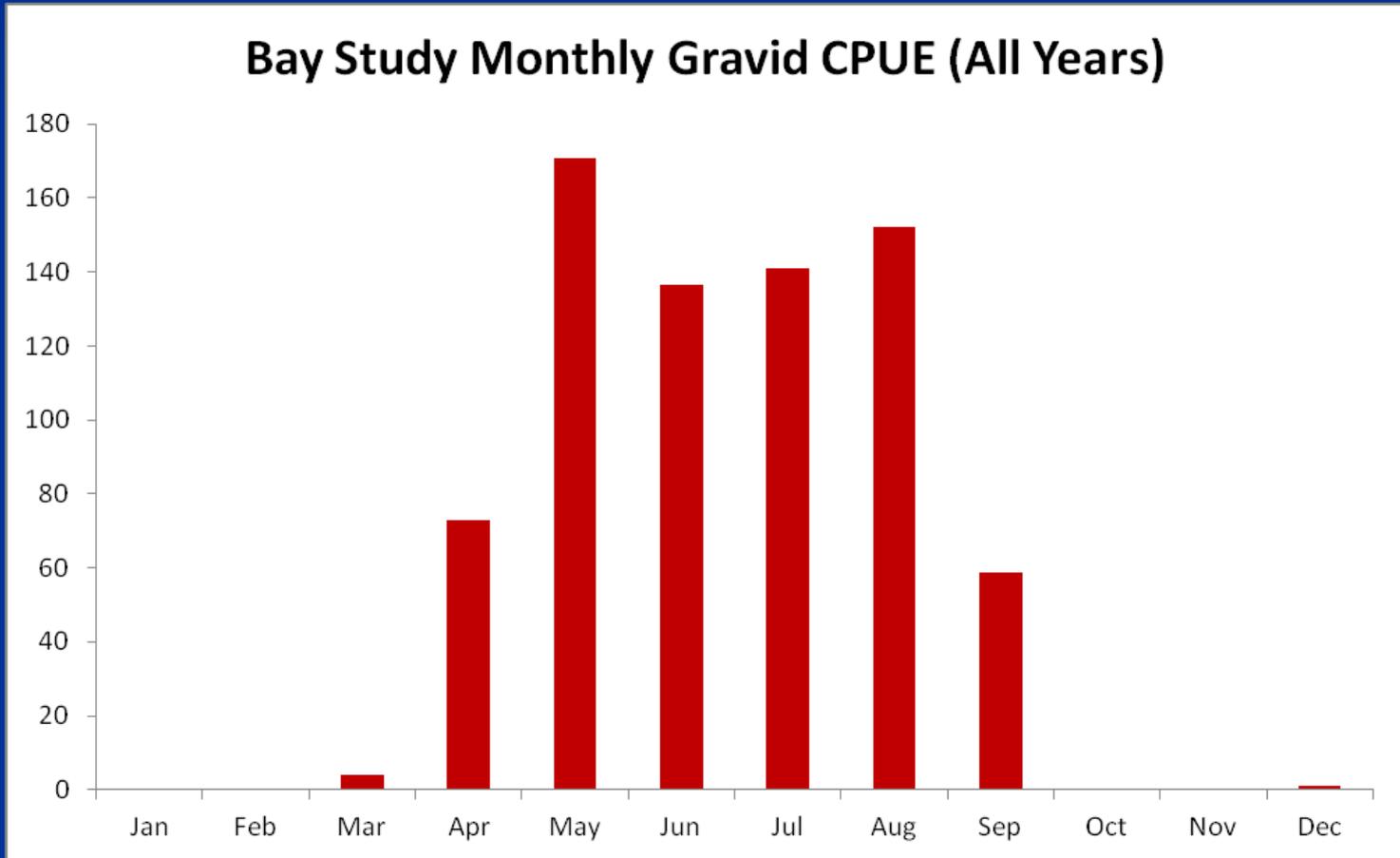
E. modestus in California cont.

- **Bay Study: seasonal peak in abundance in late fall and winter (non-gravid shrimp)**



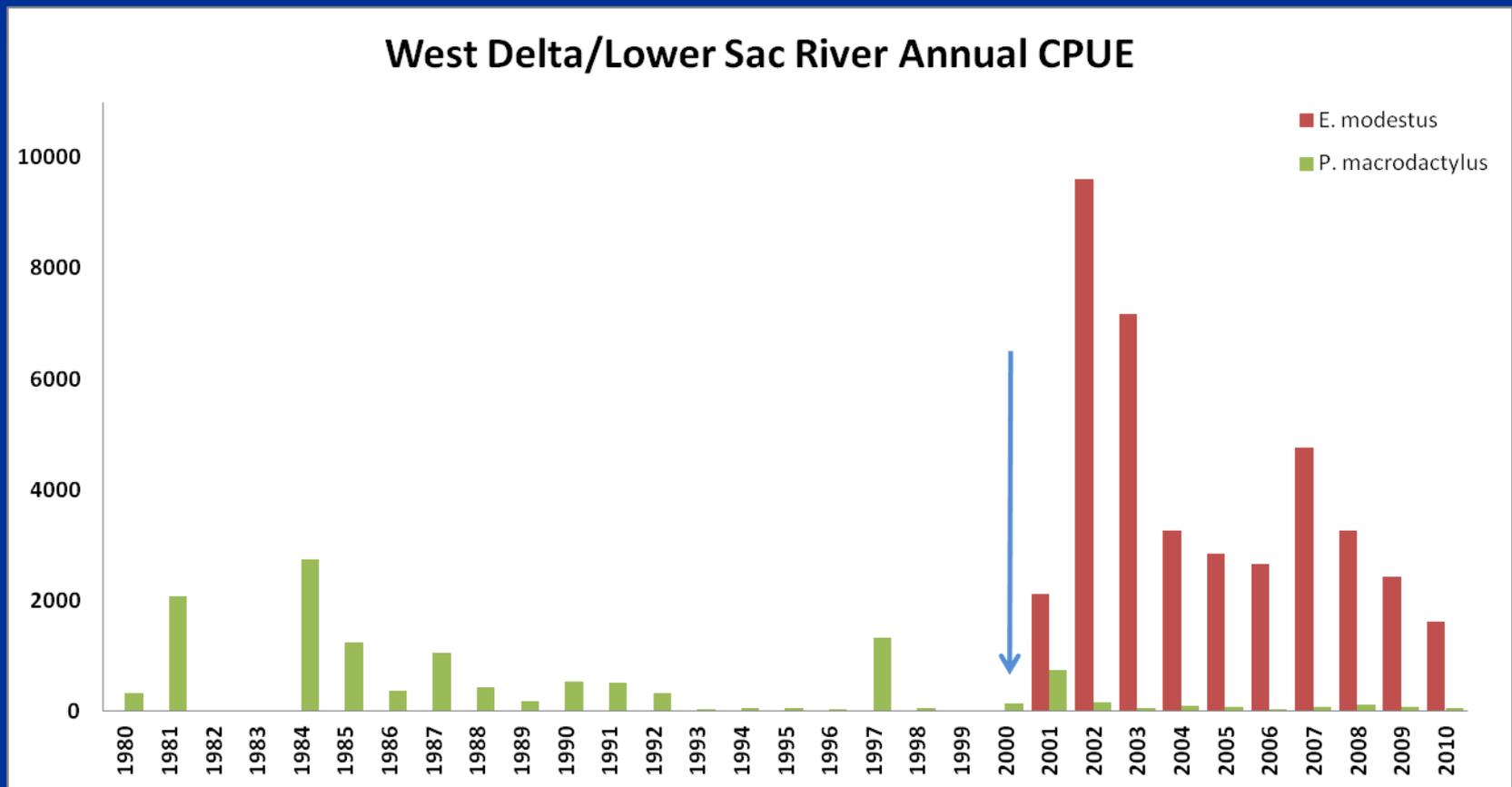
E. modestus in California cont.

- **Bay Study: gravid shrimp peak in spring/summer**



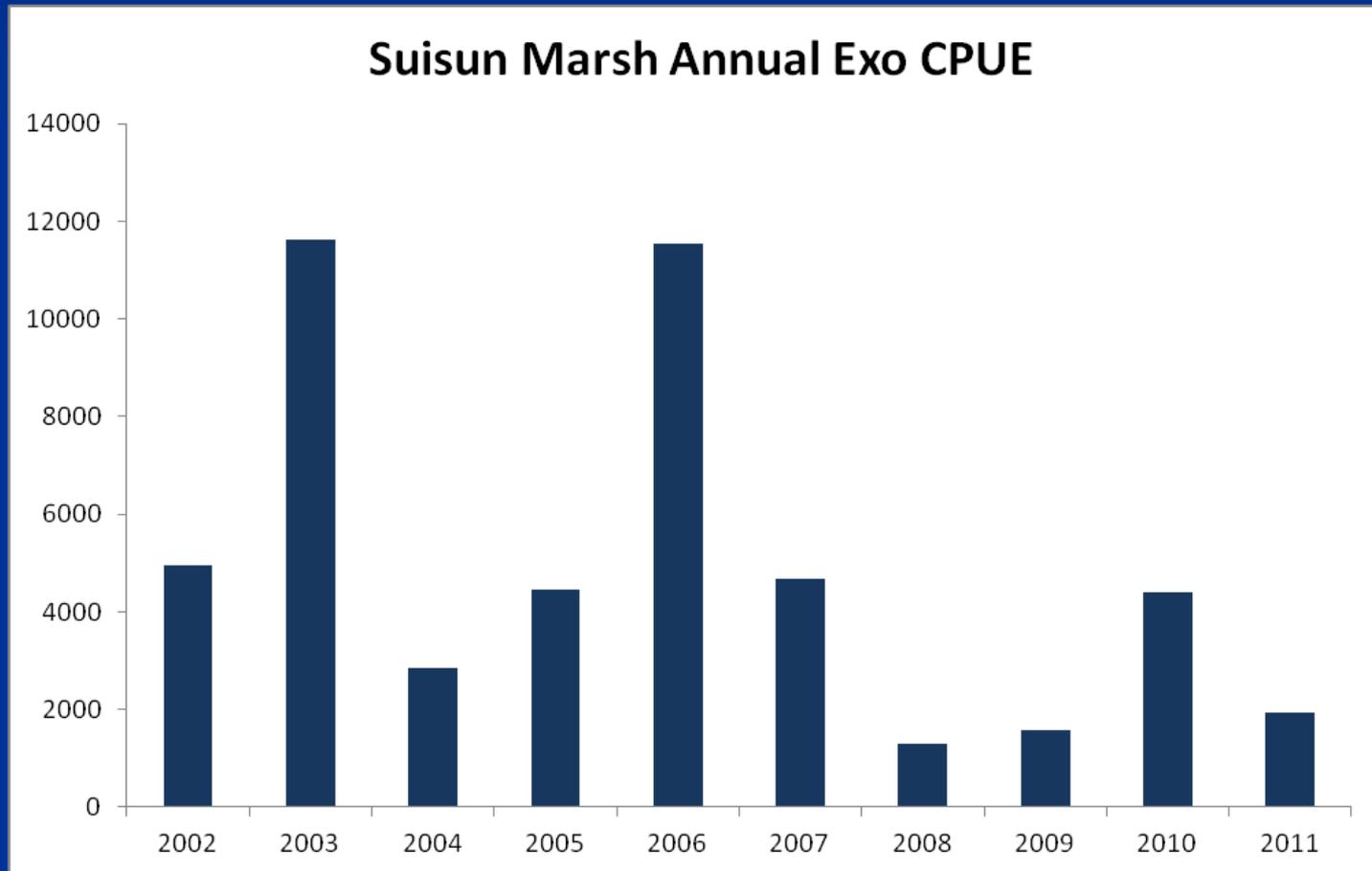
E. modestus in California cont.

- **Bay Study: *E. modestus* displacing *Palaemon macrodactylus* in upstream areas**



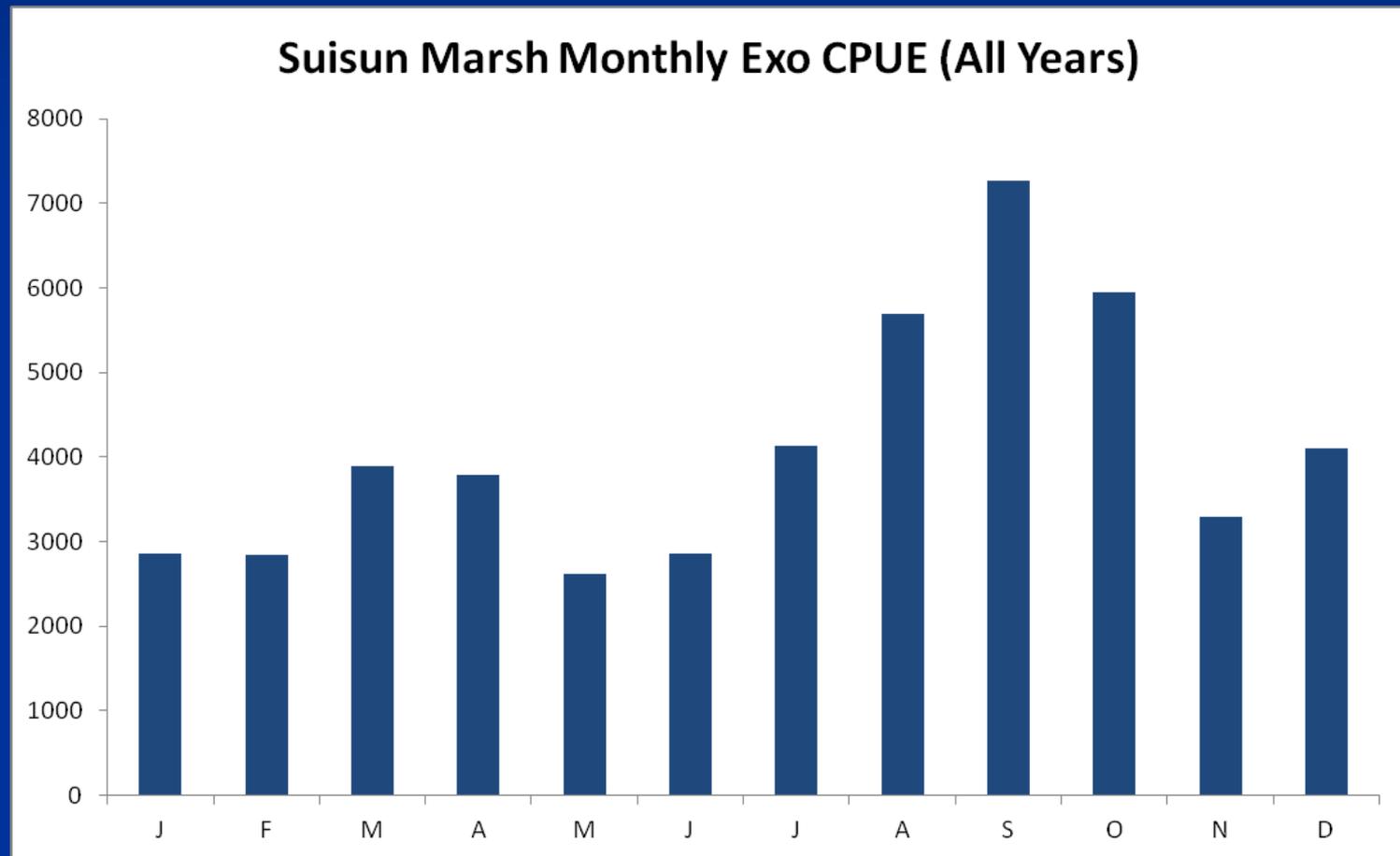
E. modestus in California cont.

- **Suisun Marsh: numbers peak in 2003 and 2006; have since dropped & appear stabilized**



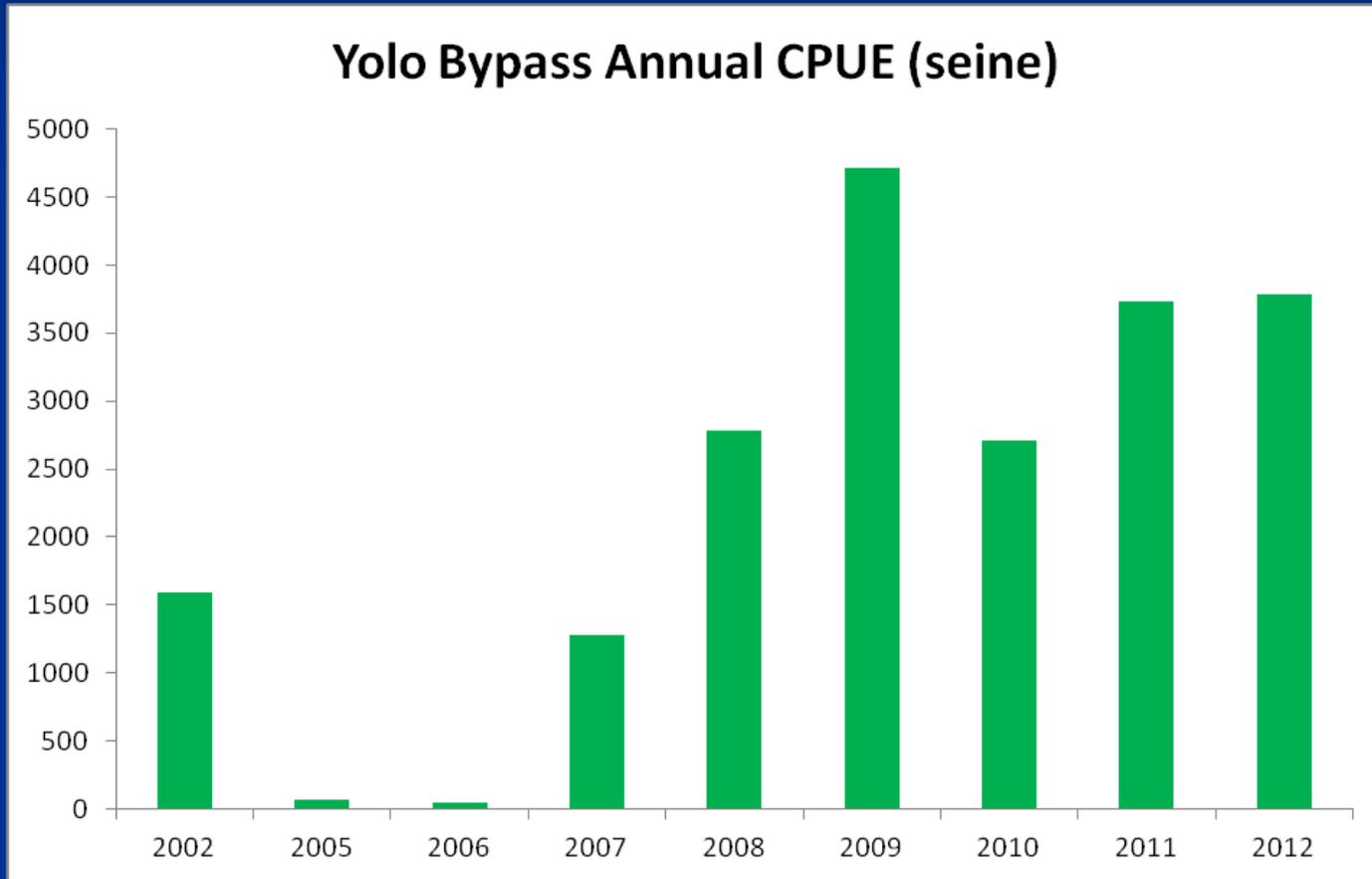
E. modestus in California cont.

- **Suisun Marsh: seasonal trend similar to Bay Study data**



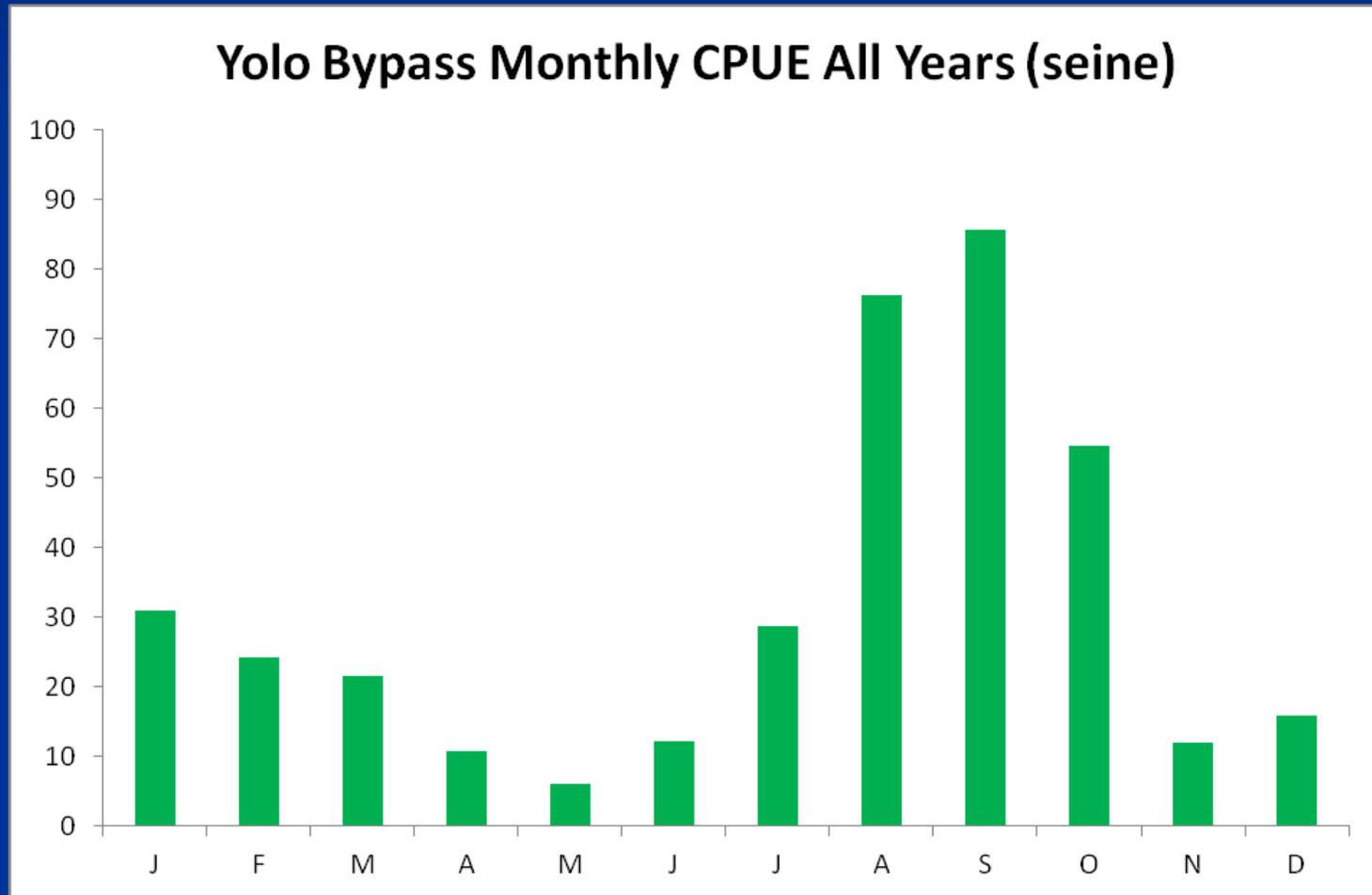
E. modestus in California cont.

- **Yolo Bypass: increase in annual CPUE since introduction**



E. modestus in California cont.

- **Yolo Bypass: seasonal trend similar to Bay Study and Suisun Marsh data**



In Summary:

- *E. modestus* is established, and likely to spread elsewhere in California
- Delta population appears stabilized, but little monitoring done upstream or in shallow habitats
- Effects of *E. modestus* (mostly) unknown
- Vigilance is essential for detecting newly introduced species!