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DISTRIBUTIONS OF MONOGONONT ROTIFERS, *BRACHIONUS* spp IN NORTH SULAWESI

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ABSTRACT

In order to characterize the distribution pattern of rotifers *Brachionus* spp. in North Sulawesi, sample collections have been conducted at four locations, two at east coast and other two at west coast of North Sulawesi peninsula, which are connected to Maluku and Sulawesi Seas, respectively. At each location, a 40 μm mesh size plankton net with a 0.3 m opening diameter was horizontally towed at three sites to represent coastal water, estuary and brachkiswater pond. Sampling periods were in January and August 2005 to represent west monsoon and east monsoon, respectively. Each sampling was performed twice a day during high and low tide. Some environmental factors were also measured in situ during the sampling.

Three species of *Brachionus* were found during the survey, *Brachionus rotundiformis*, *B. caudatus* and *B. quadridentatus*. Their abundances were significantly different, both between locations and sampling sites. However, among the similar habitat such as between Manembo-nembo and Minanga brachkishwater ponds, *B. rotundiforms* abundance was not significantly different. This species was the most abundant compared to the other two species, in average 1984,4 ind/m^3, while the other species was as low as 26,1 ind/m^3 and 212,9 ind/m^3 for *B. caudatus* and *B. quadridentatus,* respectively. The abundance of rotifers in northern areas connected to Molluccas Sea is higher compared to those in the southern areas connected to Sulawesi Sea. Distribution of *B. caudatus* is very similar to those of *B. rotundiformis*, while *B. quadridentatus* appears to have its specific pattern. Results of this study suggest that the abundance and species composition of the rotifers reflect trophic status of the aquatic ecosystem in the area. It is still awaiting future studies to elaborate the impacts of the trophic gradients in horizontal distribution of rotifers. Therefore, it is necessary to conduct a long term monitoring with emphasis on the structure of rotifer assemblages in a variety of sites subjected to environmental perturbations, including anthropogenic contaminant inputs.

Keyword: Distribution, Monoqonont rotifers, Nort Sulawesi

INTRODUCTION

Rotifer are found in nearly every body of freshwater; in tiny, temporary puddles, in rivers and swamps, and in the largest lakes. They are much less commonly encountered in the sea, which appear to be confined to coastal regions, reaching their greatest abundance in brackish waters. The species found in the sea often differ from freshwater forms, but there are no genera that are confined to the sea. The marine rotifer is usually comprised of only a few species, often dominated by *Synchaeta* species that are truly marine, and sometimes *Brachionus plicatilis*.

The rotifers has become very famous after the sixties when Japanese researches found them are suitable live food organisms for the early larval stages of marine fish. Only a few rotifer species belonging to the genus *Brachionus*, mainly *B. plicatilis* and *B. rotundiformis* are being used in aquaculture and considered as cosmopolitan inhabitants of inland saline and coastal brackish waters (Dhert, 1996). *B. rotundiformis* was previously known as S-type *B. plicatilis*, until the evidences from morphological and genetical studies by 1990s, when their karyotype was found to be much different from L-type *B. plicatilis* (Rumengan and Hirayama, 1990; Rumengan *et al.* 1993a,b). This species, a typical tropical rotifer is widely used for feeding small-mouth finfish larvae such as groupers in tropical countries.

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Together with protozoans and microcrustaceans, rotifers are the principal components of zooplankton communities. Rotifers can account for 50% or more of the zooplankton production, because they can reproduce very rapidly (Herzig, 1983). Abundance and species composition of rotifers often reflect the trophic status of aquatic ecosystem. It is assumed that the trophic gradients play an important role in horizontal distribution of rotifers.

It is likely that biogeographical research will play an important role in monitoring environmental condition by examining the sturcture of rotifer assemblages in a variety of sites subject to environmental pertubations, including anthropogenic contaminant inputs. It it was believed that all rotifers are cosmopolitan, and seemingly supported by the fact that the resting eggs of monogononts and the anhydrobiotic stages of Bdelloids are transported by birds. It was argue that passive dispersal was sufficient to ensure that most species become globally distributed (Nogrady *et al.* 1993).

The horizontal variability in rotifer distribution is much less explored, especially in north Sulawesi even in Indonesia. In order to characterize the distribution pattern of rotifers *Brachionus* spp in north Sulawesi, sample collections have been conducted at four locations, two at east coast and other two at west coast of North Sulawesi peninsula, which are connected to Maluku and Sulawesi Seas, respectively (Fig. 1). This study was conducted to provide an initial explanation on the variability of rotifer distributions in north Sulawesi peninsula.

MATERIALS AND METHODS

The survey was conducted at four locations, two locations in west coast of north Sulawesi peninsula facing Sulawesi Sea and the other two locations in east coast facing Molluccas Seas. Figure 1 shows that the two locations in the east are Manembo-nembo and Minanga, while the other two locations in the west are Wori and Tumpaan. At each locations, sampling was done at three stites i.e. coastal water, estuary and brachkiswater pond. Each sampling was conducted twice a day during high and low tide. Sampling periods were in January and August 2005 to represent west and east monsoons, respectively.

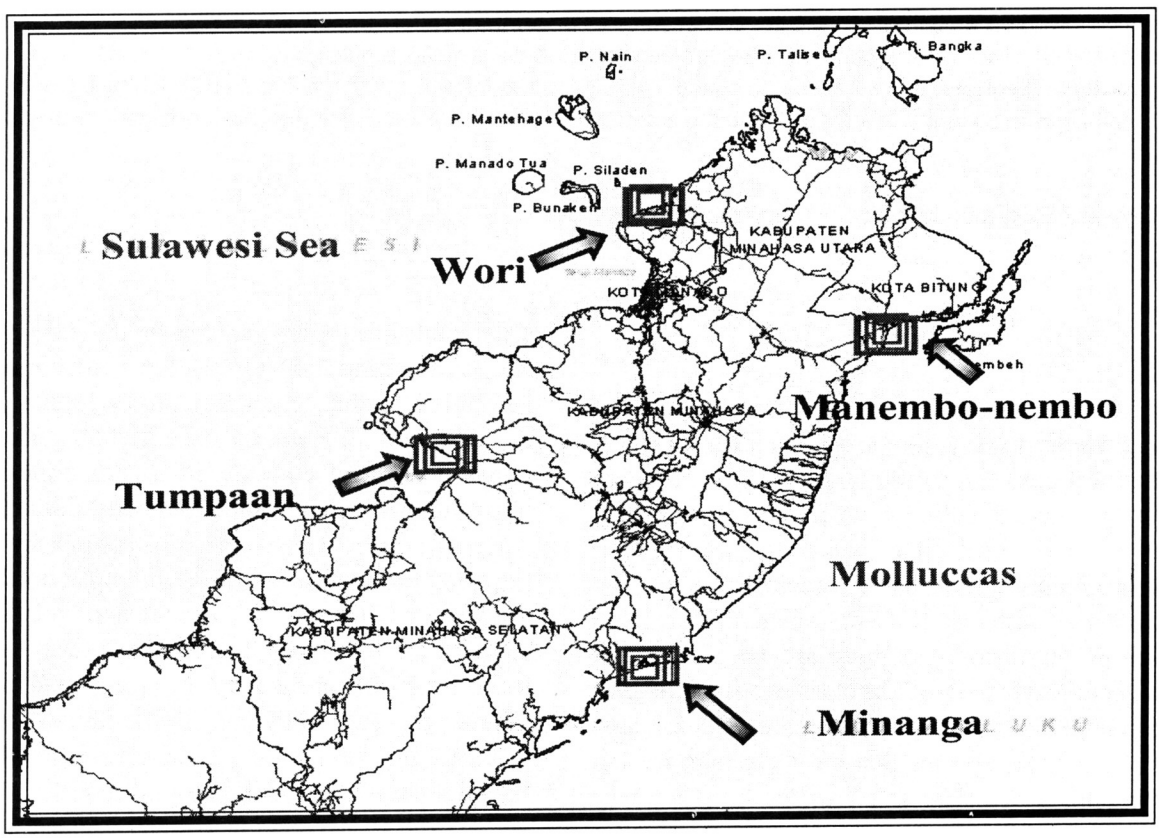

Figure 1. Map of study area

Sampling was made up by three times repeatation of 10 m horizontal tows of 40 μm mesh size plankton net with 0.3 m diameter opening at each sites. The plankton material was fixed in a mixture solution of 4% formaldehyde and borax for further identification and measurements. Physical and chemical parameters such as temperature, salinity, pH, turbidity, dissolved oxygen, and current velocity were also measured in situ using test kit water Horiba U-10.

Species identification of the rotifer was conducted using taxonomical features (morphological characters) of lorica, anterior thorn, and posterior thorn. While their density was calculated by following Hirayama and Rumengan (1993). The calculated density data were then treated with lograritmic transformation -log (x + 1) - for better visualization.

RESULT AND DISCUSSION

There are tree species of genus *Brachionus* were found during the study. The three species are *B. rotundiformis*, *B. caudatus*, and *B. quadridentatus* as summarized in Table 1 and Figure 2. It is quite easy to distinguish *B. caudatus* from the other two species, however rather difficult to differentiate *B. rotundiformis* and *B. quadridentatus*.

The average density of the three rotifers in each site and each sampling time are arranged in Figure 3. It reveals that *Brachionus* rotifers more abundant in east coast than in west coast, and estuary appear as the most favorable habitat for them. According to Nogrady *et al.* (1993), most rotifers are strictly littoral, being found in open

Table 1. Morphological specific characters of the three species

Species	Morphological character			
	Anterior thorn	Lorica shape	Posterior thorn	Foot
B.rotundiformis	4 antennae 2 jut Dorsal 4 small jut	Lorica terminating in two stout posterior spines. The body is slightly oval in shape. Posterior spines are long. The occipital spines are small.	2 antennae	---
B. caudatus	6 antennae Dorsal 4 small jut	Posterior lorica margin tapered and rounded	---	1
B. quadridentatus	6 antennae Dorsal 4 small jut	Lorica barrel-shaped, swollen at its posterior third, prolonged posteriorly in two stout and parallel lateral spines. Two posterior spines	2 margin antennae, 2 jut	1

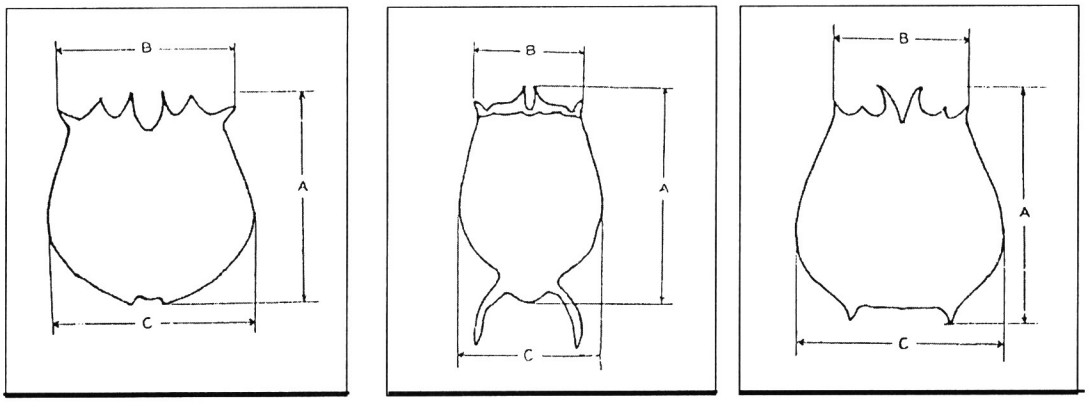

Figure 2. Morphology character of the three species of *Brachionus* spp.

waters only as occasional migrants, whereas a minority are pelagic.

The distribution pattern of the *B. caudatus* and *B. rotundiformis* is very similar, they were found in all locations, sites, and seasons. Distribution of *B. caudatus* was narrow, this species only existed in estuary and coastal water of east coast. This result correspond with Preissler (1977, 1980) who found that horizontal distribution pattern of rotifer is species dependent. He reported that some rotifers avoid inshore waters, while others are attracted to it, and related this horizontal distributions to the fluctuation of supra-surface ambient light caused by natural shadow of shoreline. This phenomenon may explain the absent of *B. caudatus* in all brackishwater pond of the study area.

The abundance of *Brachionus* rotifers was higher during east monsoon compared to west monsoon in the east coast, and in west coast appears similar. There was no abundance differences between high tide and low tide in all sites.

The results of measurement of some physical and chemical parameters presented in Table 2 show positive correlation betwen the abundance of rotifer and increasing of turbidity, where estuary has higher turbidity rate compare to the other two sites. Conversely, salinity has negative correlation with rotifer abundance, where lowest abundance occurred in coastal waters. Other parameters (temperature, pH, dissolved oxygen, and current velocity) seem have no signivicant correlation with the rotifer abundance.

Results of this study suggest that the pattern of abundance and species composition of the rotifers may not based solely on elevated population growth due to favorable physical and chemical conditions, or to water movements which tend to concentrate animals in certain regions. It is still awaiting future studies to elaborate the impact of the environmental factor gradient on horizontal distribution of rotifers. It is suggested the neccessary of a more elaborate monitoring with

Table 2. Average physical and chemical parameters in study area

	West Monsoon						East Monsoon					
	High T			Low T			High T			Low T		
Manembo	**Pond**	**Estuary**	**Coastal**	**Pond**	**Estuary**	**Coastal**	**Pond**	**Estuary**	**Coastal**	**Pond**	**Estuary**	**Coastal**
Temp.	30,43	29,70	30,30	31,00	29,97	31,50	30,27	31,47	31,23	29,20	28,60	28,83
Salinity	22,67	19,23	31,67	23,03	12,10	31,23	25,13	24,50	32,10	25,33	15,67	32,53
pH	6,47	6,97	6,70	6,40	6,43	6,57	7,77	7,10	6,83	6,80	6,17	7,43
D. Oxigen	6,57	6,23	6,93	6,23	6,37	6,80	6,10	6,53	6,90	6,03	6,47	6,83
Current	0,00	13,33	14,17	0,00	12,33	13,33	0,00	17,33	18,83	0,00	17,67	18,33
Turbidity	81,00	124,33	118,67	80,33	126,00	120,67	99,00	99,00	105,67	99,00	102,33	108,00
Minanga												
Temp.	27,20	28,17	28,13	27,20	26,17	27,20	30,20	29,10	30,17	28,40	28,60	29,23
Salinity	10,73	17,00	30,30	10,63	12,37	30,17	14,40	22,40	31,53	14,83	13,43	31,77
pH	6,37	6,47	6,83	6,33	6,43	6,63	6,67	6,73	6,67	6,17	6,40	6,53
D. Oxigen	6,07	6,33	6,70	5,97	6,67	6,87	5,97	5,97	6,17	5,93	5,87	5,90
Current	0,00	12,17	13,67	0,00	12,50	12,17	0,00	20,33	21,33	0,00	19,50	20,17
Turbidity	99,00	123,00	110,33	102,33	127,33	112,67	89,67	122,67	112,67	89,67	127,67	112,67
Wori												
Temp.	28,43	28,30	30,13	32,27	29,70	31,40	29,40	30,40	31,27	29,87	29,93	30,90
Salinity	15,37	17,43	31,27	15,57	12,67	31,27	19,10	21,93	31,33	20,13	14,47	32,10
pH	6,27	6,47	5,93	5,70	6,27	6,33	6,57	6,00	6,37	5,30	5,90	6,03
D. Oxigen	5,97	6,67	7,07	6,13	6,53	7,07	6,17	6,60	7,17	6,50	6,40	7,00
Current	0,00	13,00	14,17	0,00	12,83	13,33	0,00	13,17	13,17	0,00	11,67	12,67
Turbidity	98,00	122,67	120,00	99,00	128,67	120,67	83,00	115,33	115,00	93,33	115,33	111,00
Tumpaan												
Temp.	28,23	29,50	30,07	28,37	30,07	30,17	29,33	30,17	31,27	30,10	29,83	31,17
Salinity	13,87	15,23	32,00	13,57	10,90	31,90	14,73	19,40	32,83	14,30	12,87	31,27
pH	5,83	6,23	6,77	6,53	5,83	5,73	6,33	6,03	6,73	6,40	6,00	6,53
D. Oxigen	6,10	6,40	6,93	6,03	6,03	6,73	6,30	6,17	6,80	5,87	6,10	6,57
Current	0,00	18,17	20,17	0,00	17,17	18,50	0,00	17,67	18,83	0,00	17,83	17,83
Turbidity	93,67	116,67	100,67	94,33	120,67	103,33	84,67	99,33	98,33	85,67	101,33	98,67

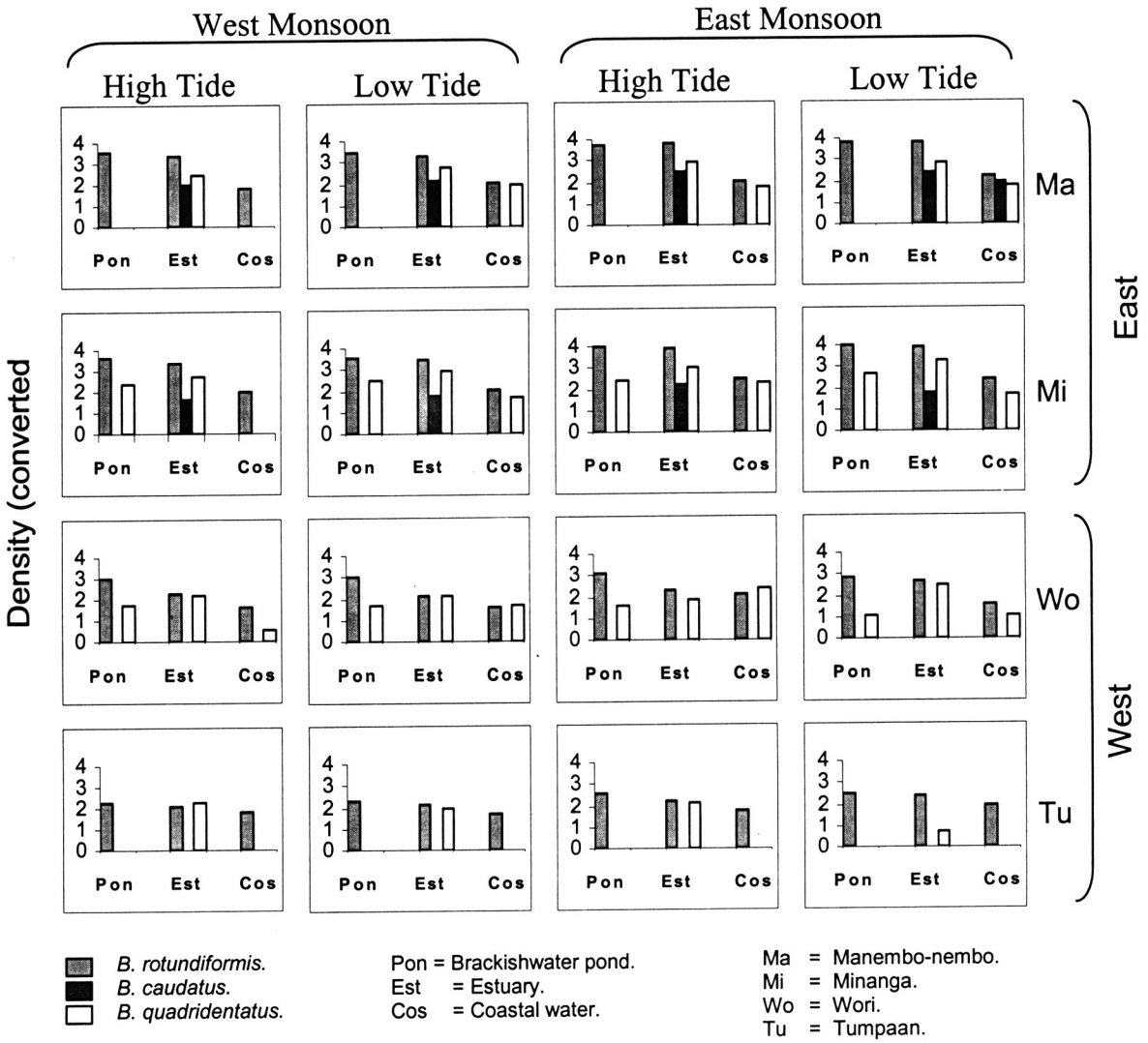

Figure 3. Average density of rotifer in study area

emphasis on the structure of rotifer assemblages in a variety of sites subjected to environmental perturbations, including anthropogenic contaminant inputs.

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