

**FEEDING BEHAVIOR OF HARLEQUIN SHRIMP *HYMENOCERA PICTA* DANA, 1852 (HYMENOCERIDAE) ON SEA STAR *LINCKIA LAEVIGATA* (OPHIDIASTERIDAE)**

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Shrimps commonly designated as harlequins are placed under the family Hymenoceridae (Decapoda: Caridea) but earlier it has been referred to as a member of the family Gnathophyllidae. These shrimps are the most striking decapods in the world, showing unique coloration and morphological features (Debelius 2001). Harlequins of the genus *Hymenocera* Latreille display greatly expanded and leaf like appendages including outer flagellum of the antennules and fixed fingers of the second pair of chelipeds. Earlier, two closely related species were recognized worldwide with similar morphology (body coloration) in the same genus (Calado 2008). Recently, *H. elegans* Heller was re-designated as a junior synonym of *H. picta* Dana (De Grave & Fransen 2011; Radhakrishnan et al. 2012). This species has circum-tropical distribution, throughout the Indo-Pacific and distributed from the Red Sea, eastern Africa, to Indonesia and northern Australia, central and eastern Pacific.

In general, shrimps feed on a variety of prey and do not display selective feeding regimes. However, shrimps of the genus *Hymenocera* have a special feeding behavior, which, exclusively feeds on starfishes. This possess

a problem for hobbyists wishing to display it in reef aquariums (Wickler & Seibt 1970). Harlequin shrimps feed on a variety of starfish with arms that are triangular in section. In harlequins, females are generally larger than males, thus exhibiting larger colored blotches in the ventral region of their abdominal segments. The harlequin *H. picta* was reported from Andaman & Nicobar Islands (Heller 1861; Tikader et al. 1986) and Lakshadweep (Radhakrishnan et al. 2012).

Recently, a pair of *Hymenocera picta* (TL 4.8–5.6 cm) (Image 1) was collected from the intertidal region of Agatti Island (10°50'39.86"N & 72°11'16.89"E), Lakshadweep during November 2011. Shrimps were transferred to the hatchery without causing any damage to the body parts. They were maintained in a cylindrical-conical tank of 500L capacity with a water volume of 300L with 12:12 L:D photoperiod. The water quality parameters were maintained at a temperature of 26±1 °C, salinity 32 ppt, pH 8.0 and dissolved oxygen 5mg/l. Ammonia and nitrite levels were maintained below 0.1ppm. Initially, the shrimps were not fed for three to five days and then examined the feeding behavior associated with its favorite prey *Linckia laevigata*.

Blue Star *L. laevigata* was introduced into the shrimp tank 30cm away from the pair of *H. picta* to observe the feeding behaviour on its favorite prey. Initially, there was no obvious cooperation between the members, or the two different animals that would necessarily make their hunting a success. Among the shrimps, the matured male was first to attack the Sea Star (Image 2a) against every conspecific including the



ISSN  
 Online 0974–7907  
 Print 0974–7893

**OPEN ACCESS**

**DOI:** <http://dx.doi.org/10.11609/JoTT.o3506.4819-21> | **ZooBank:** urn:lsid:zoobank.org:pub:B8EAC45A-B9C8-43E5-B602-737487F53394

**Editor:** Deepak Apte, BNHS, Mumbai, India.

**Date of publication:** 26 September 2013 (online & print)

**Manuscript details:** Ms # o3506 | Received 29 January 2013 | Final received 11 April 2013 | Finally accepted 07 September 2013

**Citation:** Prakash, S. & T.T.A. Kumar (2013). Feeding behavior of Harlequin Shrimp *Hymenocera picta* Dana, 1852 (Hymenoceridae) on Sea Star *Linckia laevigata* (Ophidiasteridae). *Journal of Threatened Taxa* 5(13): 4819–4821; <http://dx.doi.org/10.11609/JoTT.o3506.4819-21>

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**Funding:** Ministry of Earth Sciences, Government of India under the project entitled “Development of technologies for hatchery production of ornamental fishes at Lakshadweep : Sea ranching and technology transfer to coastal and island communities”

**Competing Interest:** Authors declare no competing interest.

**Acknowledgements:** The authors are grateful to the authorities of Annamalai University for the facilities. Thanks are extended to Centre for Marine Living Resources and Ecology (CMLRE), Ministry of Earth Sciences (MoES) for providing financial assistance.

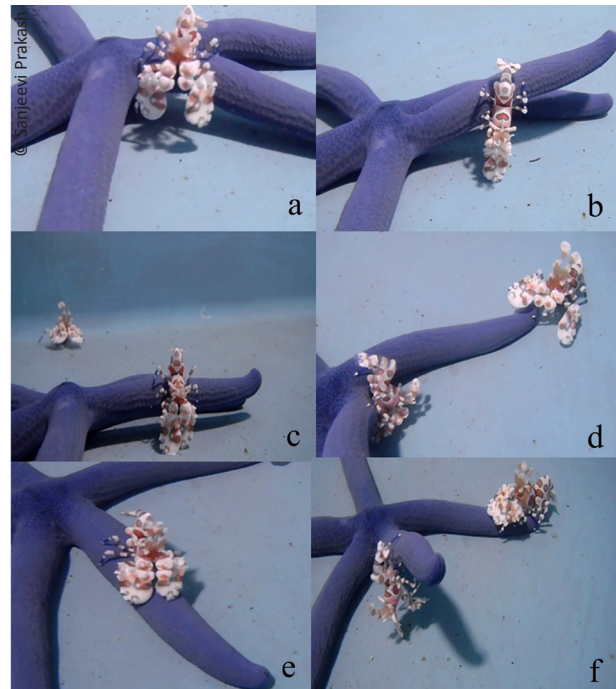




**Image 1.** A pair of Harlequin shrimps *Hymenocera picta* Dana, 1852 (Hymenoceridae) collected from Lakshadweep waters.

paired mate. While feeding, the shrimp covered the food with its larger claws touching it with several of its walking legs as if riding on it. First, the smaller male pierced the tubed feet of the Sea Star at the outer edges, which helped to make the prey upside down to facilitate easy feeding (Image 2b). Initially, the male alone lifted the prey with its legs and a major pair of larger claws, while larger female stayed in position and spent some time moving around (Image 2c). In the case of mated pairs, if the male failed to lift the prey, the female slowly approached the prey to help the male. (Image 2d). Both the individuals were highly involved in moving around the edges of the starfish's legs to pierce the tubed feet, which helped them to lift their prey (Image 2e,f) (Video 1). Finally, after about 30–60 minutes, the Sea Star was turned upside down with the efforts of both individuals. The feeding initiated by *Hymenocera* individuals was started from the outer edges by piercing the epidermis of the Sea Star with its first pair of legs, which possess tiny and sharp chelae. Further, the shrimps pulled out and ate the internal ambulacral feet and gonadal tissue of the prey.

Correlations between social organizations and ecology of animal species have been often suggested but not sufficiently demonstrated in Crustacea. The monogamous *Hymenocera* is a predator hunting for larger prey (Wickler 1973) and finds its prey through chemical cues (Wickler & Seibt 1970; Seibt 1974; Rainbow 1974; Wasserthal & Seibt 1976). Both the sexes are equally effective in hunting (male are more agile and find new prey faster); single individuals can effectively turn the larger prey upside down and immobilize them



**Image 2.** Harlequin Shrimp *Hymenocera picta* feeding on Blue Star *Linckia laevigata*.

a - Smaller male senses and approaches the prey; b - trying to lift the prey; c - larger female stays in a position to move around; d - female approaching the prey and male piercing the tube feet; e - smaller male moving around the edges; f - upliftment of prey continues.

(Seibt & Wickler 1979). In addition, females feed more on prey because of its larger size and their need to increase their reproductive value.

*Hymenocera's* are able to feed on the crown of thorn starfish *Acanthaster* sp., which is destructive to Indo-Pacific coral reefs. This has led to a premature publicity of these shrimps considering them as a biological weapon against the *Acanthaster*, if this could be bred in captivity and transferred to threatened areas (Seibt & Wickler 1979).

The main bottleneck for hobbyists in maintaining individuals of harlequins is in trying to provide live starfish for their prey. Finding a suitable alternate commercial feed for these organisms instead of live starfish will greatly help in culturing of this species, and make a tremendous increase in their market value.

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