THE ABDOMINAL LOCKING MECHANISM IN THE DEEP-SEA SHRIMP GENUS Glyphocrangon (Decapoda, Glyphocrangonidae)

BY

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Shrimps of the genus Glyphocrangon are unique amongst the decapods in having locking mechanisms between the last three abdominal somites and between the sixth somite and the telson which enable these four elements to act as a single rigid unit. The mechanisms are so effective that it is virtually impossible to flex the abdomen of specimens preserved in the locked position without damaging the exoskeleton. Indeed, in his original description of the genus A. Milne Edwards (1881) thought that the sixth abdominal somite and the telson were fused, presumably because this articulation was locked in his material. Although these curious articulations have been remarked upon several times (see Smith, 1882; Bate, 1888; Holthuis, 1971) the exact nature of the locking mechanism has never been elucidated.

Externally, the articulations appear to be simple ball and socket joints formed by a process from the postero-lateral margin of the anterior segment of each pair which curves around a kidney-shaped peg on the succeeding segment and moves in a semi-circular groove on the surface of this segment (see fig. 1). The articulations become locked when the segments are in the fully extended position, and when all three joints are immobilized in this way the abdomen assumes a pronounced upward curve (fig. 2A). In this position the dorsal crest

Fig. 1. Lateral view of the disarticulated abdominal somites 4-6 and the telson in Glyphocrangon longirostris (Smith, 1882), the pleopods and uropods having been omitted. All of the illustrations are based on this species, but the principle is the same in all species of the genus. The regions marked "A" slide beneath the preceding tergite when the abdomen is fully extended.
on each somite and on the telson fit exactly against the posterior dorsal margin of the somite in front, and the pleural plates with their strong ventral spines are well separated.

If the pegs which are visible in the locked condition marked the true centres of rotation of the somites, as has been assumed in the past (see Holthuis, 1971: 272), it would be difficult to imagine how the system could become locked mechanically. However, a completely locked articulation can only be "unlocked" by simultaneously pressing the pegs on both sides of the somite inwards and flexing the somite downwards. The pegs now disappear from view beneath the curved processes of the preceding somite and the articulation remains quite free throughout the flexing movement. When all of the abdominal somites are fully flexed the pleural plates overlap and their posterior margins each fit snugly against a crest on the succeeding somite (see fig. 2B). If the ab-

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**Fig. 2. Glyphocrangon longirostris** (Smith, 1882). A, Posterior portion of the abdomen in the fully extended position showing the pegs (black) jamming in the notches formed by the curved postero-lateral processes. B, Posterior portion of the abdomen in the fully flexed position. The pegs have now disappeared from view, the pleural spines are bunched together and the anterior regions of the tergites (see fig. 1, A) are exposed.