THE FINAL AND SUBFINAL LARVAL STAGES OF 
PANULIRUS POLYPHAGUS 
(HERBST) AND THE FINAL STAGE OF PANULIRUS ORNATUS 
(FABRICIUS), WITH A REVIEW OF LATE-STAGE LARVAE OF THE 
PANULIRUS HOMARUS LARVAL COMPLEX 
(DECAPODA, PALINURIDAE) 

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RÉSUMÉ
Les dernier et avant-dernier stades larvaires de Panulirus polyphagus sont décrits et illustrés. Des comparaisons ont été faites avec les derniers stades de P. ornatus et de P. versicolor (Latreille) recueillis au large de l'Australie du Nord-Ouest, et également décrits ici. La dernière larve de P. polyphagus diffère morphologiquement de toutes les larves du dernier stade jusqu'à présent attribuées à ces trois espèces ou aux sous-espèces de P. homarus. Un réexamen de la littérature à la lumière des données de cette étude a abouti à l'identification de cinq formes larvaires distinctes, correspondant à chacune de ces cinq espèces: P. polyphagus, P. homarus sspp., P. ornatus, P. versicolor et P. stimpsoni. Les derniers stades larvaires attribués à P. homarus sspp., P. ornatus et P. versicolor ont un flagelle antennaire spatulé. Les caractéristiques diagnostiques qui permettent de séparer les stades avant-derniers et de séparer aussi les derniers stades de ces cinq formes sont données, même lorsque leurs antennes sont endommagées ou absentes. Il en a été déduit que les larves originellement attribuées à P. ornatus (Fabricius) sont plus probablement celles de P. stimpsoni Holthuis.

INTRODUCTION
Four species and three subspecies of the spiny lobster genus, Panulirus White, 1847, are distributed through the tropical Indo-West Pacific. Two of the subspecies, Panulirus longipes longipes (A. Milne Edwards, 1868) and Panulirus longipes femoristriga (Von Martens, 1872) are closely-related members of the "Panulirus japonicus complex" (George & Holthuis, 1965) and inhabit both tropical and subtropical waters of the Indian and West Pacific Oceans respectively. The other five members inhabit tropical waters only. They are the very widely-distributed Indo-Pacific species, Panulirus penicillatus (Olivier, 1791) and four closely-related Indo-West Pacific species: Panulirus polyphagus
(Herbst, 1796), *Panulirus ornatus* (Fabricius, 1798), *Panulirus versicolor* (Latreille, 1804) and *Panulirus homarus homarus* (Linnaeus, 1758) (i.e. the "microsculpta form" discussed by Berry, 1974b). *Panulirus stimpsoni* Holthuis, 1963, another mainly tropical species closely related to *P. ornatus*, is found only on the east coast of China (Holthuis, 1978) and in Taiwan (Ho & Yu, 1979 cited by Sekiguchi, 1988a).

George & Main (1967) who investigated the phylogeny of all 19 species of the genus, placed *P. homarus*, *P. ornatus*, *P. versicolor* and *P. stimpsoni* into Group IV of their four "Panulirus species groups" established on the basis of closer morphological similarities within the genus. *Panulirus polyphagus*, belonging to their species Group III, is more closely related to Group IV than are species groups I and II (George & Main, 1967: table 4). The phyllosoma larvae of these five species are collectively termed the *P. homarus* larval complex in the present paper.

*Panulirus homarus homarus* (Linnaeus) is the only one of the three *P. homarus* subspecies having an Indo-West Pacific distribution, and the only one found in Australia. Though mainly distributed in the eastern Indian Ocean, it extends as far as the Marquesas in the South Pacific Ocean (George, 1968; Pyne, 1970; Michel, 1971; Berry, 1974b). The distribution of the other two subspecies is restricted to the western Indian Ocean, *P. homarus megasculptus* Pesta, 1915, to the north, and *P. homarus rubellus* Berry, 1974a, to the south (Berry, 1974b; Phillips et al., 1980). However, because of the wide dispersal potential of palinurid larvae (Phillips & McWilliam, 1986) the larval distribution of these three subspecies would undoubtedly overlap in tropical and subtropical regions of the Indian Ocean. Moreover, the larvae of several species of the *P. homarus* complex co-occur in the tropical and subtropical Indo-West Pacific (Michel, 1971; Johnson, 1971; Berry, 1974a; Prasad et al., 1975; McWilliam & Phillips, 1983).

Adults of all 5 species of the complex are found as far north as Taiwan in the N.W. Pacific, while small numbers of *P. homarus homarus*, *P. ornatus* and *P. versicolor* are also reported from the Ryukyu and Ogasawara (Bonin) Islands and other Japanese regions south and south east of the mainland (Ho & Yu, 1979; Morokita et al., 1984, cited by Sekiguchi, 1988 a, b). *P. ornatus* and *P. versicolor* also extend through the South Pacific. The former has been reported as far east as Fiji, the latter as far as Tonga (George, 1972). More systematic faunal surveys may extend these currently known adult distributions. Nevertheless, it is quite likely that their larvae occur in waters further east of these distribution records in the South Pacific Ocean (see Phillips & McWilliam, 1986, 1989).

Phyllosoma larvae belonging to members of the *P. japonicus* complex fall into "Group 1" of the two categories of *Panulirus* larvae established by Baisre & Ruiz de Quevedo (1982) for those known. This group contains the larvae of *Panulirus argus* (Latreille, 1804) (Western Atlantic), *P. interruptus* (Randall,