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Serpulidae (Annelida: Polychaeta) from the Suez Canal— From a Lessepsian Migration Perspective (a Monograph)

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Table of contents

Abstract	4
Introduction	4
Material and methods	10
Systematic section	14
<i>Ficopomatus enigmaticus</i> (Fauvel, 1923)	14
<i>Filograna implexa</i> Berkeley, 1835	14
<i>Hydroides dianthus</i> (Verrill, 1873)	14
<i>Hydroides dipoma</i> (Schmarda, 1861)	16
<i>Hydroides diramphus</i> Mörch, 1863	17
<i>Hydroides elegans</i> (Haswell, 1883)	19
<i>Hydroides heterocerus</i> (Grube, 1868).....	26
<i>Hydroides homoceros</i> Pixell, 1913	32
<i>Hydroides norvegicus</i> Gunnerus, 1768	35
<i>Hydroides steinitzi</i> Ben-Eliahu, 1972	35
Non-identified <i>Hydroides juveniles</i>	40
<i>Josephella marenzelleri</i> Caullery & Mesnil, 1896.....	41
<i>Placostegus tridentatus</i> (Fabricius, 1780)	42
<i>Placostegus</i> sp.	42
The genera <i>Pomatoceros</i> , <i>Pomatoleios</i> and <i>Spirobranchus</i>	43
<i>Pomatoceros caeruleus</i> (Schmarda, 1861), variant spelling <i>coeruleus</i>	43
<i>Pomatoceros triqueter</i> (Linnaeus, 1758)	43
<i>Pomatoleios kraussii</i> (Baird, 1865)	43
Genus <i>Protula</i> Risso, 1826.....	45
<i>Protula cf. palliata</i> (Willey, 1905)	49
Genus <i>Salmacina</i> Claparède, 1870	62
<i>Salmacina incrustans</i> Claparède, 1870	66
<i>Serpula concharum</i> Langerhans, 1880	72
<i>Serpula hartmanae</i> Reish, 1968	72
<i>Serpula jukesii</i> Baird, 1865	83
<i>Serpula vermicularis</i> Linnaeus, 1767	87
<i>Spirobranchus giganteus</i> (Pallas, 1776)	88
<i>Spirobranchus polytrema</i> (Philippi, 1844).....	88
<i>Spirobranchus tetraceros</i> (Schmarda, 1861)	88
Genus <i>Vermiliopsis</i> Saint Joseph, 1894, s. str.	95
<i>Vermiliopsis infundibulum</i> / <i>V. glandigera</i> -complex	96
<i>Vermiliopsis infundibulum</i> s. auct.	96
<i>Vermiliopsis striaticeps</i> (Grube, 1862)	97
Results and discussion	98
Conclusions	118
Acknowledgements	119
References	120
Appendix	134

Abstract

Data on Serpulidae collected in the Suez Canal were assembled and analyzed. Five serpulid taxa are reported from the canal for the first time bringing the number of serpulids to at least 16. The Systematic Section compiles revised literature records, confirmed synonymies of the taxa, redescriptions where necessary, photographic studies of taxa and remarks on the populations studied. The possible Indo-West-Pacific or Mediterranean origins of the taxa in the Suez Canal are considered and their chronological records and distributions tracked within the Red Sea, the Gulfs of Aqaba and Suez, the Suez Canal and the Levant Basin based on the compiled literature and our extensive databases. Two Lessepsian migrants, *Hydroides heteroceros* and *H. homoceros*, show evidence of morphological variability along their migration route; the last also provides an example of a founder effect. Problems of identifying *Protula* and *Salmacina* taxa are addressed, along with remarks on the “cosmopolitan” designations of some taxa. Various hypotheses concerning Lessepsian migration are discussed, and attributes making Lessepsian migrant serpulid tubeworms successful invasive species are evaluated.

Key words: Suez Canal, Serpulidae, taphonomy, Lessepsian migrants, alien invasive species, “Yellow Fleet”, historical records, biogeography, morphological variability

ملخص

تم جمع وتحليل البيانات حول الديدان الأنبوبية – السيريبوليدي (Serpulidae) في قناة السويس. ويتم لأول مرة الإبلاغ عن خمسة أصناف من الديدان الأنبوبية – السيريبوليدي مما يرفع عددها إلى 16 صنفاً على الأقل. يشمل القسم المنهجي (Systematic Section) سجلات معدلة في المنشورات العلمية، ومترادفات الأصناف المعتمدة، وإعادة وصف عند الضرورة، ودراسات تصويرية للأصناف وملاحظات حول المجموعات التي شملتها الدراسة. وقد أخذ بعين الاعتبار أن تكون الأصول المحتملة للأصناف في قناة السويس من المحيط الهندي – المحيط الهادئ (Indo-West-Pacific) أو البحر الأبيض المتوسط، وتم تتبّع انتشارها عبر السنين في البحر الأحمر، خليجي العقبة والسويس، قناة السويس والحوض المتوسطي الشرقي استناداً إلى الأبحاث التي جمعت ومن قواعد البيانات الواسعة التي بحوزتنا على حد سواء. تبين الهجرتان اللسبسيان (Lessepsian migrants)، هيدرويديس هيتروسيروس (*Hydroides heteroceros*) وهيدرويديس هوموسيروس (*H. homoceros*)، وجود أدلة على التغيير المورفولوجي على طول مسار الهجرة؛ توفر الأخيرة أيضاً مثالا على أثر المؤسس (founder effect). تتم معالجة المشاكل المتعلقة بتحديد أصناف البروتولا (*Protula*) والسالمسينا (*Salmacina*)، بالإضافة إلى ملاحظات حول التسميات “العالمية” لبعض الأصناف. وتتم مناقشة فرضيات متنوعة حول الهجرة اللسبسية، وتقييم الخصائص التي تجعل من الديدان الأنبوبية – سيريبوليدي المشاركة في الهجرة اللسبسية أحد الأنواع الغازية الناجحة.

Introduction

Completed in 1869, the Suez Canal is a man-made marine connection between the Red Sea and the eastern basin of the Mediterranean Sea (Fig. 1). It joins two biogeographical areas inhabited by characteristic and very different biotas, the Red Sea province of the tropical Indo-West-Pacific Region and the subtropical Levant Basin that is part of the warm-temperate Atlantic-Mediterranean Region (Thorson 1971, Briggs 1974, Por 1978). These Regions have been partially separated since the early Miocene (ca. 20 Ma) and have been completely separated since the Miocene (Serravallian, 13.5 Ma ago) (Harzhauser *et al.* 2007). Joining these seas opened a pathway for faunal interchange.

The late Dr. Walter Steinitz (1882–1963), a physician and zoologist from Breslau, Germany, was among the first to call for monitoring of the impact of the Suez Canal on the Levant biota in “real” time; he was active in promoting that (e.g., Steinitz 1929) even before immigrating with his family to Palestine in 1933 (Bytinski-Salz 1965, Clark & Aron 1972). This call for monitoring was later taken up by scientists from the Hebrew University of Jerusalem. Some serpulid samples were collected along the Levant coast already in the early 1930s (the university was founded in 1925). In 1967, collaboration between the Smithsonian Institution, Washington, D.C., and the Hebrew University of Jerusalem finally enabled launching the wide-ranging sampling project, “The Biota of the Red Sea and eastern Mediterranean” (1967–1972), to evaluate the extent of reciprocal penetration of migrants into the seas and the impact of these migrants on the indigenous biota. Wm. Aron and Heinz Steinitz, Walter Steinitz’s son, and, following the latter’s demise in April 1972, F.D. Por, were the co-principal investigators (Por *et al.* 1972).