

# *Caligus productus* Dana, 1852, Copepod parasite on marine fishes of Waltair Coast, Visakhapatnam, Andhra Pradesh, India.

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## ABSTRACT

Whereas conducting a study of parasitic copepods in marine angle Waltair coast, Visakhapatnam, *Caligus productus* Dana 1852 in *Euthynnus affinis affinis* (Cantor) has been depicted. Shiino (1959) and Lewis (1967) have given portrayal of this species where as the distributions of Helna A.K., *et al.*, (2018), Froese R. *et al.*, (2019) and Koyuncu C. E., *et al.*, (2015), gave a modification of this species. Within the display ponder the examples have appeared likenesses in all characters to C.productus particularly the ventral surface of the guts, the external distal corners of the genital section, the nature of the final portion of exopod of leg-1, the outer distal corner of the primary endopod portion of leg -2.

**Key words:** First antenna, Second antenna, Maxillipede, Second maxilla, Endopod, Exopod, Genital segment.

## INTRODUCTION

Within the course of examination on the systematic of copepod parasites of the marine angle, *Caligus productus* Dana, 1852 has been portrayed from the have *Euthynnus affinis affinis* (Cantor) Margolis *et al.* (1975) Cressey and cressey (1980).

After exhaustive examination the examples within the show ponder are recognized as *C.productus* in spite of the fact that they take after *C. quadrates* in one or two minor characters. Not one or the other *C.productus* nor *C.quadratus* has been detailed from India till now. So this can be the primary report from Waltair coast, Visakhapatnam, Andhra Pradesh, India.

## MATERIALS AND METHODS

The tests were collected from the gills of the angle and set in saline arrangement. Gill fibers were carefully prodded and the substance were inspected beneath a binocular magnifying instrument and parasites were settled in 4% formalin. As the parasites are marginally murky, it is troublesome to look at the parasite, so cleaning is fundamental. For this reason Lactic corrosive is utilized. The examples to be inspected are

kept in a depth square with a couple of drops of lactic corrosive for 2-4 hours. Drawings were made with the help of camera Lucida. Estimations were made with visual micrometer.

## DESCRIPTION OF THE FEMALE

Add up to length of the body is 4.2 - 4.9 m.m. Cephalon is half circle, measuring 2.8x1.7mm. Genital section is longer than wide and external distal corners are to some degree circular and amplify well past the addition of the guts. Genital portion is measuring 1.2 x 0.76mm. Midriff is single portioned almost thrice longer than wide measuring 1.13 x 0.33mm. The ventral surface of the midriff bears a average subterminal fix of diminutive spinules and a terminal transverse fix of fine hairs. Caudal rami (Fig. 1k) with regular plumose three sets of setae and in expansion a match of little plumose setae is taken note at the edges on each rami. Lunules are well isolated; space between them is more prominent than breadth of limulus.

To begin with receiving wire (Fig. 1b) is two fragmented, to begin with fragment is much more extensive than the moment and with around 26 plumose setae though moment section is longer and with almost 13 bare setae. The basal portion of moment radio wire (Fig. 1c) with a noticeable sclerotized recurred snare and with a back handle. The recurred snare bears a little spine on the center of the edge. Tines of sternal furca (Fig.1d) about parallel and box is rectangular in shape. Space between the tips of tines somewhat more extensive than the base.

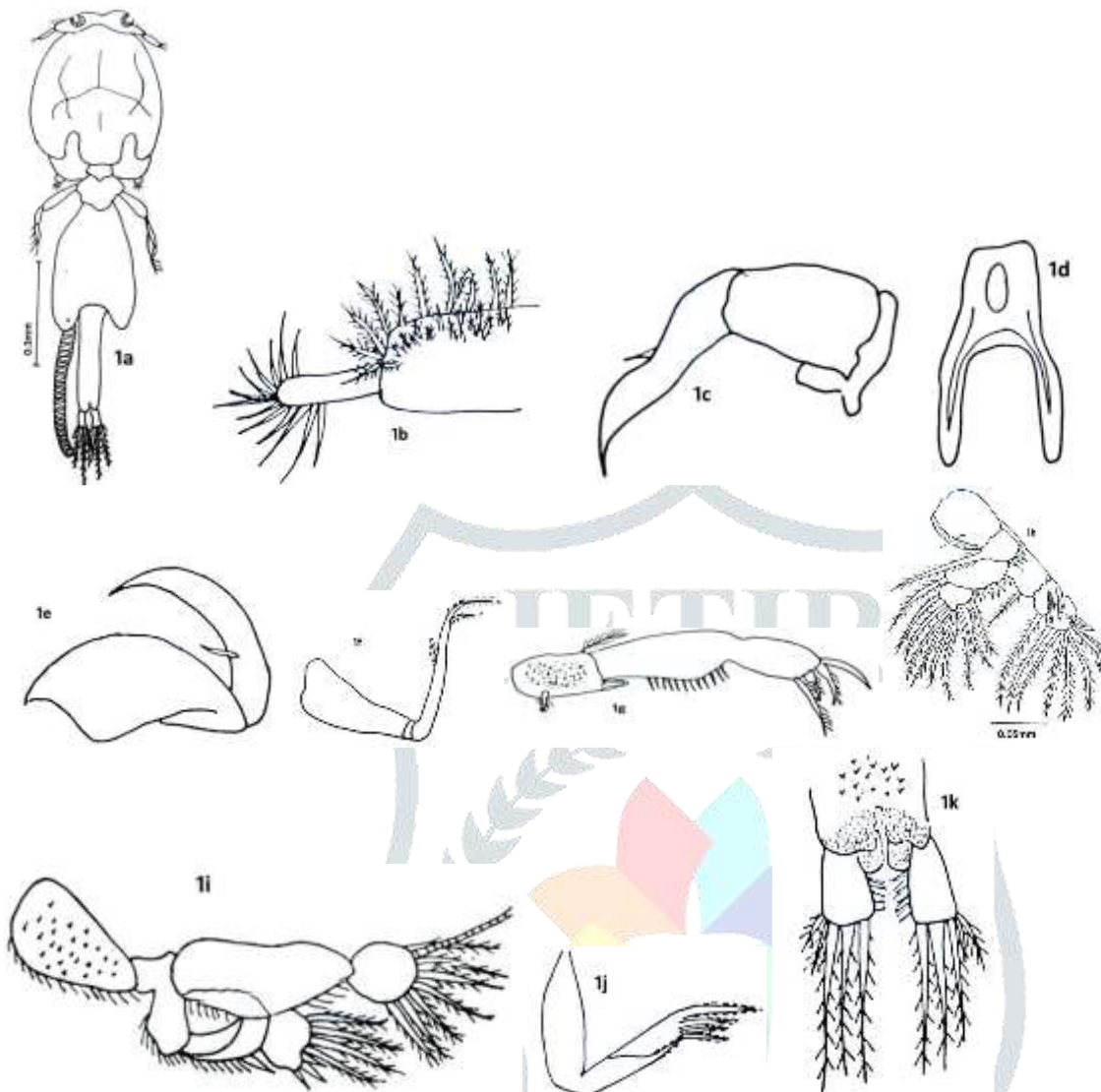
Maxillipede (Fig.1e) with a wide basal portion. Both external and internal edges of the basal portion without any armature. A sclerotized claw with a little spine at the base is watched. Moment maxilla (Fig.1f) two fragmented, to begin with is wide and the final fragment is longer than the primary and with a little limit bordered prepare close the terminal locale and 2 unequal bordered forms at the tip.

Leg 1, (Fig.1g) endopod with a fix of brief spinules and with a long plumose seta on the external distal corner and a little limit spine like handle at the inward distal corner and a short plumose seta on the inward proximal corner. Exopod to begin with portion is long and wide; bearing a push of spinules along the average edge. Final section is with 3 claws and one seta with external plumosities.

Leg 2, (Fig. 1h) endopod to begin with section with long spinule at external distal corner and a push of 7 hefty spines taken note on the moment portion. Exopod to begin with fragment with a unmistakable, deep down coordinated bordered spine on the external distal corner and a long plumose seta on the inward edge. Moment portion with a bordered spine on the external corner and two long plumose setae inward corner, but the spine is littler than that of to begin with section. The final is with two spines on the external distal corner, one thick, limit spine with membranous edge and 4 plumose long setae along the internal edge.

Leg 3, (Fig. 1i) exopod to begin with portion is with recurred spine not coming to moment portion; moment portion with 3 bare setae on external distal corner and 4 long plumose setae on inward edge; final section with 7 long setae on the internal edge.

Leg 4, (Fig. 1j) exopod 2 portioned, to begin with portion with a seta coming to the base of to begin with seta of terminal section. Final section with 3 sidelong and 1 terminal seta, all with subtle periphery.



### *Caligu productus*

**Fig, 1a:** Female, 1b: 1<sup>st</sup> antenna, 1c: 2<sup>nd</sup> antenna, 1d: Sternal furca, 1e: Maxilliped, 1f: 2<sup>nd</sup> maxilla, 1g: Leg 1, 1h: Leg 2, 1i: Leg 3, 1j: Leg4, 1k: Caudal rami.

## DISCUSSION

*Caligus productus* has been first described by Dana, 1852. Later this species has been reported from many scombrid and non scombrid hosts. Shiino (1959) , Lewis (1967), Ivanenko V.N., *et al* .,(2018), and Ozak AA, *et al* ., (2019) , have provided good description of this species whereas the publications of Margilis *et al* . (1975) and Cressey and Cressey (1980) gave a revision of this species.

*C.productus* and *C.quadratus* resemble each other and differentiating these two species is a difficult task. Lewis (1967) and Heckmann R.,(2015) discussed the difficulties in distinguishing the two species. In the present study the specimens have shown resemblances in all characters to *C.productus* especially the most differentiating characters like the ventral surface of the abdomen bearing a medial sub terminal patch of minute spinules and a terminal transverse patch of fine hairs ; Toksen E.,*et al*.,(2015),

WoRMS Editorial, (2019), WoRMS., (2020) discussed the outer distal corners of genital segment are round and extend well beyond insertion of the abdomen; the abdomen is single segmented. But another important character which differentiates *C. productus* from *C. quadrates* is the nature of last segment of exopod of leg1. In the present specimen according to Ramyrez F., *et al* (2017), Saraiva A, *et al* .,(2015), Rania AA *et al*.,(2015), the last exopod segment of leg 1 does not show the lateral setae which is a characteristic feature of *C.productus*. Again the leg 2 bears a row of long spinules on the outer distal corner of the first endopod segment, a character of *C.productus*. Leg4 also shows character of *C.produtus*. After thoroughly examining all the specimens, the present specimens are identified as *C.productus*.

*C.productus* has been reported for the first time from the marine waters of Visakhapatnam, A.P, India.

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**Different fish species examined and the % of infection during the years -2019**

Name of the Fish	<i>Euthynnus affinis</i>			Thunnus thunnus			Scomberomorus guttatus			Scomberomorus commerson			Rastrelliger kanagurta			Johnius carutta			Pricanthus hamrur			Muraenesox talaboloides			Trichiurus lepturus		
	Examined	Infected	% of Infection	Examined	Infected	% of Infection	Examined	Infected	% of Infection	Examined	Infected	% of Infection	Examined	Infected	% of Infection	Examined	Infected	% of Infection	Examined	Infected	% of Infection	Examined	Infected	% of Infection	Examined	Infected	% of Infection
Jan-2019	-	-	-	55	18	32.7	51	18	35.3	-	-	-	-	-	-	-	-	78	28	36	-	-	-	-	-	-	
Feb-2019	52	19	36.53	-	-	-	-	-	-	62	20	32.3	-	-	-	-	-	-	-	-	54	18	33	-	-	-	
Mar-2019	-	-	-	-	-	-	52	-	-	-	-	-	71	22	31	-	-	58	21	36	-	-	-	-	-	-	
Apr-2019	54	17	31.48	-	-	-	-	-	-	64	18	28.1	-	-	48	-	-	-	-	-	-	-	-	51	-	-	
May-2019	-	-	-	48	-	-	-	-	-	-	-	-	78	24	31	54	19	35	-	-	52	17	33	-	-	-	
Jun-2019	-	-	-	-	-	-	49	-	-	68	17	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Jul-2019	56	19	33.92	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56	20	36	-	-	-	-	-	-	
Aug-2019	-	-	-	51	20	39.2	-	-	-	-	-	-	-	-	56	21	38	-	-	-	-	-	-	-	-	-	
Sep-2019	-	-	-	-	-	-	54	19	35.2	-	-	-	65	23	35	-	-	-	-	-	56	19	34	-	-	-	
Oct-2019	53	14	26.41	-	-	-	-	-	-	-	-	-	63	21	33	-	-	-	-	-	-	-	-	-	-	-	
Nov-2019	-	-	-	54	-	-	-	-	-	-	-	-	66	20	30	-	-	-	-	-	-	-	-	64	18	28.1	
Dec-2019	64	20	31.25	-	-	-	-	-	-	59	18	30.5	-	-	-	-	-	-	-	-	58	20	35	-	-	-	

**Different fish species examined and the % of infection during the years -2020**

Name of the Fish	<i>Euthynnus affinis</i>			Thunnus thunnus			Scomberomorus guttatus			Scomberomorus commerson			Rastrelliger kanagurta			Johnius carutta			Pricanthus hamrur			Muraenesox talaboloides			Trichiurus lepturus		
	Examined	Infected	% of Infection	Examined	Infected	% of Infection	Examined	Infected	% of Infection	Examined	Infected	% of Infection	Examined	Infected	% of Infection	Examined	Infected	% of Infection	Examined	Infected	% of Infection	Examined	Infected	% of Infection	Examined	Infected	% of Infection
Jan-2020	58	16	27.58	-	-	-	-	-	-	-	-	-	42	-	-	-	-	-	-	-	-	-	-	64	20	37.3	
Feb-2020	-	-	-	41	-	-	-	-	-	54	17	31.5	-	-	-	53	18	34	-	-	-	-	-	-	-	-	
Mar-2020	-	-	-	-	-	-	45	-	-	52	18	34.6	58	18	31	-	-	-	-	-	46	-	-	-	-	-	
Apr-2020	-	-	-	53	16	30	-	-	-	-	-	-	48	-	-	-	-	-	-	-	-	-	63	-	-	-	
May-2020	52	18	34.61	-	-	-	56	20	35.7	-	-	-	-	-	-	-	54	-	-	-	-	-	-	-	-		
Jun-2020	-	-	-	55	19	35.5	48	-	-	-	-	-	-	-	-	-	-	54	18	33	-	-	-	-	-		
Jul-2020	51	-	-	-	-	-	-	-	-	-	-	60	19	32	-	-	54	18	33	-	-	-	-	-	-		
Aug-2020	52	19	36.53	-	-	-	-	-	-	52	14	26.6	-	-	-	-	-	-	-	-	-	-	49	-	-		
Sep-2020	-	-	-	53	18	34	-	-	-	-	-	-	54	-	-	-	-	-	-	-	59	18	31	-	-		
Oct-2020	54	18	33	-	-	-	55	17	30.9	-	-	-	-	-	-	-	52	-	-	-	-	-	-	-	-		
Nov-2020	-	-	-	49	-	-	-	-	-	-	-	62	17	27	52	19	37	-	-	-	-	-	-	-	-		
Dec-2020	-	-	-	-	-	-	-	-	-	51	15	29.4	-	-	-	-	-	-	-	-	53	-	-	62	17	27.4	