Sarsia
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713400168

Redescription and distribution of two species of Syscenus (Crustacea, Isopoda, Aegidae) in the North Atlantic

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Online Publication Date: 01 June 2004

To cite this Article: Kensley, Brian (2004) 'Redescription and distribution of two species of Syscenus (Crustacea, Isopoda, Aegidae) in the North Atlantic', Sarsia, 89:3, 160 — 174

To link to this article: DOI: 10.1080/00364820410005412
URL: http://dx.doi.org/10.1080/00364820410005412

Published in collaboration with the University of Bergen and the Institute of Marine Research, Norway

Redescription and distribution of two species of *Syscenus* (Crustacea, Isopoda, Aegidae) in the North Atlantic

Brian Kensley*

SARSIA

Kensley B. 2004. Redescription and distribution of two species of *Syscenus* (Crustacea, Isopoda, Aegidae) in the North Atlantic. *Sarsia* 89:160–174.

The isopod species *Syscenus atlanticus* Kononenko, 1988, is recorded for the second time, from Bear Seamount off New England, western North Atlantic. The species, previously known only from the central North Atlantic, is redescribed, illustrated, and compared with the more common *S. infelix* Harger, 1881, which is also redescribed and illustrated. The distribution of *S. infelix* in a broad arc across the North Atlantic Ocean, based on 171 specimens from several museum collections, is discussed.

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Keywords: Crustacea; Isopoda; Aegidae; *Syscenus atlanticus*; *Syscenus infelix*; North Atlantic.

INTRODUCTION

A cruise by NOAA Research Ship *Delaware II* to the vicinity of Bear Seamount off New England, took place from 27 November to 8 December 2000. The primary objective of the cruise was to investigate the biodiversity of this seamount, the most westerly of the chain of New England seamounts. To accomplish this, sampling was carried out by bottom, mid-water, and shrimp trawls. The area was found to have a rich diversity of benthic and pelagic fishes and invertebrates, with several new records for the region and several rare species being noted. Eleven specimens of the large blind isopod *Syscenus atlanticus* Kononenko, 1988, were collected, a species previously known only from the two type specimens, taken from the region of the southern extremity of the Reykjanes Ridge of the mid-North Atlantic. As the original description of *S. atlanticus* was brief, it was thought useful to redescribe and illustrate the species.

The collection of *S. atlanticus* specimens prompted an examination of material of the far more common *S. infelix* Harger, 1881, the type species of the genus, in the Smithsonian Collections. It was found that a good description with illustrations of this species has not been published since Richardson's 1905 treatment. *Syscenus infelix* was thus redescribed and figured, to facilitate comparison with *S. atlanticus*. The distribution of both species, based on actual specimens from museum collections, was plotted on a map of the North Atlantic Ocean.

*We are sorry to announce that Professor Kensley died after submitting this article for publication in the journal.

MATERIAL AND METHODS

In addition to the Smithsonian (USNM) holdings of *Syscenus*, specimens from The Natural History Museum, London (BMNH), the Rijksmuseum of Natural History, Leiden (RMNH), the Museum of Comparative Zoology (MCZ) at Harvard University, the Atlantic Reference Center (ARC) in New Brunswick, the Institut de Ciències del Mar de Barcelona (CSIC), and the Zoological Museum, University of Copenhagen (ZMUC), were examined and the distribution plotted. All material was measured and sexed.

Measurements of specimens are of total length, measured in millimetres, from the apex of the cephalon to the tip of the pleotelson.

SYSTEMATICS

Family Aegidae Leach, 1815
Genus *Syscenus* Harger, 1881

Syscenus atlanticus Kononenko, 1988 (Figs 1–3, 8)

Syscenus atlanticus Kononenko, 1988:266, figs 1, 2. – Bruce, 1997:114.

Material examined

USNM 310367, 4 ♂ 24.0, 27.8, 29.2, 34.4 mm, R/V *Delaware II*, cruise 00-11, Stn 7, 39°57.60′N 67°30.49′W, 2000 m, IGYPT (International Gadid Young Pelagic Trawl) mid-water trawl, 3 December 2000. (1 ♂ 29.2 mm deposited in RMNH). – USNM 310368, 1 ♀ 54.0 mm, R/V *Delaware II*, cruise 00-11, Stn 13, 39°55.45′N 67°25.54′W, shrimp trawl, 4

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DOI 10.1080/00364820410005412

December 2000. – USNM 310369, 2 ♂ 32.5, 44.5 mm, 3 ♀ 26.4, 48.9, 52.4 mm, R/V *Delaware II*, cruise 00-11, Stn 20, 39°55.61′N 67°25.75′W, Yankee 36 bottom trawl, 6 December 2000. (1 ♂ 32.5 mm, 1 ♀ 26.4 mm, deposited in BMNH). – USNM 310370, 1 ♂ 30.6 mm, R/V *Delaware II*, cruise 00-11, Stn 22, 39°53.28′N 67°30.54′W, Yankee 36 bottom trawl, 6 December 2000. – ZMUC, CRU 2077, 1 ♂ 37.8 mm, Stn 10018, M. W. 1750, 65°02′N 56°00′W, 730–740 m, plaice trawl, 19 July 1956, identified by N. L. Bruce.

Previous records

Type locality, 2 ♂ approximately 45 mm, 54°N 35°W, 810–860 m, swimming free in trawl.

Description

Male. Body about 2.5 times longer than greatest width at pereonites 5 and 6, dorsally quite strongly convex, unornamented (Fig. 1B). Cephalon with small downwardly flexed rostral point between antennular bases; anterolateral margins faintly sinuate, posterior margin with faint ridge. Pereonites in mid-dorsal length: $1>2=3<4>5=6>7$; coxae not reaching posterior beyond segment, those of pereonites 2 and 3 posteriorly angular, of 4–7 posteriorly rounded; faint oblique groove on pereonites 2–7 reaching anteriorly from posterior coxal region. Pleonite 1 narrow, posterolaterally acute, pleonites 2–5 subsimilar in length, posterolaterally rounded. Pleotelson length about two thirds greatest width, lateral margins convex, posterior margin faintly convex to truncate; faint transverse groove near anterior margin, equally faint mid-dorsal longitudinal groove almost reaching posterior margin. Antennule (Fig. 1C, D) reaching to article 5 of antennal peduncle; article 1 subequal in length to article 3 of peduncle, but twice as robust, separated dorsally by narrow rostrum, ventrally by triangular frontal lamina; article 2 about half length of article 3; flagellum of about 11 articles. Antenna (Fig. 1C, D) with peduncle articles 1 and 2 short, subequal, article 3 twice length of article 2, article 4 one third longer than 3, article 5 slightly longer than 4; flagellum of about 38 articles, reaching posteriorly to pereonite 4. Frontal lamina (Fig. 1D) triangular, with lateral margin faintly concave, apex acute, posterior margin convex. Mandible (Fig. 1F) with acute sclerotized incisor, well separated from flattened, distally convex molar; palp of three articles, articles 1 and 2 subequal in length, article 2 with few distal setae; article 3 curved, with a row of about 20 setae increasing in length distally, on lateral margin, article tipped with stout unguis. Maxilla 1 (Fig. 1G) slender, with four terminal sclerotized hooks (robust setae). Maxilla 2 (Fig. 1I) about twice width of maxilla 1, lobes poorly defined distally, apically with three stout hooks (robust setae). Maxillipedal palp (Fig. 1H) article 1 roughly rectangular, unarmed; article 2 very short, with two hook spines mesodistally; terminal article 3 consisting of single hook. Pereopods 1–3 robust, 4–7 more elongate. Pereopod 1 (Fig. 2A), basis subequal in length to propodus, carpus, merus and ischium together, merus with few short spine-like setae distally; dactylus strongly recurved, acute apex sclerotized. Pereopods 2 and 3 (Fig. 2B, C) essentially similar to pereopod 1, with basis becoming more elongate. Pereopods 4–7 increasing in length posteriorly. Pereopod 4 (Fig. 2D) ischium with single short seta at mid-length of posterior margin, few stout setae on posterodistal margin; merus about half length of ischium, with small setae at mid-length of posterior margin, single robust spine-like seta posterodistally, anterodistal lobe bearing row of about eight spine-like setae; carpus longer than merus, with two setae posterodistally, anterodistal lobe bearing row of about 10 setae; propodus longer than carpus, with single seta posterodistally; dactylus strongly curved, acute. Pereopod 5 (Fig. 2E), ischium with small seta at mid-length of posterior margin, two stout setae posterodistally, few setae on anterodistal lobe; merus and carpus subequal in length, shorter than ischium, with single seta at mid-length of posterior margin, row of more than 10 setae on anterodistal lobe; propodus longer than carpus, with single seta at mid-length of posterior margin, single stronger seta distally; dactylus strongly curved, acute. Pereopod 6 (Fig. 2F), ischium with single seta at mid-length of posterior margin, two stout posterodistal setae, few stout anterolateral setae; merus and carpus subequal in length, but carpus more slender, merus with two setae at mid-length of posterior margin, few setae posterodistally, row of strong setae on anterodistal lobe; carpus with single seta at mid-length of posterior margin, two stout setae posterodistally, row of setae on anterodistal lobe; propodus elongate slender, with single posterodistal seta; dactylus strongly curved, acute. Pereopod 7 (Fig. 2G), ischium almost as long as basis, widening distally, with few setae anterodistally and posterodistally; merus with four setae on posterior margin, numerous stout setae along distal margin; carpus with five small setae on posterior margin, two strong setae posterodistally, row of smaller setae on anterodistal lobe; propodus slender elongate, unarmed; dactylus strongly curved, acute. Penial processes represented by two low rounded submedian bosses in posterior half of sternite of pereonite 7. Pleopod 1 (Fig. 3A) protopod rectangular, with about 10 retinaculae on mesial margin; rami subequal in length,

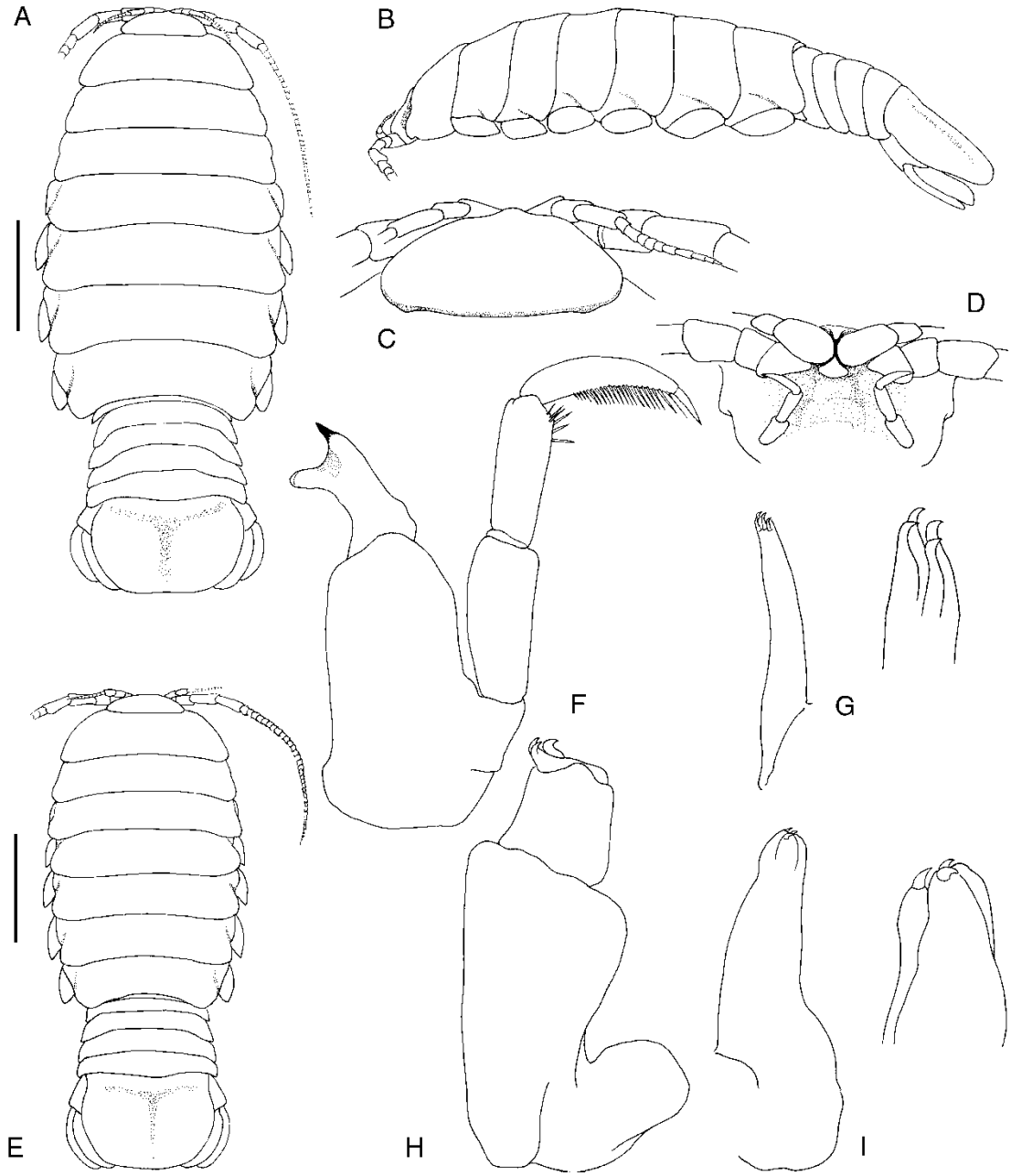

Fig. 1. Syscenus atlanticus. A. Female in dorsal view, scale = 10 mm. B. Female in lateral view. C. Cephalon, antennular and antennal bases. D. Rostrum, frontal lamina, antennular and antennal bases. E. Male in dorsal view, scale = 10 mm. F. Mandible. G. Maxilla 1 with apex enlarged. H. Maxilliped. I. Maxilla 2 with apex enlarged.

exopod about one third wider than endopod. Pleopod 2 (Fig. 3B), protopod rectangular, with about 10 retinaculae on mesial margin, endopod with sabre-shaped copulatory stylet articulating basally on mesial margin, stylet not quite reaching distal margin of ramus; exopod more broadly rounded than endopod, about 1.5 times

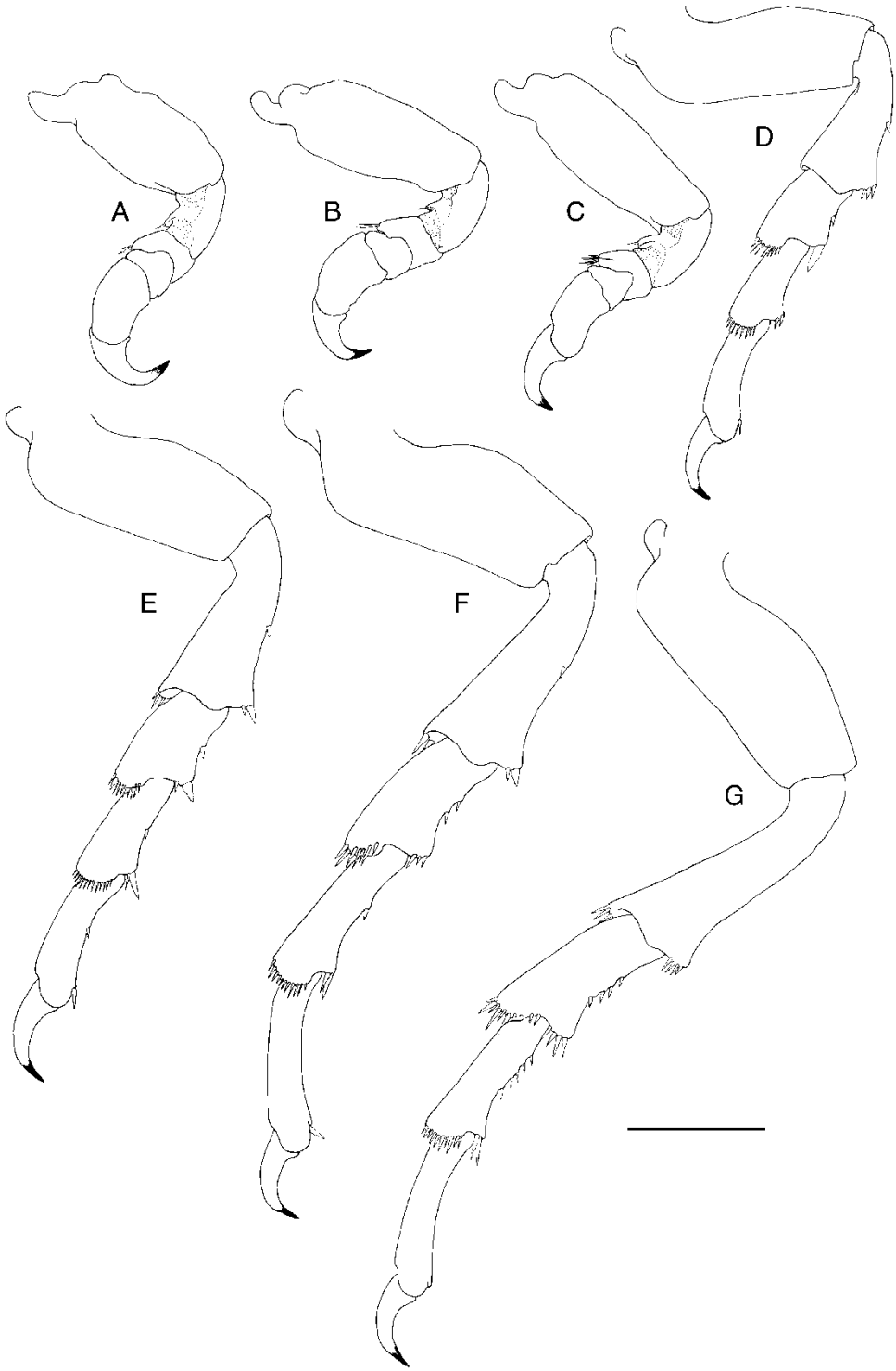

Fig. 2. Syscenus atlanticus. A. Pereopod 1. B. Pereopod 2. C. Pereopod 3. D. Pereopod 4. E. Pereopod 5. F. Pereopod 6. G. Pereopod 7. Scale = 5 mm.

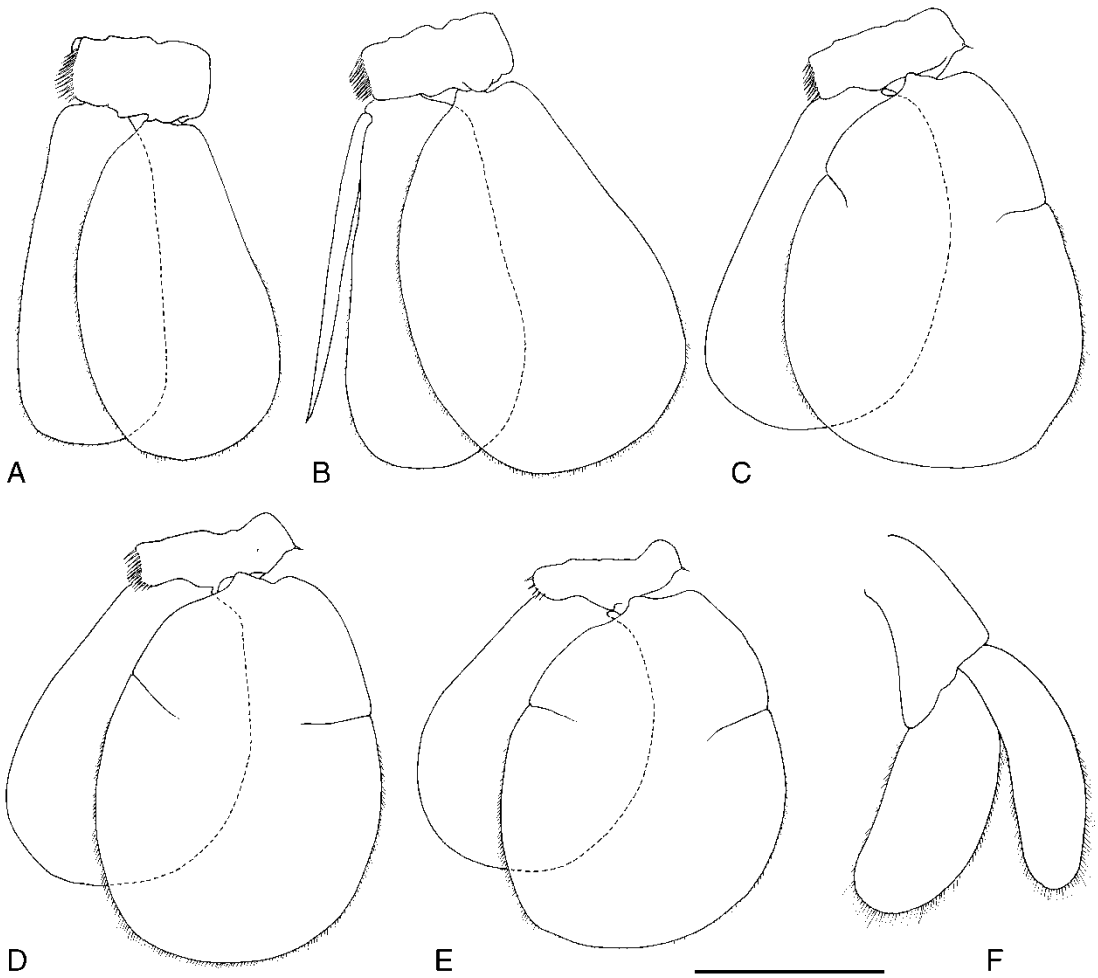

Fig. 3. Syscenus atlanticus. A. Pleopod 1. B. Male pleopod 2. C. Pleopod 3. D. Pleopod 4. E. Pleopod 5. F. Male uropod. Scale = 5 mm.

wider than endopod. Pleopod 3 (Fig. 3C) protopod becoming narrower than in preceding pleopods, with about eight retinaculae on mesial margin; exopod broader than endopod, subcircular, with incomplete transverse sutures proximally. Pleopod 4 (Fig. 3D), exopod subcircular, broader than endopod, with incomplete sutures proximally. Pleopopd 5 (Fig. 3E), protopod narrow, with few small setae on mesial margin; endopod subcircular but smaller than exopod, latter subcircular, with incomplete sutures proximally. Uropodal protopod (Fig. 3F) somewhat produced mesiodistally; exopod narrowly ovate, about two thirds width of endopod; latter distally broadly rounded; both rami bearing fine marginal setae.

Female. Essentially similar to male, but body relatively broader, about 2.3 times longer than greatest width at pereonite 5.

Remarks

Syscenus atlanticus can be distinguished from the possibly sympatric, and more commonly occurring, *S. infelix* by several clear cut differences (those of *S. infelix* in parentheses): cephalon lateral margins convex (straight or slightly concave); frontal lamina triangular, posterior margin convex (anterior narrowly triangular, posterior margin produced); coxae of pereonites 2–7 posteriorly rounded (posteriorly acute); margins of uropods and pleotelson strongly setose (weakly setose); pleotelson broader than long, posterior

margin convex/truncate (slightly broader than long, posterior margin tapering to narrowly rounded apex). Male uropodal endopod not sexually dimorphic as in *S. infelix*.

Syscenus infelix Harger, 1881
(Figs 4–8)

Syscenus infelix Harger, 1881:387, 1883:100, plate 3 fig. 5, plate 4 fig. 3. –Richardson, 1898:8, 1900:219, 1901:524, 1905:212, fig. 216. –Sars, 1897:67, plate 28, 1899:247, suppl. plate 1. –Norman, 1904:437. –Zirwas, 1910:84, 100, 106, 109. –Wahrburg, 1930:24, plate 4 fig. 18. –Nierstrasz & Schuurmans Stekhoven, 1930:78, fig. 17. –Schultz, 1969:197, fig. 309. –Kussakin, 1979:269, figs 137, 138. –Nunomura, 1981:16. –Kononenko, 1988:268. –Bruce, 1997:114, 120. –Saito, Itani & Nunomura, 2000:61. –Ross, Sulak & Munroe, 2001:595–600, figs 1a, b, 3. –Kensley & Cartes, 2003:775–776, fig. 1.
Harponyx pranizoides Sars, 1883:60, plate 2 fig. 1.
Rocinela lilljeborgii Bovallius, 1885:3–10, plates 1, 2 (on operculum of whiting).
Syscenus lilljeborgii Bovallius, 1886:17–18.
Cyscenus infelix Mann, 1970:188 (from Mediterranean, parasitic on gadoid fishes).

Material examined

HOLOTYPE, USNM 35334, ♀ 22.5 mm, US Fish Commission, Stn 344, 15 miles northeast of Cape Cod, 238 m, 10 September 1879. –USNM 3357, 1 ♀ 33.9, Fish Hawk Stn 1049, off Delaware. –USNM 3368, 6 ♂ 27.9, 28.0, 28.2, 31.8, 37.8, 40.9, 3 ♀ 22.2, 23.4, 30.5, Fish Hawk Stn 925, off Martha's Vineyard, 419 m, 1881. –USNM 4747, 3 ♂ 34.0, 34.9, 35.5 mm, 2 ♀ 25.5, 28.5 mm, Fish Hawk Stn 1096, off Martha's Vineyard, 580 m. –USNM 4749, 2 ♂ 25.0, 31.9, 5 ♀ 19.2, 31.4, 32.0, 33.4, 33.5 mm, Fish Hawk Stn 1124, off Martha's Vineyard, 1171 m. –USNM 4778, 5 ♀ 11.5, 17.9, 25.2, 26.8, 33.0, Gillis Stn 1093, off Martha's Vineyard, 638 m, 1882. –USNM, 5026, 1 ♀ 25.8, Fish Hawk Stn 1045, off Martha's Vineyard, 561 m, 1881. –USNM 5100, 1 ♀ 23.5, Fish Hawk Stn 1026, off Martha's Vineyard, 333 m, 1881. –USNM 5583, 1 ♂ 23.2, 1 ♀ 33.9, Albatross Stn 2025, off Martha's Vineyard, 437 m, 1883. –USNM 7201, 1 ♀ 35.3, Albatross Stn 2262, off Martha's Vineyard, 39°54′45″N 69°29′45″W, 457 m, 1884. –USNM 7989, 1 ♂ 39.5, Albatross Stn 2176, 39°32′30″N 72°21′30″W, 552 m, 1884. –USNM 8015, 1 ♂ 12.7, Albatross Stn 2175, south of Long Island, 39°33′00″N 72°18′30″W, 827 m, 1884. –USNM 8098, 1 ♂ 20.9, Albatross Stn 2187, off Martha's Vineyard, 768 m, 1884. –USNM 11130, 1 ♂ 26.8, Albatross Stn 2589, off Martha's Vineyard, 422 m, 1885. –USNM 11135, 2 ♀ 26.9, 31.8, Albatross Stn 2586, off Martha's Vineyard, 600 m, 1885. –USNM 11711, 1 ♀ damaged, Albatross Stn 2687, off Martha's Vineyard, 596 m, 1886. –USNM 31025, 1 ♀ 33.5, Fish Hawk Stn 1153, off Martha's Vineyard, 411 m, 1882. –USNM 35335, 3 ♂ 22.0, 25.6, 30.6, 1 ♀ 27.6, Fish Hawk Stn 893, off Block Island, 680 m, 1880. –USNM 35336, 2 ♂ 20.0, 34.7, 1 ♀ 35.5, Fish Hawk Stn 946, off Martha's Vineyard, 452 m, 1881. –USNM 35337, 2 ♀ 29.2, 35.9, Fish Hawk Stn 938, off Martha's Vineyard, 567 m, 1881. –USNM 35338, 1 ♂ 39.4, 1 ♀ 29.7, Fish Hawk Stn 1113, off Martha's Vineyard, 351 m. –USNM 35340, 2 ♂ 12.4, 31.3, 3 ♀ 22.1, 22.4, 39.3, Fish Hawk Stn 951, off Martha's Vineyard, 411 m, 1881. –USNM 35341, 1 ♂ 17.2, 2 ♀ 19.8, 32.8, Fish Hawk Stn 947, off Martha's Vineyard, 583 m, 1881. –USNM 35342, 1 juvenile 8.8 mm, 1 ♀ 18.9, Fish Hawk Stn 1095, off Martha's Vineyard, 587 m, 1882. –USNM 35343, 2 ♀ 23.0, 28.9, Fish Hawk Stn 1032, off Martha's Vineyard, 380 m, 1881. –USNM 35344, 2 ♂ 15.2, 24.1, 2 ♀ 16.8, 21.6, Gillis Stn 1028, off Martha's Vineyard, 750 m, 1881. –USNM 35346, 1 ♂ 19.7, 2 ♀19.2, 22.0, 1 juvenile 8.5, Fish Hawk Stn 1094, off Martha's Vineyard, 550 m, 1882. –USNM 35347, 1 ♀ 22.1, Gillis Stn 869, off Block Island, 351 m, 1880. –USNM 35348, 3 ♂ 23.0, 27.4, 34.7, Fish Hawk Stn 879–880, off Block Island, 411–461 m, 1880. –USNM 35349, 2 ♂ 31.9, 35.6, 1 ♀ 36.0, Fish Hawk Stn 880, off Block Island, 461 m, 1880. –USNM 35350, 2 ♂ 24.7, 27.5, Gillis Stn 881, off Newport, Rhode Island, 594 m, 1880. –USNM 35351, 1 ♂ 24.4, Gillis Stn 897, off Delaware Bay, 287 m, 1880. –USNM 35420, uropod only, figured, Gillis Stn 945, off Martha's Vineyard, 378 m, 1881. –USNM 36390, 2 ♂ 28.2, 28.2, 1 ♀ 15.3, Fish Hawk Stn 895, off Block Island, 238 m, 1880. –USNM 36391, 3 ♀ 28.0, 34.0, 35.4, Fish Hawk Stn 894, off Block Island, 667 m, 1880. –USNM 36405, 2 ♂ 16.0, 20.9, 2 ♀ 23.9, 27.0, Fish Hawk Stn 952, off Martha's Vineyard, 724 m, 1881. –USNM 36856, 2 ♂ 31.2, 45.0, 1 ♀ 18.9, Fish Hawk Stn 945, off Martha's Vineyard, 378 m, 1881. –USNM 37851, 2 ♂ 28.4, 28.5, 3 ♀16.0, 26.9, 30.0, Albatross Stn 2232, off Delaware, 444 m. –USNM 38123, 1 ♂ 30.8, 1 ♀ 26.2 mm, Fish Hawk Stn 998, off Martha's Vineyard, 552 m. –USNM 38124, 1 ♂ 34.0, Fish Hawk Stn 997, off Martha's Vineyard, 613 m, 1881. –USNM 40842, 1 ♀ 27.9, Talisman Stn 49, Canary Islands, 28°37′N 15°22′W, 865–927 m, coll. 27 June 1883. –USNM 42577, 1 ♀ 12.5, Albatross Stn 2582, south of Block Island, 250 m, 1885. –USNM 87069, 1 ♀ 24.2, Fish Hawk Stn 1112, off Martha's

Vineyard, 448 m, 1882. –USNM 293091, 1 ♀ 25.0, Gillis cr 74-04, Stn 81, 36°38′54″N 74°38′36″W, 570 m, 1974. –USNM 213092, 1 ♂ 26.3, 1 ♀ 36.0, Gillis cr 74-04, Stn 82, 36°36′48″N 74°38′42″W, 650–750 m, 1974. –USNM 213093, 1 ♂ 28.0, Gillis cr 74-04, Stn 69, 36°42′48″N 74°36′36″W, 605–685 m, 1974. –USNM 213094, 1 ♂ 34.5, Gillis cr 74-04, Stn 89, 36°32′30″N 74°40′06″W, 860–960 m, 1974. –USNM 310758, 1 ♂ 38.7, R/V *Eastward*, cr E-6-75, Stn 5, 36°41.2′N 74°40.0′W, 558–600 m, 22 July 1975. –USNM 310759, 3 ♀ 33.0, 37.5, 42.0, Gilliss cr G I-74-04, Stn 107, 37°03′54″N 74°28′30″W, 720–595 m, 25 November 1974. –USNM 310760, 1 ♀ 42.6, R/V *A.T. Cameron*, cr A189, Stn 68, Gulf of St Lawrence, 47°50′02″N 60°36′15″W, 331 m, 1971. –USNM 365126 (fish catalogue number), 1 ♂ 36.3, Johnson Sea Link II Stn 3216, submersible suction collector, off False Cape, Virginia, 36°46′12″N 74°38′W, 2200 ft, coll. K. J. Sulak & S. W. Ross, 29 June 1992 (isopod attached to dorsum of rattail fish *Nezumia bairdii*, behind first dorsal fin). –BMNM 1911.11.8, 3 ♂ 20.0, 28.3, 38.2 mm, 1 ♀ 28.0 mm, Norman Collection, Fish Hawk Stn 1124, Butt of Lewis, Martha's Vineyard, 59°25′N 7°33′W, 1171 m. –BMNH 1979.36.1, 1 ♀ 25.6 mm, R/V *Challenger*, 56°24′N 9°13′W, 750 m, coll. R. W. Ingle, 19–20 October 1977. –BMNH 1984.68.70, 1 ♂ 30.5 mm, 1 ♀ (telson damaged), Cirolana Stn 17, 59°43.2′N 7°12.5′W, 1115–1095 m, 16 July 1973. –BMNM 1984.69.1, 1 ♀ 32.9 mm, Cirolana Stn 38, Tory Island, 55°32.2′N 9°37.4′W, 19 July 1973. –BMNM 1984.69.1, 1 ♂ 39.5 m, Cirolana Stn 40, 55°30′N 9°54.3′W, 1080–1110 m, 19 July 1973. RMNH 1716, 1 ♀ 29.0 mm, 62°10′N 4°15′E, coll. G. Y. Klooster, 3 November 1936. –RMNH 1733, 1 ♂ 22.8 mm, Stjorn Fjord, Norway, 63°40′N 9°14′E, 200 m, coll. Excursie Leidse Biologen, 20 August 1961. –ZMUC, CRU-2073, 1 ♂ 32.9 mm, 2 ♀ 29.1, 37.2 mm, 25 miles northnorthwest of Skagens lightship, north of Jutland in Skagerak, 220 m, coll. K. Winther, 7 September 1936. –ZMUC, CRU-2074, 1 ♂ 32.9 mm, 1 ♀ 34.8 mm, Skagerak, 24 miles southwest of Cape Lindesnes, Norway, 250 m, coll. H. Billeskov-Jansen, 14 June 1935. –ZMUC, CRU-2075, 1 ♂ 35.5 mm, Thor Stn 211, 14 km northeast to north of Skagens lightship, north of Jutland in Skagerak, 188 fms, 9 March 1904. –ZMUC, CRU 2076, 1 ♀ 38.7 mm, Shinkai Maru Stn 61, Davis Strait, 64°07.8′N 54°02.2′W, 739 m, 9 August 1991. –ZMUC, CRU-2080, 1 ♀ 25.2 mm, deep-sea fish, Skagerak, between Jutland and Norway, 23 August 1943. –ZMUC, 1 ♀ 30.9 mm, Thor Stn 210, northeast of Trøndelagen, Norway, 52–43 fms, 8 March 1904. –ZMUC, 1 ♀ 29.9 mm, Frederikshaven, October 1899, ident. G. O. Sars. –ZMUC, 1 ♀ 28.2 mm, 4 km west of Nyholmsgabet, Denmark, 18 July 1934. –ZMUC, 1 ♀ 23.4 mm, Thor Stn 936, 30 km northwest of Hirtshals, Denmark, 145 m, 9 April 1907. –ZMUC, 1 ♀ 24.4 mm, Thor Stn 226, 10 km west northwest of Hirtshals, Denmark, 70–85 m, 18 March 1904. –ZMUC, 2 ♀ 20.2, 25.3 mm, Thor Stn 751, 15 km northeast by north of Skagens lightship, north of Jutland in Skagerak, 200 m, 23 March 1906. –ZMUC, 1 juvenile 10.0 mm, Thor Stn 220, Mediterranean, 36°25′N 0°42′E, 375 m, 4 September 1910. –ZMUC, 1 juvenile 8.1 mm, Thor Stn 204, Mediterranean, 38°52′N 7°43′E, 27 August 1910. –ZMUC, juvenile 5.5, 6.1 mm, Thor Stn 99, Mediterranean, 61°15′N 9°35′W, 900 m, 22 May 1904 (specimen = *Harponyx pranizoides* G.O.Sars). –ZMUC, 2 juveniles 6.1, 6.7 mm, Thor Stn 99, 36°02′N 5°16′W, 750 m, 24 June 1910. –ZMUC, 1 juvenile 7.5 mm, Thor Stn 14.1125, Mediterranean, 41°24′N 17°15′E, 1000 m, 21 February 1908. –ARC 61512, 1 ♀ 34.0 mm, Scotian Shelf, 1116 m, coll. M. J. Dadswell, October 1985. –ARC 61518, 1 ♀ 34.5 mm, Johnson Sea Link II Stn 3068, off *Nezumia bairdii*, coll. K. Sulak, 28 July 1991. –ARC 8957712, 1 ♀ 38.0 mm, R/V *Lady Hammond*, Gulf of St. Lawrence, 49°26′N 65°37′W, coll. W. E. Hogans, 23 August 1986. –ARC 8957745, 1 ♂ 37.7 mm, R/V *Alfred Needler*, 45°32′N 57°54′W, 271 m, 11 February 1986. –ARC 9159196, 1 ♂ 40.2 mm, R/V *Alfred Needler*, 42°52′N 62°24′W, 710 m, coll. P. Hurley, 11 October 1988. –CSIC, 1 ♀ 27.8 mm, Bathos III Stn 17, 40°45.8′N 1°55.4′E, Catalan Sea, northwest Mediterranean, 1434–1319 m, 4 July 1988. –CSIC, 2 ♀ 20.5, 22.8 mm, Bathos III Stn 22, 40°05.8′N 2°04.9′E, Catalan Sea, northwest Mediterranean, 1631–1578 m, 6 July 1988. –CSIC, 2 ♂ 21.9, 24.2 mm, Bathos IV Stn 4, 40°56.7′N 3°00.7′E, Catalan Sea, northwest Mediterranean, 2071–1880 m, 28 July 1988. –CSIC, 1 ♀ 28.9 mm, Bathos V Stn 2, 40°20.5′N 1°42.5′E, Catalan Sea, northwest Mediterranean, 1609–1562 m, 25 October 1988. –CSIC, 2 ♀ 19.4, 25.3 mm, Bathos V Stn 8, 40°30.7′N 1°47.6′E, Catalan Sea, northwest Mediterranean, 1680–1575 m, 27 October 1988. –CSIC, 1 ♂ 29.2 mm, Bathos V Stn 11, 40°55.6′N 1°44.6′E, Catalan Sea, northwest Mediterranean, 1036–994 m, 28 October 1988. –CSIC, 1 ♀ 29 mm, Bathos V Stn 17, 41°07.5′N 2°27.3′E, Catalan Sea, northwest Mediterranean, 861–1100 m, 29 October 1988. –CSIC, 1 ♂ 21 mm, 1 ♀ 23.9 mm Bathos V Stn 18, 41°02.9′N 2°35.9′E, Catalan Sea, northwest Mediterranean, 1524–1479 m, 29 October 1988. –CSIC, 1 ♂ 24.3 mm, Stn MEDITS-ESO 1, Stn 12, Alboran Sea, Mediterranean, 720 m. –CSIC, 1 ovigerous ♀ 25.6 mm, Q1 Stn 21, 38°29.1′N 1°48.4′E, southwest Eivissa, southwest Mediterranean, 809–823 m, 22 October 1996. –MCZ 3326, 4 ♂ 20.6, 30.7, 31.0,

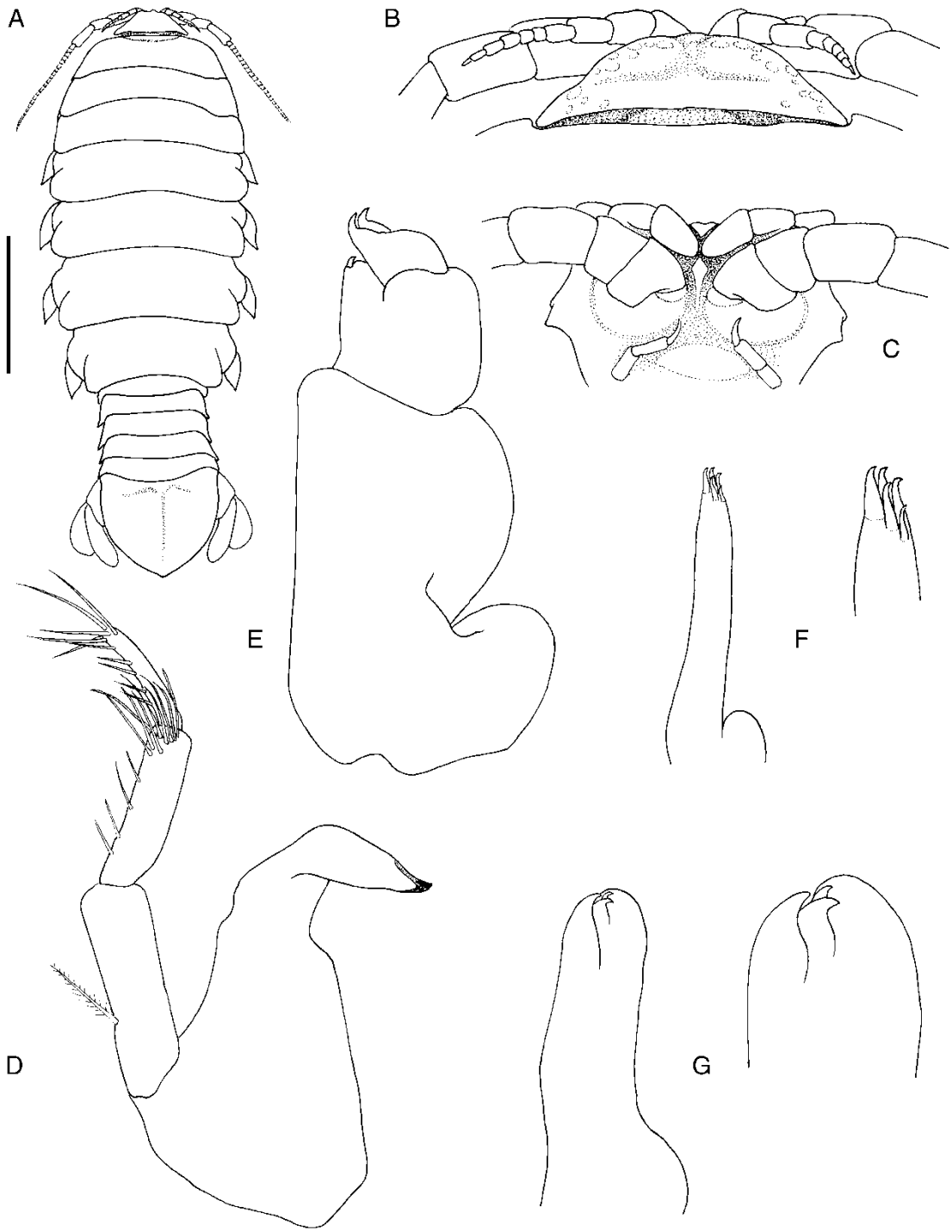

Fig. 4. Syscenus infelix. A. Male in dorsal view, scale = 10 mm. B. Cephalon, antennular and antennal bases. C. Rostrum, frontal lamina, antennular and antennal bases. D. Mandible. E. Maxilliped. F. Maxilla 1 with apex enlarged. G. Maxilla 2 with apex enlarged.

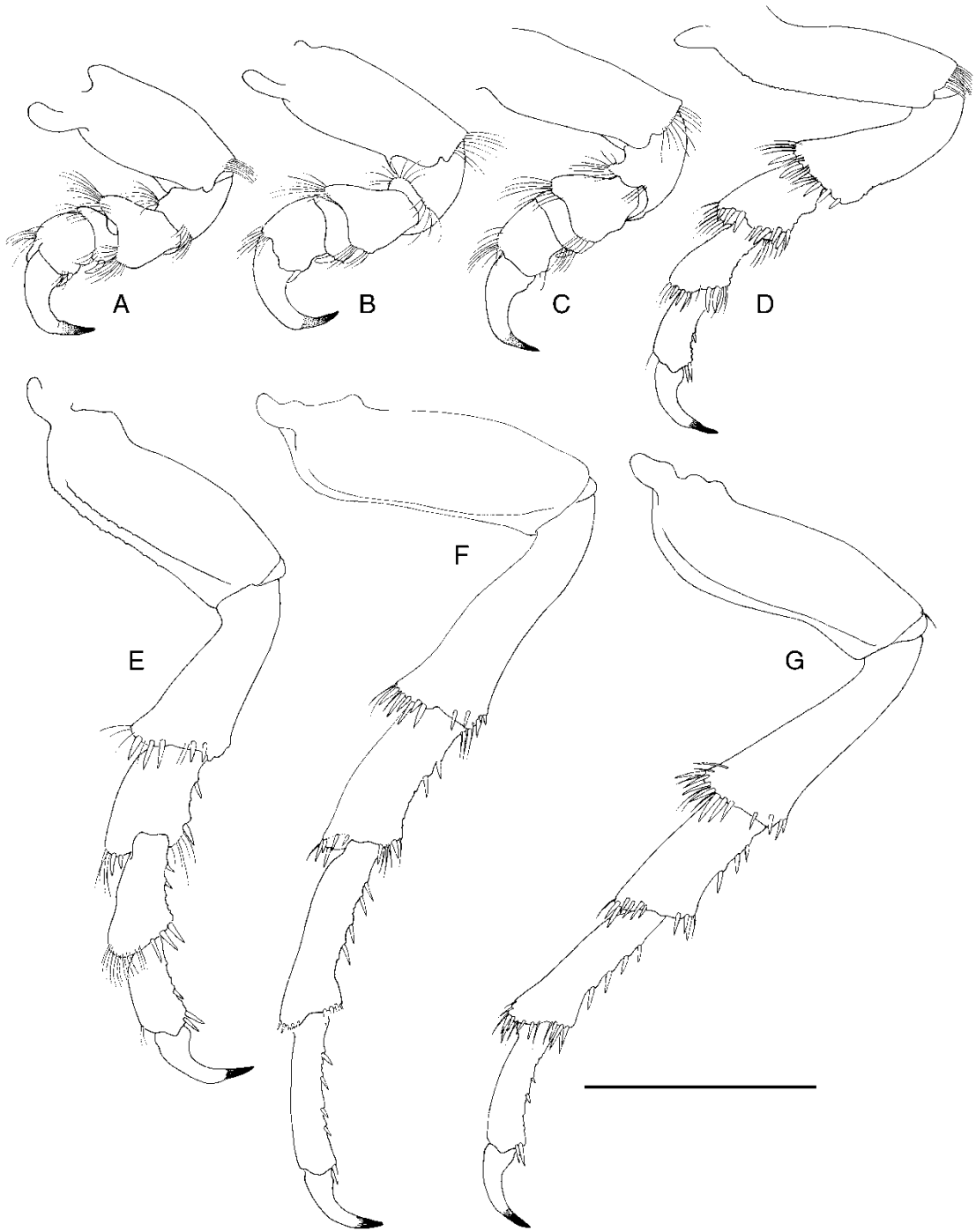

Fig. 5. Syscenus infelix. A. Pereopod 1. B. Pereopod 2. C. Pereopod 3. D. Pereopod 4. E. Pereopod 5. F. Pereopod 6. G. Pereopod 7. Scale = 5 mm.

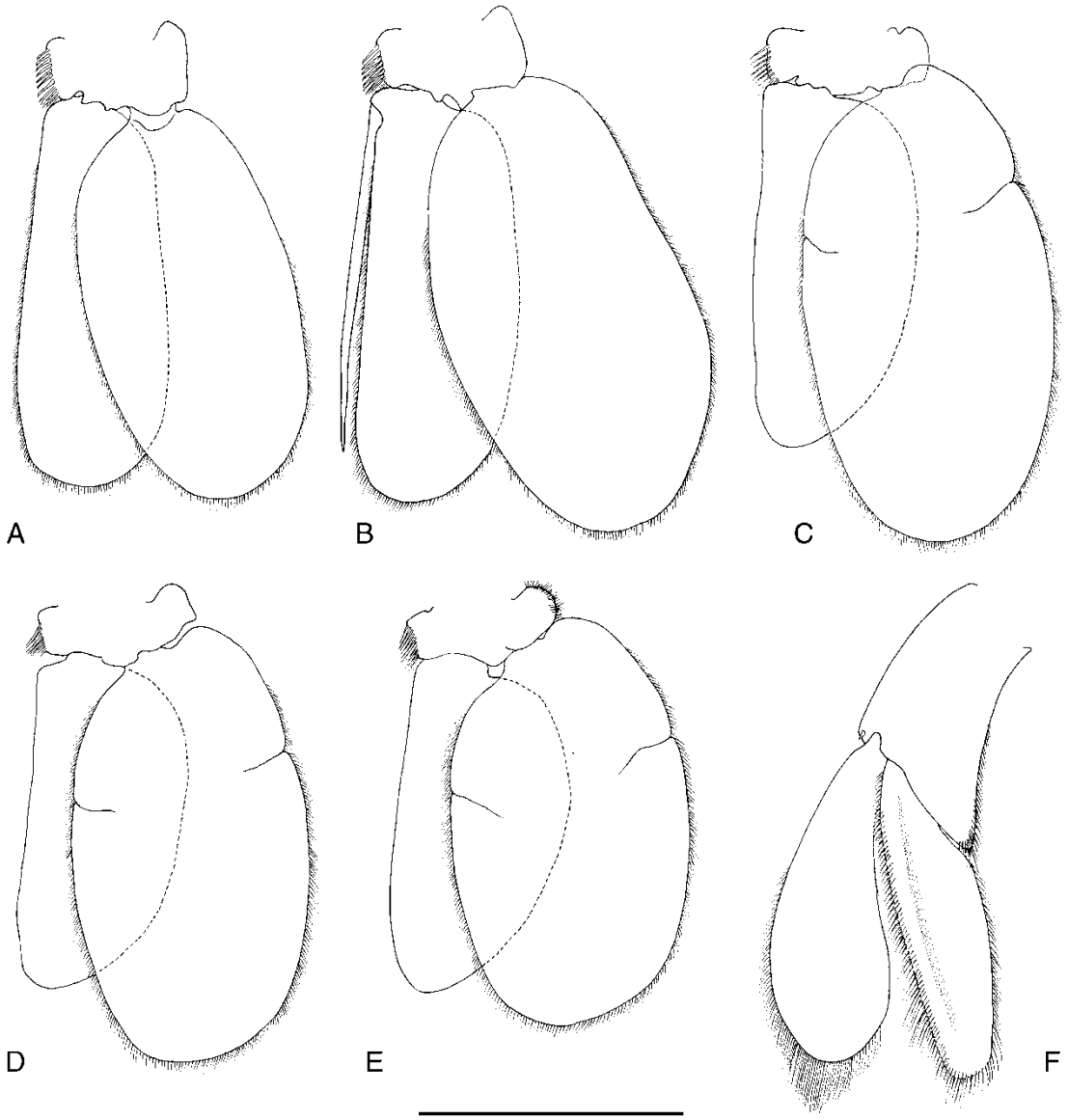

Fig. 6. Syscenus infelix. A. Pleopod 1. B. Male pleopod 2. C. Pleopod 3. D. Pleopod 4. E. Pleopod 5. F. Male uropod. Scale = 5 mm.

31.0 mm, 3 ♀ 19.2, 28.9, 32.9 mm, Fish Hawk Stn 1029, off Martha's Vineyard, 39°57′N 69°16′W, 838 m, coll. U. S. Fish Commission 14 September 1881. –MCZ 3913, 1 ♀ 24.0 mm, Blake Stn 303, off Georges Bank, 41°34′30″N 65°54′30″W, 560 m, coll. A. Agassiz, 28 June 1880. –MCZ 3914, 2 ♂ 28.1, 30.0 mm, Blake Stn 309, 40°11′40″N 68°22′0″W, 556 m, coll. A. Agassiz, 30 June 1880.

Description

Male. Body about three times longer than greatest width at pereonites 5 and 6, dorsally convex, unornamented (Fig. 4A). Cephalon with small downwardly flexed rostral point between antennular bases; front faintly trilobed; shallow pitting mainly along anterolateral margins. Eyes absent. Pereonites in mid-dorsal length:

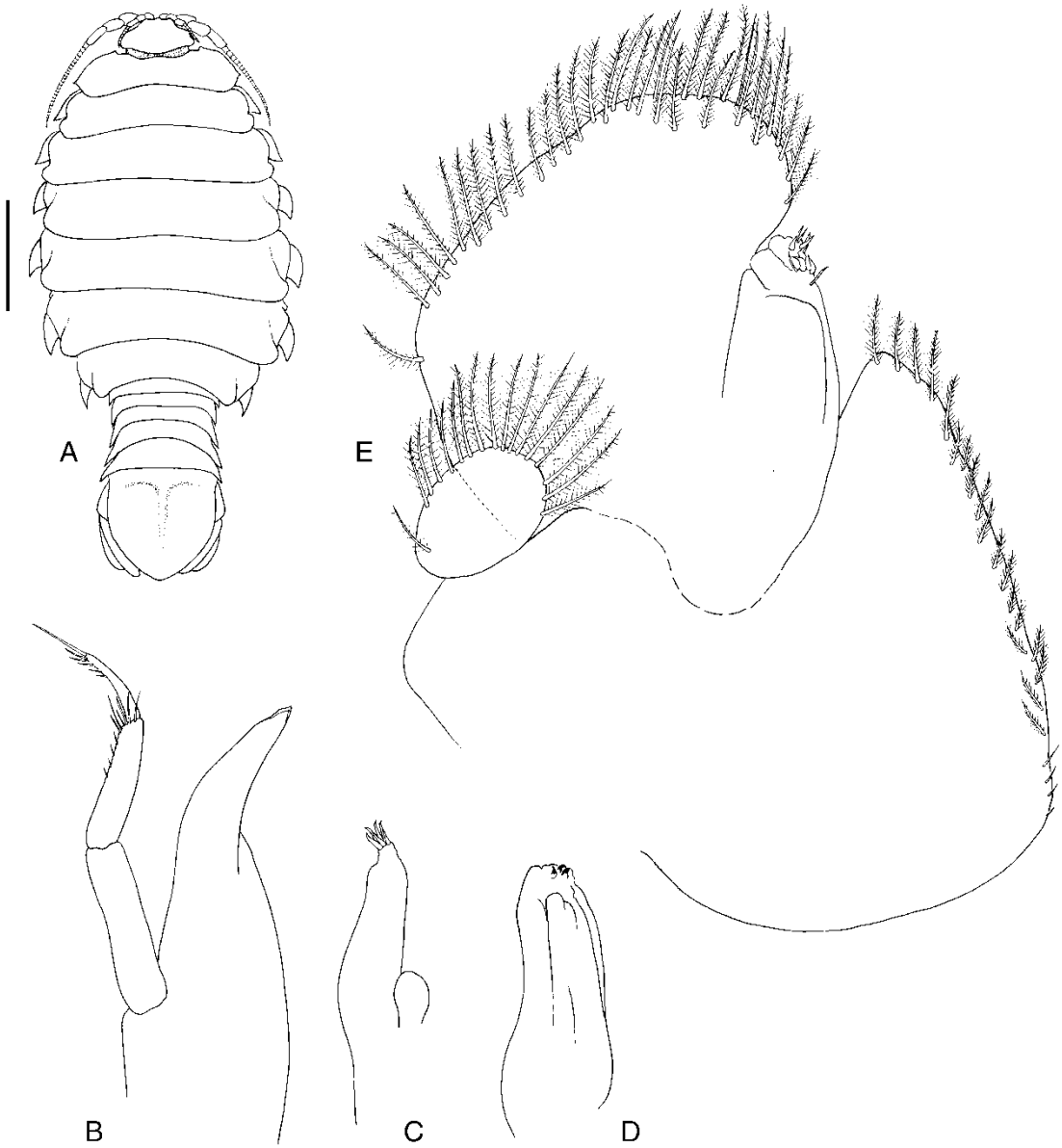

Fig. 7. Syscenus infelix, ovigerous female. A. Dorsal view, Mediterranean, scale = 5 mm. B. Mandible. C. Maxilla 1. D. Maxilla 2. E. Maxilliped. Mouthparts to same scale.

1 = 2 < 3 < 4 = 5 < 6 > 7; coxae not or barely reaching beyond pereonite, all posteriorly acute; pereonites 4–7 with faint oblique groove reaching anterodorsally from posterior coxal region. Pleon markedly narrower than pereon. Pleonite 1 laterally rounded, pleonite 2 narrowly rounded, pleonites 3–5 posteriorly acute. Pleotelson mid-dorsally slightly shorter than basal width, lateral margins convex, with narrowly rounded point at midpoint of posterior margin; faint mid-dorsal longitudinal groove visible, joining with faint sinuate basal groove. Antennule (Fig. 4B, C) reaching to base of antennal peduncle article 5, just reaching anterior margin of pereonite 1; peduncle articles 1–3 having shallow pitting similar to that on cephalon; article 1 slightly longer than 2, articles 2 and 3 subequal in length but article 3 more slender; flagellum of about

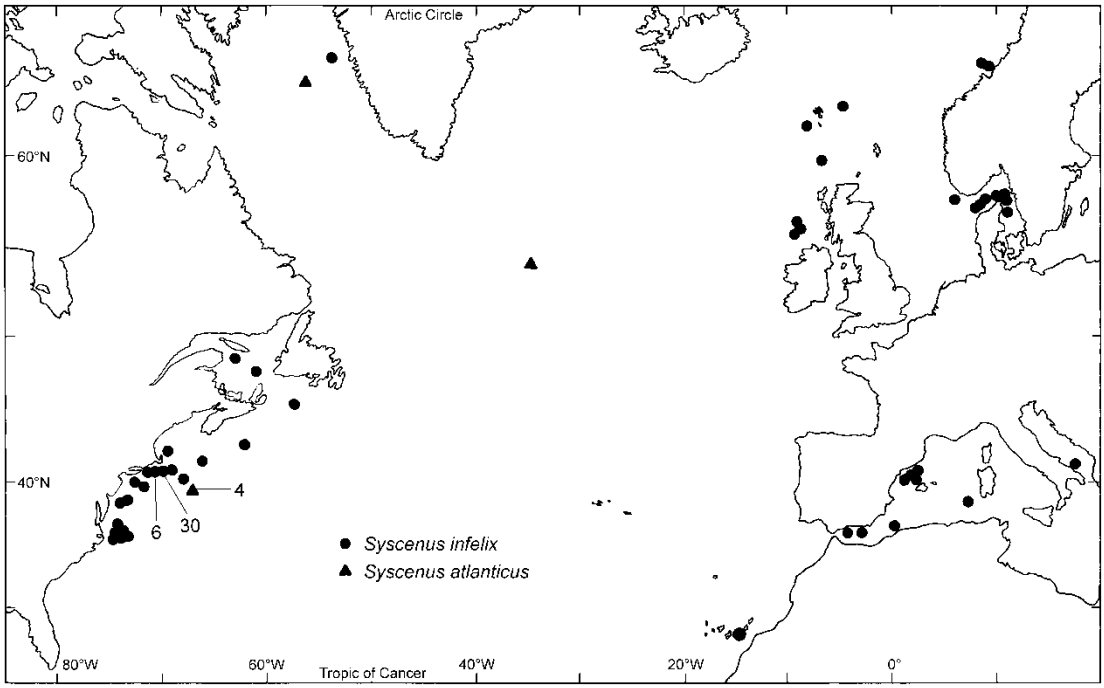

Fig. 8. Map of the North Atlantic showing collection localities for *Syscenus atlanticus* and *S. infelix*. 30 denotes 30 separate collection records of *S. infelix* off Martha's Vineyard; 6 denotes six separate collection records of *S. infelix* off Block Island; 4 denotes four separate collection records of *S. atlanticus* at Bear Seamount.

seven articles. Antennal bases separated by narrow diamond-shaped frontal lamina (Fig. 4B, C); peduncle articles 1 and 2 subequal, short; articles 3 and 4 subequal, twice length of article 2; article 5 about 1.5 times length of 4; articles 2, 4 and 5 having clumps of elongate setae ventrally; flagellum of about 26 articles, reaching posteriorly to posterior margin of pereonite 3. Frontal lamina (Fig. 4C) narrow, diamond-shaped with slender posterior extension. Mandible (Fig. 4D) with distal sclerotized incisor region flexed towards midline; no obvious molar structure present; palp of three articles, basal article about 1.3 times length of article 2, with single fringed seta on outer surface; article 2 with four setae on lateral margin and cluster of eight elongate setae distally; article 3 slender, slightly curved, 0.75 times length of article 2, with four setae along lateral margin, cluster of about six distal elongate setae. Maxilla 1 (Fig. 4F) slender, with five distal sclerotized hooks. Maxilla 2 (Fig. 4G) twice width of maxilla 1, lobes poorly defined, apically with three stout hooks. Maxilliped (Fig. 4E) palp article 1 roughly rectangular, with small mesiodistal hook; article 2 half width and length of article 1, with single distal hook; terminal article 3 tiny, consisting of single hook. Pereopods 1–3 robust, short, 4–7 more elongate. Pereopod 1 (Fig. 5A), basis subequal in length to carpus, merus and ischium together, with distal clump of setae; merus and ischium each with antero- and posterodistal clump of setae; carpus short, with robust seta on posterior margin; propodus with posterodistal robust setae, clump of antero- and posterodistal setae; dactylus strongly recurved, acute apex sclerotized. Pereopods 2 and 3 (Fig. 5B, C) essentially similar to pereopod 1, with basis becoming more elongate; merus, carpus and propodus each with single stout posterodistal seta and antero- and posterodistal clumps of setae. Pereopods 4–7 increasing in length posteriorly. Pereopod 4 (Fig. 5D), ischium widening distally, with several robust setae and fine simple setae along distal margin; carpus and merus subequal in length, carpus narrower, each with several robust setae and simple setae along distal margin; propodus more slender than carpus, with small spine-like seta at mid-length of posterior margin, two spine-like setae posterodistally; dactylus subequal to propodus in length, curved, acute sclerotized. Pereopod 5 (Fig. 5E), ischium with several robust spine-like setae and few simple setae on distal margin; merus with two spine-like setae on posterior margin, few spine-

like setae on anterodistal margin; carpus with two small spine-like setae on posterior margin, several strong spine-like setae on distal margin; propodus with small spine-like seta at midpoint of posterior margin, two setae posterodistally; dactylus curved, acute, sclerotized. Pereopod 6 (Fig. 5F), ischium with several spine-like setae along distal margin; merus with two spine-like setae on posterior margin, several spine-like setae along distal margin; carpus longer but more slender than merus, with four small spine-like setae along posterior margin, cluster of antero- and posterodistal spine-like setae; propodus slender, with four spine-like setae on posterior margin, and single posterodistal seta. Pereopod 7 (Fig. 5G) essentially similar to pereopod 6, merus with three spine-like setae on posterior margin; carpus with four spine-like setae on posterior margin; propodus with two small spine-like setae on posterior margin, two longer spine-like setae posterodistally. Penial processes represented by a pair of low submedian rounded bosses in posterior half of sternite of pereonite 7. Pleopod 1 (Fig. 6A) protopod rectangular, with about seven retinaculae and several slender setae on mesial margin; rami subequal in length, exopod about one third wider than endopod. Pleopod 2 (Fig. 6B), protopod rectangular, with about seven retinaculae and several simple setae on mesial margin; copulatory stylet slender, tapering, not reaching apex of endopod; exopod about one third wider and slightly longer than endopod. Pleopod 3 (Fig. 6C), about seven retinaculae on mesial margin of rectangular protopod; exopod about one third longer and wider than exopod, latter with incomplete transverse sutures proximally. Pleopods 4 and 5 (Fig. 6D, E) essentially similar, with exopod longer and wider than endopod, with incomplete sutures proximally. Uropodal protopod (Fig. 6F) somewhat produced mesiodistally; exopod ovate, wider distally than proximally; endopod narrower than exopod, distally subtruncate, with shallow longitudinal groove near lateral margin; both rami bearing dense fine marginal setae.

Ovigerous female. Mouthparts' sclerotization reduced; mandible having slender tapering incisor ending in acute slightly sclerotized cusp; palp with article 2 four fifths length of basal article, bearing cluster of about six distal setae, article 3 about three fifths length of article 2, much more slender, with six distal setae, terminal one longest. Maxilla 1 thin-walled, with six distal spine-like setae. Maxilla 2 thin-walled, distally rounded, with three small distal hooks. Maxillipedal palp reduced, with two hooks and about six short setae distally, endite and epipod expanded anteriorly and posteriorly, bearing plumose marginal setae, covering mouthparts completely. Four pairs of oostegites on pereopods 1–4, increasing in size posteriorly, that of pereopod 4 largest and covering most of marsupium. Uropod similar to male, but endopod lacking shallow groove.

Although almost 200 specimens of *Syscenus* were examined for this study, only a single ovigerous female was encountered, from the Mediterranean (see Kensley & Cartes 2003).

Juveniles. Juveniles (< 15 mm total length) exhibit an elongation of the sixth, and to a lesser extent the seventh, pereopod, so that these two pairs of legs, much longer than the rest of the legs, reach posteriorly well beyond the pleotelsonic apex. In these juveniles, the pleotelson is somewhat narrower and more acute than in adults.

DISTRIBUTION

Seven species in the genus *Syscenus* are currently recognized: two from the North Atlantic (*S. infelix* and *S. atlanticus*); one from the southeastern Pacific (*S. peruanus* Menzies & George, 1972); four from the western Pacific (*S. springthorpei* Bruce, 1997 from Australia, *S. pacificus* Nunomura, 1981 from the East China Sea, which may be conspecific with *S. latus*, *S. intermedius* Richardson, 1910 from the Philippines, and *S. latus* Richardson, 1909 from Japan).

The only record from the Indian Ocean is that of *S. infelix* recorded by Stebbing (1923) (see also Kensley 1978). This specimen (♀ 15.1 mm, BMNH 1928.12.1.850, Natal coast, South Africa) was examined, and found to be very similar to *S. infelix*. With only one specimen available, and given the enormous geographical gap between this record and its next nearest in the Canary Islands, it is thought best to leave the specific status of this specimen undecided.

Three other extra-Atlantic records of *S. infelix* have been published. The specimen from Japan, recorded by Richardson (1909:85, USNM 39357), has a pleotelson with sinuate lateral margins and a broader apex than in typical *S. infelix*. This specimen is very similar to those from the Philippines (Richardson 1910:17, USNM 41553, 41555), also having sinuate lateral margins, and apically more rounded pleotelsons than in typical *S. infelix.* These specimens cannot be identified as the latter species.

The specimen from New Caledonia (Monod 1973:126, figs 45–53) was not examined, and with only the mouthparts illustrated, its specific status cannot be decided.

Syscenus infelix has been collected in a broad arc across the northern Atlantic from the Canary Islands (the most southerly record), the Mediterranean, the

North Sea in the regions of the Skagerrak, off Ireland and the Faroe Islands, the Davis Strait (the most northerly record), Gulf of St. Lawrence and down the east coast of the USA as far south as North Carolina (see Fig. 8). The species has been collected from 30 separate stations off Martha's Vineyard, and six stations off Block Island, these areas having been subject to particularly heavy sampling over the course of more than 100 years.

Of the 87 separate collecting stations recorded here for *S. infelix* (representing 172 specimens), 10 are from the Mediterranean. Here, the depth range is from 375 to 2071 m, with eight of the ten records being from more than 900 m. Of the remainder, the depth range is 70–1171 m; 53 of these stations are in depths between 300 and 900 m; 12 stations are from less than 300 m; six stations are from more than 900 m.

Ross & al. (2001), using a submersible, obtained photographs of *S. infelix* in situ on its host, the rattail fish *Nezumia bairdii* (Goode & Bean), the first record positively confirming the isopod's parasitic habit. The isopod seems always to attach at the same spot on the fish, namely, in the midline just posterior to the first dorsal fin. This apparently long-term attachment results in scar formation. A survey of scars in 1236 museum specimens of *N. bairdii* revealed a 16.6% infestation rate for material from 26 to 64°N. Scars were also found on *N. aequalis*, *N. sclerorhynchus*, and *N. suilla*, mostly from areas outside the range of *N. bairdii*, all at much lower rates of infestation (1.2–14.3%), suggesting that *N. bairdii* is the preferred host in the western Atlantic. What the preferred host might be in other parts of the known range of the isopod is unknown. Likewise, there are no clues as to the host for *S. atlanticus*. Kensley & Cartes (2003) suggest that in the Mediterranean there is no single preferred host. The Mediterranean *N. aequalis* is a possible host, but tends to occur in shallower depths than the isopod. Other possible hosts include the macrourids *Chalinura mediterranea* and *Coryphaenoides guentheri*. Mann (1970) makes an unconfirmed reference to *S. infelix* in the Mediterranean being parasitic on gadoid fishes. The record of *Rocinela lilljeborgii* Bovallius, 1885 (=*S. infelix*) on the operculum of a whiting (*Gadus merlangus*; see also Wahrberg 1930:24), must be treated with caution, such an attachment being easily effected during capture in a trawl net. The western Atlantic host fish species, *N. bairdii* (see Ross & al. 2001) is known from the northern Florida Straits to Newfoundland, in depths up to 2300 m, occurring in depths of less than 200 m north of Cape Cod.

In the western North Atlantic, *N. bairdii* is also the host of the parasitic copepod *Lophoura pentaloba* Ho, 1985, which imbeds its head in muscle tissue, but this is probably not as close an association as with *Syscenus*, as the copepod was also recorded from *Coryphaenoides armatus*.

ACKNOWLEDGEMENTS

Dr Michael Vecchione (NOAA/National Marine Fisheries Service, Chief Scientist on the *Delaware II* cruise 00-11), Virginia Institute of Marine Sciences student Melissa Southworth, and Dr Jon Moore, Florida Atlantic University, helped on board ship, to make invertebrate material, including the present isopods, available for study. The following scientists loaned material for this study; I am very grateful to all of them: Dr Geoff Boxshall, The Natural History Museum, London; Dr Charles Fransen, Rijksmuseum of Natural History, Leiden; Dr Jørgen Olesen and Mr Bjarne Bisballe, Zoological Museum, University of Copenhagen; Dr Joan Cartes, Institut de Ciències del Mar de Barcelona; Dr Lou van Guelpen, Atlantic Reference Center, New Brunswick, Canada; Ms Ardis Johnson, Museum of Comparative Zoology, Harvard, Cambridge, Massachusetts. I thank Dr Steve Ross, University of North Carolina at Wilmington, and Dr Tom Munroe, NOAA/NMFS, who provided valuable information regarding their observations of *Nezumia bairdii*, and location of material and data. I thank Dr Niel Bruce of NIWA, New Zealand, for his valuable comments made on an earlier draft of this paper.

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Accepted 9 December 2003 – Printed 2 June 2004
Editorial responsibility: Tore Høisæter/Kjersti Sjøtun