ICES IDENTIFICATION LEAFLETS FOR PLANKTON – FICHES D'IDENTIFICATION DU ZOOPLANCTON: Corystidae Samouelle, 1819 and Thiidae Dana, 1852.

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Corystidae Samouelle, 1819 and Thiidae Dana, 1852

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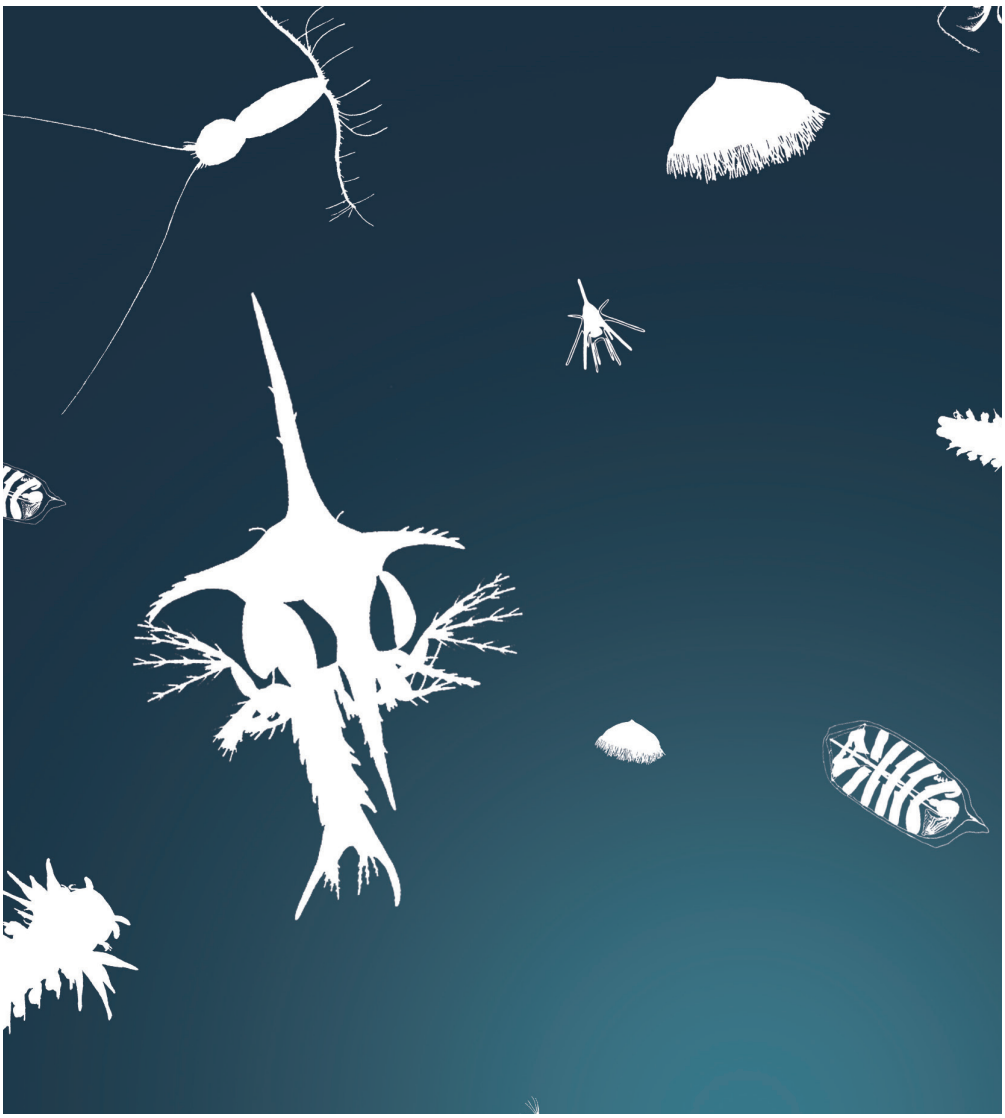

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Contents

Decapoda

Suborder: **Pleocyemata**

Infraorder: **Brachyura**

Section: **Eubrachyura**

Families: **Corystidae Samoulle, 1819 and Thiidae Dana, 1852**

Author: Elena Marco-Herrero

1 Summary

Families Corystidae and Thiidae comprise 13 species of burrowing crabs, and only 2 of them inhabits the ICES area. These species are *Corystes cassivelaunus*, belonging to the family Corystidae, and *Thia scutellata* in the family Thiidae. Both are warm-water species and inhabit the sublittoral zone in sandy bottoms. The larval series of the two species is known to include two phases: zoea and megalopa. The zoeal stages are the dispersal phase, and the megalopa is the dispersive and specialised recruitment phase.

This leaflet provides the distinctive characteristics of the larval stages for *C. cassivelaunus* and *T. scutellata*, and illustrated keys are included to improve the identification of zoeae and megalopa stages.

2 Introduction

Families Corystidae Samouelle, 1819 and Thiidae Dana, 1852, known as burrowing crabs, belong to the brachyuran subsection Heterotremata Guinot, 1977. The only family of the superfamily Corystoides, Corystidae, is considered one of the oldest brachyuran families and dates to the Jurassic period (Guinot *et al.*, 2007). They are called masked crab or sand crab due to their appearance (Števčić, 2005) and habitat, completely buried in the sand (Hartnoll, 1972). Corystidae comprises three extant genera, *Corystes* Bosc, 1802 (1 sp.), *Gomeza* Gray, 1831 (2 spp.), and *Jonas* Hombron and Jacquinot, 1846 (7 spp.) (Ng *et al.*, 2008).

Of the 10 species of the family Corystidae, only one species inhabits European waters of the ICES area. The type genus of the family is *Corystes*, with monospecific *C. cassivelaunus* (Pennant, 1777) occurring from the eastern Atlantic to the Mediterranean Sea (Taylor et *al.*, 2012). The adult form is morphologically unusual, with a modified respiratory system due to its burrowing habit (Hartnoll, 1968; Bellwood, 2002), and extreme sexual dimorphism of the chelae (Hartnoll, 1972).

C. cassivelaunus larvae were described in detail by Ingle and Rice in 1971, from ovigerous females. *C. cassivelaunus* comprises 5 zoeal stages (ZI-ZV) in its life cycle, and are characterized by a globular carapace with prominent lateral and long dorsal and rostral spines, maxillipeds

with long distal swimming setae, 1st article of endopod of the 1st maxilliped with three setae (dos Santos and Gonzalez-Gordillo, 2004), pleopods appear in ZV, and 5, 6-segmented pleon with dorsolateral processes on the 2nd pleonite and fork-shaped telson armed with dorsal spines (Paula, 1996). The megalopa of *C. cassivelaunus* are behaviourally and morphologically similar to the benthic juvenile, with functional walking legs and chelae, the maxillipeds becoming mouthparts and the pleon provided with pleopods. The most distinctive morphological feature of the megalopa of *C. cassivelaunus* is the 17–20-segmented antenna (Pessani *et al.,* 2004).

The family Thiidae is composed of two subfamilies: Nautilocorystinae Ortmann, 1893 and Thiinae Dana, 1852 (Ng *et al*., 2008). Nautilocorystinae comprises only one genus, *Nautilocoryste* H. Milne Edwards, 1837 with 2 species, and the subfamily Thiinae has only one genus with one species, *Thia scutellata* (Fabricius, 1793).

The genus *Thia* Leach, 1886 has been shown to fit within the Polybiine clade (Schubart and Reuschel, 2009; Spiridonov *et al.,* 2014; Evans, 2018), although its significant morphological peculiarity calls for a separate status. Currently *Thia scutellata* is an easily recognizable species with a wide distribution in the north-eastern Atlantic and the Mediterranean. The carapace is heart-shaped, and the margins and ventral surface are fringed with long yellowish setae.

The thumbnail crab, *Thia scutellata* has larval information provided by Ingle in 1984, from laboratory-reared females. Larval development consists of 4 zoeal stages and one megalopa. The zoeal stages are characterized by a globular carapace with lateral, long dorsal, and rostral spines, maxillipeds with long distal swimming setae, 1st article of endopod of the 1st maxilliped with two setae, pleopods appear in ZIV, and 5, 6-segmented pleon with dorsolateral processes on the 2nd pleonite and fork-shaped telson armed with one dorsal and one lateral spines (Paula, 1996). *Thia scutellata* shows distinctive morphological characters, such as 3-articled antennal exopod and uropod protopod without setae (Ingle, 1984; Pessani *et al*., 2004).

Listed below are the species belonging to the Corystidae and Thiidae families which are currently recorded in ICES area. The taxonomic status, according to WoRMS (2022), is:

ORDER DECAPODA

Superfamily 1815 Corystoidea Samouelle, 1819

Family Corystidae Samoulle, 1819

Corystes cassivelaunus (Pennant, 1777)

Superfamily Portunoidea Rafinesque, 1815

Family Thiidae Dana, 1852

Subfamily Thiinae Dana, 1852

Thia scutellata (Fabricius, 1793)

3 Distribution

Corystes cassivelaunus.

Adult habitat: it is a boreal/warm-temperature species. *Corystes* is restricted on fine sandy and/or muddy bottoms (d'Udekem d'Acoz, 1999).

Bathymetric: normally sublittoral, between 2 to 115 m depth, usually not below 40 m (Hartnoll, 1968; Manning and Holtuis, 1981; d'Udekem d'Acoz, 1999).

ICES area distribution: distributed on the eastern side of the Atlantic from 37°N on the coast of southwest Spain (González-Gordillo *et al*., 1990) to 59°N on the west coast of Sweden. (Hartnoll, 1972; d´Udekem d'Acoz, 1999).

Worldwide distribution: Mediterranean basin; Alboran Sea and western Mediterranean (Zariquiey-Álvarez, 1968), Adriatic Sea (Stevic, 1990), Ionian Sea (Pastore, 1976), Aegean Sea (Koukoras *et al*., 1992); (d´Udekem d'Acoz, 1999).

Thia scutellata.

Adult habitat: warm-water species in middle (Türkey, 2011) and coarse sands, and fine gravel bottoms (d´Udekem d'Acoz, 1999).

Bathymetric: sublittoral, in depths between 10 and 25 m (Manning and Holthuis, 1981), and down to 45 m (Clark, 1986).

ICES area distribution: Eastern Atlantic, from Norway (Christiansen, 1985) to southwest of the Iberian Peninsula in the Gulf of Cádiz (González-Gordillo and Rodríguez, 2003).

Worldwide distribution: continues to the eastern of the Atlantic to Sierra Leone and São Tomé e Principe in the Gulf of Guinea (Ingle, 1980; Clark, 1986). In the Mediterranean it is known from the Alboran Sea to the Levantine Basin (d'Udekem d'Acoz, 1999).

4 Taxonomic Key

Zoeal stages

1. Telson furcae with one pair of small dorsal spines (Figure 1d-e), ZII-ZV postero-lateral processes on pleonites 3-5 (Figure 1e), endopod of the maxilliped I with 3, 2, 1, 2, 1 + 4 setae respectively (Figure 1c), pleopods uniramous in ZII and biramous in ZIII–ZV…….....***Corystes cassivelaunus***

2. Telson furcae with one pair of small dorsal and lateral spines (Figure 2d-d1-e), without postero-lateral processes on pleonites (Figure 2d–e), endopod of the maxilliped I with 2, 2, 1, 2, 1 + 4 setae respectively (Figure 2b), pleopods uniramous in ZI–ZIII and biramous in ZIV…….....***Thia scutellata***

Both species share morphological characters in the zoeal stages that could be useful to differentiate them with respect to other species in the plankton (shown in detail in Table 1). Characteristics of the zoeal stages are as follows:

i. Globular carapace with lateral, and long dorsal and rostral spines (Figure 1a, 2a).
ii. Antennal exopod shorter than the protopod, with terminal setae and spine (Figure 1b).
iii. Maxilliped I basis with 2 + 2 + 3 + 3 setae (Figure 1c, 2b).
iv. Maxilliped II basis with 1 + 1 + 1 + 1 setae, and endopod with 1,1,4 setae (Figure 2c).
v. Dorsolateral knobs on pleonites 2 (Figure 1d–e, 2d–e).
vi. Telson furcated with median notch, and furcal armed (Figure 1d–e, 2d–e).

Megalopa stage

1. Rostrum trifid, carapace with spines on hepatic, mesogastric, epigastric and cardiac regions (Figure 1f–g), antenna 17–19-articled (Figure 1h), cheliped with ischial spine, uropod propotod with one seta and exopod with 8-9 setae (Figure 1i).....***Corystes cassivelaunus***

Rostrum short and triangular shape, carapace without spines and tubercle on cardiac region (Figure 2f–g), antenna 8-articled, cheliped without spines, uropod protopod without setae and exopod with 9–10 setae (Figure 2i)….....….***Thia scutellata***

To increase the ability to distinguish between the two species and other crab species, more morphological details are provided in Table 2, showing the variability of some morphological characters (Marco-Herrero, 2015).

5 Tables

Table 1. Meristic and morphological characters of the zoeal stages of *Corystes cassivelaunus* by Ingle and Rice (1971) and *Thia scutellata* by Ingle (1984). Larval morphology data by Ingle (1992) are given in brackets. Abbreviations: CL, Carapace length; TL, total length; (cp), carapace; (sp), spine; (s), setation; (a), aestethascs; (art), articulated; (ple), pleonite; (lat), lateral; (dor), dorsal; (min), minute; (ND), no data; (+), present; (-) absent.

	Corystes cassivelaunus					*Thia scutellata*			
	ZI	**ZII**	**ZIII**	**ZIV**	**ZV**	**ZI**	**ZII**	**ZIII**	**ZIV**
CL (mm)	0.6	0.6-0.7	0.8-0.9	1.3-1.5	1.6-1.8	0.7	0.75	1.30	1.60
TL (mm)	2.1-2.2 (3.4-4)	2.2-2.6 (4.3)	3-3.4 (5)	4-4.5	5-5.6	2.70	3.1-3.40	3.8	4.6
Carapace									
dorsal (sp)	+	+	+	+	+	+	+	+	+
rostral (sp)	+	+	+	+	+	+	+	+	+
lateral (sp)	prominent	=	=	=	=	1/3 cp	=	=	=
posterior (sp)	1	5	9	11	16	2	3-4	5	11-12
Antennule									
primary flagellum (a)	3 (4)	4 (6)	4 (7)	6 (9)	(10)12-13	3 (5)	6(7)	3+3-(4)	0,7+2,2
Antenna									
endopod	-	bud	equal	annulated	10-11 art	-	-	conspicuous	long
exopod (s)	2+2	1+2	1+1	=	=	1+1	=	1	=
Maxilla									
endopod (s)	5+3	3+5 I	ND	3+3+2	3+3+3	5+3	(4+3)	=	=
scaphognathite (s)	4+1	12	28	29-30	42-44 (49)	4+1	11	18	29

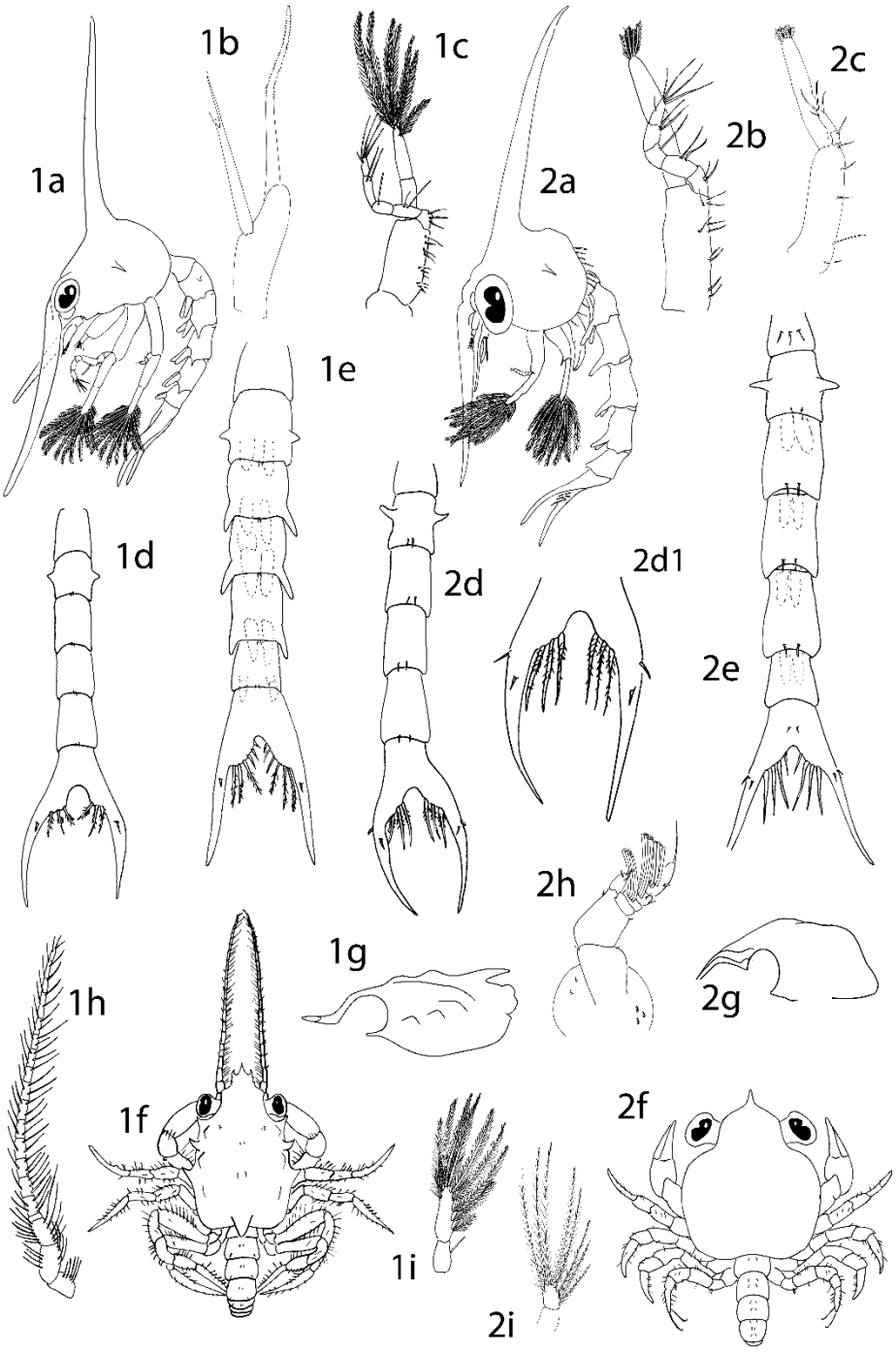
	Corystes cassivelaunus					*Thia scutellata*			
	ZI	**ZII**	**ZIII**	**ZIV**	**ZV**	**ZI**	**ZII**	**ZIII**	**ZIV**
Maxilliped I									
basial endite (s)	2+2+3+3	=	=	=	=	2+2+3+3	=	=	=
endopod (s)	3,2,1,2,1+4	=	ND	3,2,2,2,6	ND	2,2,1,2,4+1	=	2,2,1,2,5+1	=
exopod (s)	0,4	0,6-(8)	0,12	0,11-12	0,13-14	0,4	0,6	0,8	0,10
Maxilliped II									
endopod (s)	1,1,1+3	=	=	=	ND	1,1,3+1	=	=	=
exopod (s)	1,4	1,6	1,12	1,(11-12)14	0,13-14	0,4	0,6	0,8	0,10
Maxilliped III	-	-	-	bud	conspi-cuous	-	-	bud	bilobed
Pleon	5-ple	=	6-ple	=	=	5-ple	6-ple	=	=
Telson									
furca (sp)	1 dorsal	=	=	=	=	1 lat + 1 dor (1min sp)	=	=	=
inner (s)	3+3	3+1+1+3	3+2+2+3	3+3+3+3	3+3+3+3	3+3	=	=	3+1+1+3
Pleopods	-	uniramous	conspicuous	bigger	biramous	-	-	uniramous	biramous
Pereiopods	-	-	-	rudimentary chelae	art	-	-	bud	rudimentary chelae

Table 2. Meristic and morphological characters of the megalopa stage of *Corystes cassivelaunus* and *Thia scutellata*. Morphological larval data by Ingle (1992) are given in brackets. Abbreviations: CL, Carapace length; (sp), spine; (s), setation; (a), aestethascs; (art), articulated; (ND), no data; (-) absent. In addition, personal observations of a megalopa from the plankton of *C. cassivelaunus* (plankton) and of a megalopa of *Thia scutellata* one specimen borrowed from the Natural History Museum, London (NHM), are provided.

	Corystes cassivelaunus	*Corystes cassivelaunus*	*Thia scutellata*	*Thia scutellata*
	Ingle and Rice (1971)	(plankton)	Ingle (1984)	(NHM)
CL (mm)	2.3-2.5 (2.9-3.6)	3.1	2.2	2.2
Carapace				
rostrum	trifid, dorsal median sp	prominent and acute	slight deflected ventrally	short and triangular
hepatic region	2 sp	2 sp	-	inflated
epibranchial region	1 sp (2sp)	1 sp	-	-
protogastric region	1 sp	1 sp	-	-
cardiac region	1 sp	1 sp	tubercle	tubercle
Antennule				
primary flagellum (a)	11 (0,7,8,6)	0,5+5,5,3	4,4,4-5 (4,5,7)	0,8,8,4
primary flagellum (s)	0,0,0,1,1+1	0,0,2,1+1	0,1,2	0,0,2,1+1
accesory flagellum (s)	0,4 (2+5)	1+1+2	0,1+4	1+1+3-4
Antenna				
flagellum (s)	17-19 art	18 art	4,0,2,0,4,0,3,4 (0,2,0,4,0,3,4)	0,0?,4,0,4,1,4,5
Maxillule				
endopod (s)	1,1,2	1,1+1,1+1	2+2	1,1+2
Maxilla				
endopod (s)	3+3	2	1-2	1-2
scaphognathite (s)	(79-82) 94-98	82	41-42	41-42

	Corystes cassivelaunus	*Corystes cassivelaunus*	*Thia scutellata*	*Thia scutellata*
	Ingle and Rice (1971)	(plankton)	Ingle (1984)	(NHM)
Maxilliped I				
endopod (s)	2	2+7	3	3
exopod (s)	0,6	0,7	0,3	0,3
Maxilliped II				
endopod (s)	15,6,7,4,6 I	0,5,2,9,9	0,6,5+1	0,0,6,6
exopod (s)	0,4	3,7	0,3	0,3
Maxilliped III				
endopod (s)	5-art	24,28,10,10,13	10-11,7,5,6,4-5	ND
exopod (s)	4,4 I	7,8	ND	3,4
Cheliped				
spine	1 ischial+3 meral+1 carpal+3 propodal	1 ischial	-	-
Pereiopods				
2nd-3th (sp)	2 coxal+1 ischial	1 coxal (2nd)	-	1 coxal tubercle
4th	ischial	-	-	-
Pleon				
pleopod (s)	20,20,21,18	ND	13,15,14,11	16,16,14,13
uropod (s)	1,9	1,10	0,8 (0,9)	0,8-9

6 Figures



Figures 1–2. General morphology of larval stages known of families Corystidae and Thiidae. *Corystes cassivelaunus*: 1a, general lateral view ZV; 1b, antenna ZII; 1c, maxilliped I ZI; 1d, pleon ZI, dorsal view; 1e, pleon ZV, dorsal view; 1f, megalopa, dorsal view; 1g, megalopa carapace, lateral view; 1h, antenna megalopa; 1i, uropod of megalopa. *Thia scutellata*: 2a, ZIV, lateral view; 2b, maxilliped I ZI; 2c, maxilliped II ZI; 2d, ZI pleon, dorsal view; 2d1, telson detail; 2e, ZIV pleon, dorsal view; 2f, megalopa, dorsal view; 2g, megalopa carapace, lateral view; 2h, antennule of megalopa; 2i, uropod of megalopa.

Drawing not to scale. Figures redrawn from: 1a–e, 1h, Ingle and Rice (1971); 2a–g, Ingle (1984); 1f, g, i, 2h, i Marco-Herrero *et al.*, (in prep.).

7 Links to further information

WoRMS

Corystes cassivelaunus (Pennant, 1777)

(Ahyong 2020) https://www.marinespecies.org/aphia.php?p=taxdetails&id=107277

Thia scutellata (Fabricius, 1793)

(Fransen 2007) https://www.marinespecies.org/aphia.php?p=taxdetails&id=107281

Molecular information

Links to the DNA sequences of the species, *Corystes cassivelaunus* and *Thia scutellata,* are provided:

Corystes cassivelaunus
https://www.ncbi.nlm.nih.gov/nuccore/?term=txid557246[Organism:noexp

Thia scutellata
https://www.ncbi.nlm.nih.gov/nuccore/?term=txid557275[Organism:noexp

Other useful links

Corystes cassivelaunus	GBIF	https://www.gbif.org/es/species/5716132
Thia scutellata	GBIF	https://www.gbif.org/es/species/5178289

8 Terminology

The terminology used corresponds to Clark *et al*. (1998) and Clark and Cuesta (2015); it also follows the terminology used in other publications in the ICES Identification Leaflets for Plankton series (González-Gordillo and Cuesta, 2020; Cuesta and González-Gordillo, 2020).

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