KELP HUMPBACK SHRIMP

TAXONOMY

Scientific name: *Hippolyte clarki* Chace, 1951
Common name(s): kelp humpback shrimp, eelgrass shrimp, grass shrimp, green grass shrimp
Family: Hippolytidae
Taxonomic comments:
A caridean shrimp, distinguished from other members of the family Hippolytidae by the three articles making up the carpus segment of the second pereopod (Kozloff 1987). The family Hippolytidae is called the "broken back shrimps" because the abdomen is sharply flexed and the tail is often directed upward at an angle. Early Alaskan and British Columbian records of this species were listed under *Hippolyte californiensis*, a congener which overlaps much of the global range (Wing pers. comm.).

Photo courtesy of Aaron Baldwin, 2005

DESCRIPTION

Basic description: A small marine shrimp.

General description:
A small, slender-bodied marine shrimp. Color usually bright green, but may also be brown or reddish. Shell is thin and smooth-surfaced, walking legs (pereopods) are typically transparent. Third segment of the abdomen protrudes dorsally at its posterior margin into a distinct hump. The well-developed rostrum (head carapace) slopes upward to a three-pointed tip and carries 2-5 spines along its upper edge and 1-5 spines below (O'Clair and O'Clair 1998).
Length (mm): range 18 (males) to 31 (females)

Reproduction:
Unknown. Partial protandry, complete protandry and gonochory (having separate sexes) have all been recorded for other members of the genus *Hippolyte*. The reported difference in size between males and females suggests partial or complete protandry (Shirley 2003). Females reported to carry eggs from May to October (Butler 1980).

Ecology:
A small marine shrimp associated with eelgrass (*Zostera marina*) and kelp (*Nereocystis luetkeana* and *Macrocystis pyrifera*) beds. Ecological importance transferring energy from eelgrass production to higher trophic levels (e.g., juvenile fishes) is unknown but suspected to be significant; ecologically similar *Palaemonetes* shrimps are known keystone species in eelgrass communities and *H. clarki* may have a similar functional role (Shirley 2003). Eelgrass and kelp beds hosting this shrimp may be important nursery grounds for juvenile fishes of many species

including commercially valuable and forage species such as herring (*Clupea pallasi*), cod (*Gadus macrocephalus*), salmon (*Oncorhynchus* spp.) and Dungeness crab (*Cancer magister*; Kikuchi and Peres 1977, Dean et al. 2000, Johnson et al. 2003). In Alaska, predators include juvenile rockfish (*Sebastes* spp.; Shirley 2003). *Hippolyte clarki* and *H. californiensis* are sympatric from central Alaska to at least central California (Wing pers. comm.).

Migration:
Unknown.

Food:
Specific diet unknown. *Hippolyte* species from Europe, Korea and the Caribbean Sea are herbivores that feed by scraping epiphytic algae off eelgrass leaves (Shirley 2003). Phillips (1984) indicates that this species consumes other small benthic invertebrate fauna in eelgrass and eelgrass substrate.

Phenology:
Unknown.

Habitat:
Associated with eelgrass and kelp beds throughout range (Coyer 1984, O'Clair and O'Clair 1998, Shirley 2003). Shallow subtidal and lower intertidal zones, where eelgrass occurs along protected shores, in lagoons and bays on soft substrate, and where kelp beds occur along protected shores as well as exposed rocky points on rocky substrate. Clings to kelp and eelgrass leaf blades; a study of giant kelp in California found *H. clarki* more abundant within the canopy of kelp fronds than in bottom holdfasts, understory algae or other adjacent habitats (Coyer 1984).

STATUS

Global rank: GNR – suggested change to G5 (11Aug2005)
Global rank reasons:
Apparently widespread and abundant; population trend unknown. Close association with kelp and eelgrass beds renders them vulnerable to habitat loss or destruction as a result of sediment loading associated with human activities, exposure to pesticides from mariculture practices, and contamination from oiling. Warming ocean temperatures as a result of climate change also of concern.

State rank: S5 (11Aug2005)
State rank reasons:
Apparently widespread and abundant; population trend unknown. Close association with kelp and eelgrass beds renders them vulnerable to habitat loss or destruction as a result of sediment loading associated with human activities, exposure to pesticides from mariculture practices, and contamination from oiling. Warming ocean temperatures as a result of climate change also of concern.

DISTRIBUTION AND ABUNDANCE

<u>Range:</u>

Global range:
Prince William Sound, southcentral Alaska, along Pacific coast south to Baja California, Mexico (O'Clair and O'Clair 1998).

State range:
Known from Sheep Bay, Prince William Sound, and throughout Southeast Alaska (O'Clair and O'Clair 1998).

<u>Abundance:</u>

Global abundance:
Unknown, but suspected abundant. In California, abundance in giant kelp beds was higher during winter months and associated with kelp frond canopy (Coyer 1984). May be the most abundant shallow-water caridean in Southeast Alaska eelgrass and kelp beds, where these habitats are known to contain hundreds of shrimp per m^2 (Shirley 2003).

State abundance:
Unknown, but suspected abundant. May be the most abundant shallow-water caridean in Southeast Alaska eelgrass and kelp beds, where these habitats are known to contain hundreds of shrimp per m^2 (Shirley 2003). However, this species is not abundant or even common in commercial shrimp surveys (Wing pers. comm.).

<u>Trends:</u>

Global trend:
Unknown. As preferred habitats have declined in recent decades, a decline in the general abundance of small shrimp is suspected (Wing pers. comm.). Tidal marshes around Puget Sound have undergone substantial declines since the mid-1800s due to diking, filling and dredging for agricultural and port development and possibly the introduction of competitive non-native plants (Thom and Hallum 1990). Kelp forests, however, may have expanded distribution in the same area over the last century (Thom and Hallum 1990).

State trend:
Unknown. As preferred habitats have declined in recent decades, a decline in the general abundance of small shrimp is suspected (Wing pers. comm.).

PROTECTION

Global protection:
Protected under the Coastal Zone Management Act (CZMA; NOAA 1996). The outer Continental Shelf Lands Act (OCSLA) mandates that orderly development of Outer Continental Shelf resources be balanced with protection of human, marine, and coastal environments and any project that could adversely impact the Coastal Zone is subject to federal consistency requirements under the CZMA (Committee on Environment and Public Works 2000).

State protection:
Protected where it occurs within coastal habitat of National Wildlife Refuges and National Parks. The Outer Continental Shelf Lands Act (OCSLA) mandates that development of Outer Continental Shelf resources be balanced with protection of human, marine and coastal environments and any project that could adversely impact the coastal zone is subject to federal consistency requirements under the CZMA (Committee on Environment and Public Works 2000).

CHALLENGES

Global challenges:
Most important threat is likely habitat change or destruction. Species relies on eelgrass and kelp communities which have declined in many parts of range due to filling and dredging for agriculture and port development. In the early 1930s, eelgrass beds on both coasts of the Atlantic Ocean suffered dramatic declines, called the “wasting disease” (Kikchi and Peres 1997). Other threats to habitat include introduction of potentially competitive non-native species such as dwarf eelgrass (*Zostera japonica*) and increasing water temperatures caused by global climate change. Kelp forests in southern California have been shown to deteriorate when water temperature exceeds 20°C for substantial periods (North 1971). Also vulnerable to coastal marine pollution including oil spills.

State challenges:
Most important threat is likely habitat change or destruction. Light is a major factor limiting eelgrass growth; light levels can be influenced by human activities such as sediment loads as a result of logging and dredging for port or coastal development. Eelgrass and kelp habitats are vulnerable to destruction from fishing gear. Pesticides used to control invertebrates in mariculture operations may also kill the invertebrates in nearby eelgrass beds. Oil spills pose a larger threat in Alaska than elsewhere, and crustaceans such as *H. clarki* tend to be more sensitive to toxic effects of oil than other taxa (see sources in Dean and Jewett 2001). Oil-sensitive crustaceans are found in greater abundance in eelgrass than kelp habitats in Prince William Sound, and following the 1989 *Exxon Valdez* oil spill, eelgrass communities recovered more slowly and oil concentrations persisted longer than in kelp (Dean and Jewett 2001). Likely to be affected by increasing water temperatures as a result of global climate change. Kelp forests in southern California have been shown to deteriorate when water temperature exceeded 20°C for substantial periods (North 1971). Could also be affected by introduction of non-native species such as dwarf eelgrass (although currently not reported from Alaska; AKNHP 2005).

RESEARCH AND INVENTORY NEEDS

Global research needs:
See State research needs.

State research needs:
Little is understood about this species. Research needed to determine characteristics of the basic life history, sexual system, pattern of brood production, prey items, ecological role in energy transference, and predators other than juvenile rockfish species (Shirley 2003). Research also needed on the impact of stochastic events such as winter storms and ice scour on long-term

viability of kelp and eelgrass beds. Investigation needed on the risk of dwarf eelgrass introductions to Alaska and potential effects on eelgrass communities.

Global inventory needs:
See State inventory needs.

State inventory needs:
Surveys to determine the distribution, and especially northern limit, of *H. clarki* and associated habitat in eelgrass and kelp beds should be conducted in Alaska. Mapping of eelgrass beds using remote sensing technologies may allow for large-scale habitat monitoring.

CONSERVATION AND MANAGEMENT NEEDS

Global conservation and management needs:
See State conservation and management needs.

State conservation and management needs:
Train local community groups in coastal areas to monitor the health of eelgrass beds. Mariculture operations should avoid areas of eelgrass occurrence; monitor the effects of pesticides on invertebrate populations in areas where mariculture operations are near eelgrass communities. Monitor coastal development to ensure that sediment loading is within limits that are not harmful to eelgrass growth; minimize impact. Determine how *H. clarki* differs in habitat requirements and physiology from its congener *H. californiensis* in order to define any special management or conservation considerations.

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Acknowledgements

State Conservation Status, Element Ecology & Life History Author(s): McClory, J.G. and T.A. Gotthardt, Alaska Natural Heritage Program, Environment and Natural Resources Institute, University of Alaska Anchorage, 707 A Street, Anchorage, AK 99501, http://aknhp.uaa.alaska.edu.
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Reviewer(s): Bruce Wing, National Oceanic and Atmospheric Administration, NMFS, Auke Bay Lab, Juneau, AK.

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