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RESULTS OF THE DIVA-1 EXPEDITION OF RV "METEOR" (CRUISE M48/1)

Notes on the Tanaidacea (Crustacea: Peracarida) of the Angola Basin

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Abstract

In July 2000 the DIVA-1 Expedition collected deep-water benthos (5125–5449 m) in the Angola Basin, South Atlantic Ocean. The tanaidacean material is composed of 434 individuals with a body length between 1.2 and 12 mm. Sixty-eight species, belonging to 10 families were found. Tanaidomorpha with 63 species represent 96% of the material, Neotanaidomorpha with one species 3% and Apseudomorpha with 4 species 1%. The most diverse genus is *Leptognathia* (22 species). The material is dominated by *Paranarthrura angolensis* with 58 individuals. The Tanaidacea of the Angola Basin share only one species (*Neotanais americanus*) with other deep-sea areas of the Atlantic Ocean, 97% of the material is composed of new species. The different sampling gear results are discussed.

Keywords: Angola Basin; Tanaidacea; Deep sea; South Atlantic

Introduction

The deep sea is a vast and poorly known environment in comparison to shallow waters. The fauna of this environment is very diverse and many new species are expected to be found in the near future. The Tanaidacea, a little known group of Crustacea, is considered to be one of the most successful invertebrates of the deep sea (Larsen pers. comm.). Tanaids are not very diverse in shallow waters, while in the deep sea they are well represented (Dojiri and Sieg 1997) and are one of the most abundant taxa in deep-sea samples. According to Wolff (1977), tanaids may comprise as much as 19% (by number) of the benthic macrofauna at 5000 m depth, and quite often the order is found to be the second or third most abundant peracarid taxon, next to amphipods and isopods, in ecological studies of the deep sea (Borowski 2001).

Determination of particular species is notoriously difficult. In the Tanaidomorpha and Neotanaidomorpha sexual dimorphism is very strongly displayed and males show an especially high degree of polymorphism. Moreover, the ontogenetic variation of most taxa makes the identification of many species very difficult (Larsen 2001; Wilson 1987).

The tanaid fauna from the North Atlantic Ocean is one of the best known worldwide due the works of Sars (1882), Hansen (1913), Norman and Stebbing (1886), and Bird and Holdich (1988, 1989). For other regions of the world our knowledge of Tanaidacea is even more incomplete. In the tropical regions the knowledge of deep-sea fauna, especially tanaids, is poor. For the South Atlantic Ocean there are only a few reports on tanaids. The most important works are by Kudinova-Pasternak (1990) and Bamber (2000). Until now only six families and 12 species of Tanaidacea were reported for the Angola Basin: *Glabroapseudes larseni*, Guerrero-Kommritz & Heard, 2003 (Apseudidae); *Sphyrapus malleolus* Norman & Stebbing, 1886 (Sphyrapidae); *Pseudotanais denticulatus* Bird & Holdich, 1989 (Pseudotanaidae); *Collettea pegmata* Bamber, 2000, *Portaratrum afer* Guerrero-Kommritz, 2003 (Colletteidae); *Tanaella profunda* Guerrero-Kommritz & Błażewicz-Paskowycz,

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2004 (Tanaellidae); and six Agathotanaididae: *Agathotanais* sp AB1, *Metagathotanais loezae* Guerrero-Kommritz, 2003, *Paragathotanais insolitus* Guerrero-Kommritz, 2003, *Paranarthrura angolensis* Guerrero-Kommritz et al. 2002, *Paranarthrura intermedia* Kudinova-Pasternak, 1982, and *Paranarthrura insignis* Hansen, 1913 (see Guerrero-Kommritz et al. 2002 and Schmidt and Brand 2002).

The DIVA-1 Expedition is the first effort to make a comprehensive survey of the benthic fauna in the Angola Basin. The Tanaidacea of the Angola Basin collected during the DIVA-1 Expedition is the subject of the present paper.

Materials and methods

During July 2000 members of the DIVA-1 Expedition collected deep-water benthos, including Tanaidacea, from the Angola Basin. Sampling was conducted aboard the R/V *Meteor*, in depths between 5125 and 5449 m, along a transect of approximately 700 km, using four different gears: modified epibenthic sledge (EBS) (Brandt and Barthel 1995), box corer (BC), multicorer (Muc) and a large bottom trawl (BT). The samples were sieved gently with precooled seawater on board and transferred into 80% ethanol or 4% formalin in seawater. The main sorting work was done in the laboratory in Germany. Tanaidacea were found in 22 samples. For gear sampling data see Table 1. The tanaidaceans were identified to species level in the Zoological Museum Hamburg (ZMH), where the material is deposited.

Due to bad weather conditions during the recovery of the EBS little material is available from stations 320 and 338.

Results

The material of Tanaidacea found in the Angola Basin is composed of 434 individuals. Body lengths range between 1.2 and 12 mm. Sixty-eight species belonging to 10 families were found. The composition is as follows: the Tanaidomorpha are represented with 63 species (96% of all individuals), the Neotanaidomorpha with one species (*Neotanais americanus*) (3%), and the Apseudomorpha with four species (1%) (Fig. 1). Leptognathiidae is the most numerous in species and in individuals followed by Pseudotanaididae (Figs. 2

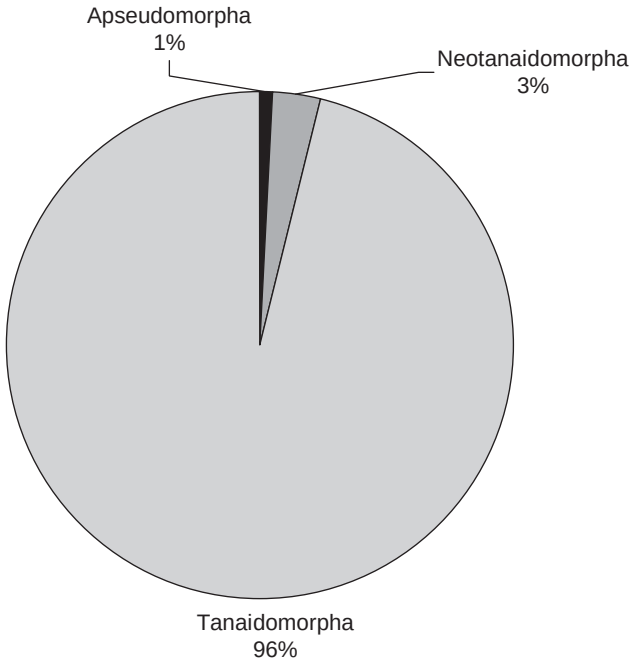

Fig. 1. Tanaidacea individuals per suborders collected in the Angola Basin during the DIVA 1 Expedition.

Table 1. Total and per gear catches of individuals and species

Families	Total catches		EBS		BC		Muc		BT	
	Ind.	Spec.	Ind	Spec	Ind	Spec.	Ind.	Spec.	Ind.	Spec.
Leptognathiidae	128	22	45	11	67	21	19	8	1	1
Anarthruridae	30	10	37	9	11	6	7	3	0	0
Agathotanaididae	77	3	31	2	38	3	8	2	0	0
Pseudotanaidae	72	12	48	11	20	8	4	4	0	0
Nototanaidae	25	10	16	8	6	4	2	2	1	1
Colletteidae	43	4	2	2	10	2	1	1	1	1
Neotanaidae	13	1	3	1	7	1	2	1	1	1
Tanaellidae	42	2	8	2	33	2	1	1	0	0
Apseudidae	3	3	3	3	0	0	0	0	0	0
Leviapseudidae	1	1	1	1	0	0	0	0	0	0
Total	434	68	194	50	192	47	44	22	4	4

Abbreviations: Epibenthic sledge (EBS), Box corer (BC) Multicorer (Muc), Bottom Trawl (BT).

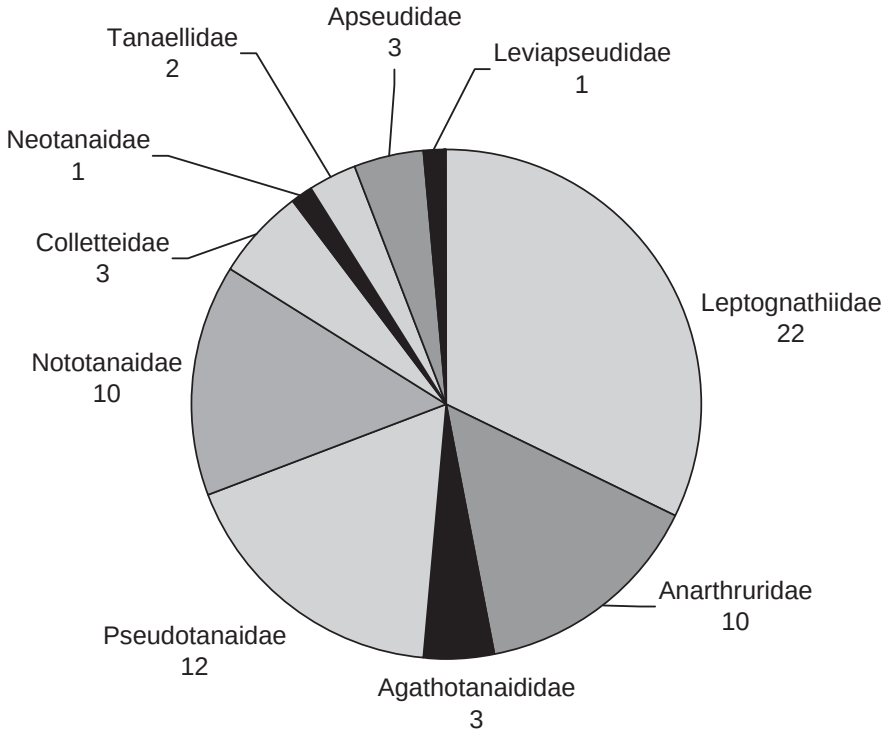

Fig. 2. Tanaidacean species per families collected in the Angola Basin during the DIVA 1 Expedition ($n = 68$).

and 3). The gear that captured most Tanaidacea is the EBS followed by the BC (Fig. 4).

The tanaidacean fauna of the Angola Basin has only one species in common with other deep-water areas of the Atlantic Ocean. Of the 68 species found, only seven are known to science, all 61 remaining species (90% of the material) are new, and several of them were recently or are being described by the author (Guerrero-Kommritz et al. 2002; Guerrero-Kommritz 2003a, b; Guerrero-Kommritz and Heard 2003; Guerrero-Kommritz and Błażewicz-Paskowycz 2004). The species of the DIVA-1 Expedition are listed in Appendix A. Table 1 shows the numbers of individuals and species captured in total and per gear.

Discussion

Of the species reported by Bamber (2000) none was found in the material of the DIVA-1 Expedition. The total list of tanaid species from the Angola Basin now consists of 75 species: six reported by Bamber (2000), 68 in the present study, and one additional species found in material of the Sanders Expedition 1968 to the South Atlantic Ocean (Guerrero-Kommritz 2003b).

Neotanais americanus Beddard, 1886 is the only species that is in common with other deep-sea regions, it has a very wide distribution in the Atlantic Ocean and is reported for the deep sea of the North Atlantic Ocean, from Greenland to the Canary Islands, from the east coast of North America, and from the coast of Europe. In the South Atlantic this species is reported from the Argentine Basin, in the vicinity of Rio de la Plata, and in the Weddell Sea (Gardiner 1975; Larsen 1999). *Neotanais americanus* is a problematic species and is considered as a species complex. The full determination is only possible for adult males, which are usually rare in the samples, and show a high degree of polymorphism (Gardiner 1975). It is probable that in future this species will be split into several ones.

Tanaidomorpha females and neuters are morphologically similar. They live in tubes most of the time and are not very motile. In contrast, males are motile individuals, some of them polymorphic, and most of them non-feeding. They are searching for females by roaming the substrate most of the time (Larsen 2001). The highest number of males was sampled by means of the EBS (32 ind.).

Apseudomorphs were found only in the EBS samples. These large tanaids of more than 10 mm body length, live primarily epibenthically and it is not known how deep they dig into the sediment. Their absence from the BC and MUC samples cannot be explained satisfactorily.

The presence of heavily cuticularized tanaidaceans, which are very bad swimmers (like members of Agathotanaidae, and species of *Araphura* and some *Leptognathia*), and of typical burrowers in the EBS can only be explained by the fact that the lower frame of the EBS dug itself into the substrate collecting everything that was in the upper sediment layer (Brenke pers. comm.)

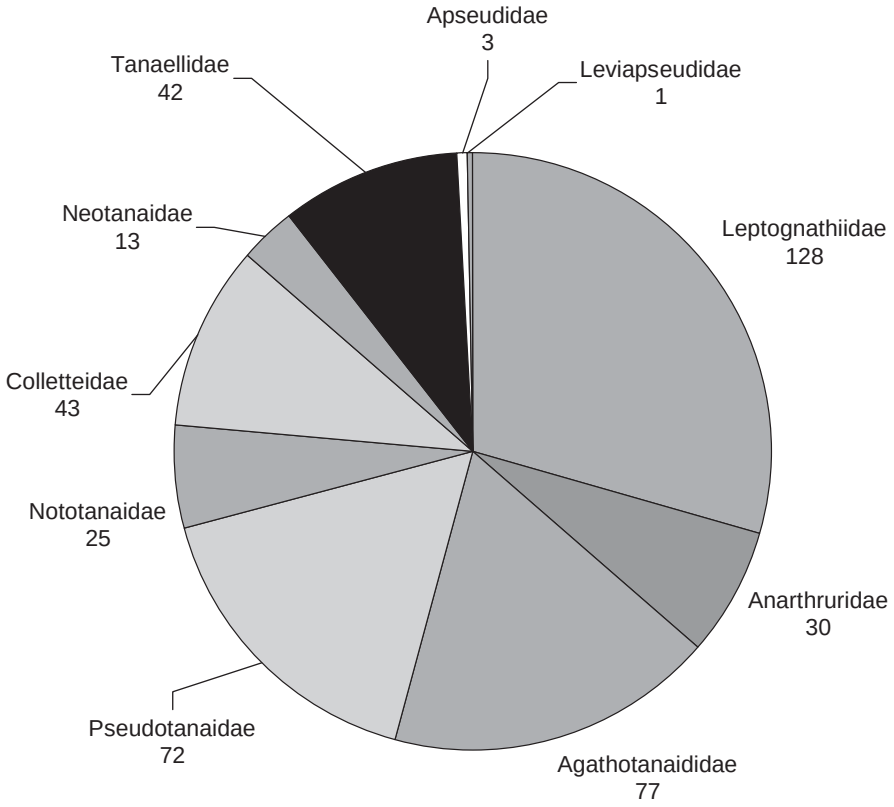

Fig. 3. Tanaidacean individuals per families collected in the Angola Basin during the DIVA 1 Expedition ($n = 434$).

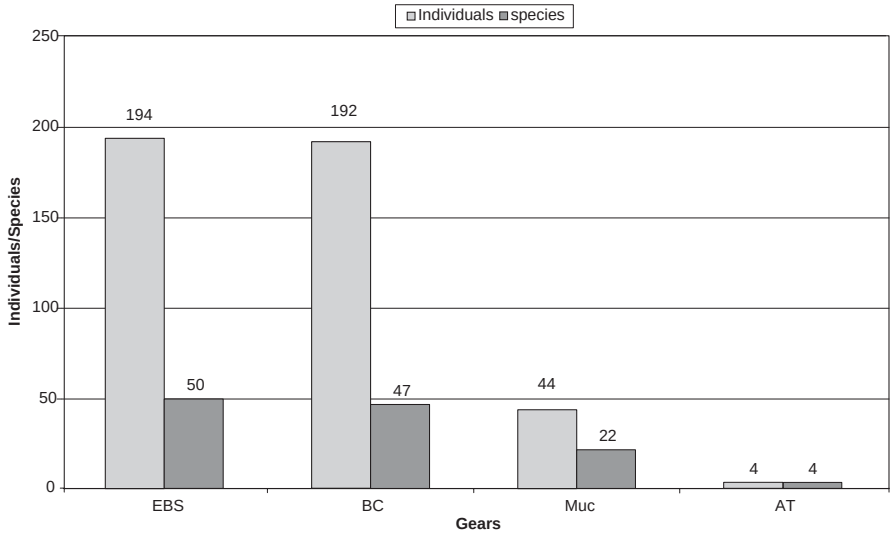

Fig. 4. Tanaidacea collected by the different gear (individuals $n = 434$).

The presence of Tanaidacea in the BT is difficult to explain. Although the tanaids captured are very big (approx. 7 mm in length), the net mesh of the BT is too wide to capture small animals of this size. The tanaids must have stuck on something including other fauna to be collected by this gear.

Apparently the catches increase with decreasing latitude in the BC samples, in which the northern most station shows the highest numbers of specimens. For the EBS the picture is different, the middle stations yielding the richest tanaid samples. The MUC samples show high numbers of tanaids in the south and in the north and only few at the middle stations of the sampling area. This surprising picture of the distribution of tanaids cannot be explained.

Due to the poor knowledge of the tanaid fauna of the deep sea a comparison with other deep-sea regions is not possible at the moment. The high percentage of new species sampled during the DIVA-1 Expedition illustrates that the amount of new species that can be discovered in the deep sea must be enormous. Because of the limited mobility of tanaidaceans the degree of endemism in the deep sea is probably very high (Larsen pers. comm.).

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Appendix A

Results of DIVA 1 expedition of are shown in Table 2.

Table 2. Species of Tanaidacea of the Angola Basin sampled in the DIVA-1 expedition

Taxa	318/ EBS[a]	320/ EBS	324/ KG	325/ Muc	330/ KG	331/ Muc	334/ AT	336/ KG	337/ AT	338/ EBS	339/ AT	340/ EBS	340/ KG	341/ KG	342/ Muc	344/ EBS	344/ KG	345/ KG	346/ Muc	348/ EBS	349/ AT	350/ EBS	Σ
Apseudidae																							
Glabroapseudes larseni[b]																				1			1
Apseudes sp1																1							1
Apseudes sp2																				1			1
Leviapseudidae																							
Leviapseudes sp																				1			1
Neotanaidae																							
Neotanais americanus	1			1	1	1								2		1	4			1	1		13
Agathotanaididae																							
Paranarthrura angolensis[c]	2	1		1		1		7		1		9	1	7	1	2		14	2	7		2	58
Paragathotanais insolitus[d]				2														3	1				6
Metagathotanais loerzae[d]								1				4		1		3		4					13
Anarthruridae																							
Anarthruridae sp1																						1	1
Anarthrurid sp2												1											1
Anarthrurid sp3																1						1	2
Portaratrum afer[e]												2		1						5		2	10
Akanthophoreus sp1				3						1		7				2		2	1	2			18
Akanthophoreus sp2												7				1	1						9
Akanthophoreus sp3	1													2				1	2			1	7
Akanthophoreus sp4												1		3	1								5
Akanthophoreus sp5					1																		1
Akanthophoreus sp6																1							1
Colletteidae																							
Collettea sp1												1						1					2
Collettea sp2	1			1				2						1				6					11
Colletteidae sp											1												1
Tanaellidae																							
Tanaella profunda[f]		1		1	3			1										6		1			13
Araphura sp1														4		5		19				1	29
Leptognathiidae																							
Chauliopleona sp													1					2		1			4
Leptognathia sp1														1						1			2
Leptognathia sp2												1		1			1						3

Table 2. (*continued*)

Taxa	318/ EBS[a]	320/ EBS	324/ KG	325/ Muc	330/ KG	331/ Muc	334/ AT	336/ KG	337/ AT	338/ EBS	339/ AT	340/ EBS	340/ KG	341/ KG	342/ Muc	344/ EBS	344/ KG	345/ KG	346/ Muc	348/ EBS	349/ AT	350/ EBS	Σ
Leptognathia sp3												2		2		2		2		3		1	12
Leptognathia sp4												2		1	1								4
Leptognathia sp5					1									2				4	3			2	12
Leptognathia sp6			1	1				2				6		3		2		3					18
Leptognathia sp7			1		1							2		1									5
Leptognathia sp8			1	3										1				2	4				11
Leptognathia sp9														1									1
Leptognathia sp10										1			3										4
Leptognathia sp11														2									2
Leptognathia sp12				2															2				4
Leptognathia sp13					1									1	1			1		2			6
Leptognathia sp14					1													1					2
Leptognathia sp15																		1					1
Leptognathia sp16								1										1					2
Leptognathia sp17			1															4	1				6
Leptognathia sp18																		2					2
Leptognathia sp19																		1					1
Leptognathia sp20			2																				2
Leptognathia sp21									1														1
Leptognathia sp22	1			1	5							2		2		6		2		5		3	27
Nototanaididae																							
Meromonacantha sp																1				1			2
Typhlotanais sp1	1											1											2
Typhlotanais sp2												1											1
Typhlotanais sp3				1										1									2
Paraespinosus sp1														2									2
Paraespinosus sp2												1			1								2
Paratyphlotanais sp1																3							3
Paratyphlotanais sp2																				1			1
Paratyphlotanais sp3					1											1							2
Nototanaididae sp							1					1				2	2			1		1	8
Pseudotanaidae																							
Pseudotanaidae sp1					1					1		3				4						2	11
Pseudotanaidae sp2	1											5					1		1	2		1	11
Pseudotanaidae sp3	2											3		1		1	1	1		1		1	11
Pseudotanaidae sp4										1						1	1	1		1			5
Pseudotanaidae sp5	1											1					2	3					7
Pseudotanaidae sp6										1		1											2
Pseudotanaidae sp7																			1	3			4
Pseudotanaidae sp8		1										1											2
Pseudotanaidae sp9												1											1
Pseudotanaidae sp10		1										1					2		1				5
Pseudotanaidae sp11			2											1		5		2	1			1	12
Pseudotanaidae sp12					1																		1
Total individuals	11	4	8	17	17	2	1	14	1	6	1	67	5	44	5	45	15	89	20	41	1	20	434
Total species	9	4	6	11	11	2	1	6	1	6	1	26	3	24	5	21	9	26	12	20	1	14	68

[a] In column heads of form a/b, a is Station and b is Gear.
[b] Guerrero-Kommritz and Heard 2003.
[c] Guerrero-Kommritz et al. 2002.
[d] Guerrero-Kommritz 2003.
[e] Guerrero-Kommritz 2003.
[f] Guerrero-Kommritz and Błażewicz-Paskowycz, 2004.

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