INT. J. BIOL. BIOTECH., 14 (4): 639-643, 2017.

A REPORT ON FREE LIVING MARINE NEMATODES FROM THE AMBRAH CREEK, GHORABARI, THATTA, SINDH

Zakia Khatoon, Mussarrat Akhtar, Razia Sultana and Hanif Ahmad Khan

Food & Marine Resources Research Centre. Pakistan Council of Scientific and Industrial Research Labs. Complex Karachi-75280, Pakistan
e-mail: zakia.khatoon@gmail.com

ABSTACT

This study first time describes the free living marine nematodes present in the bank (sediment) of Ambrah Creek, Ghorabari, Thatta. The nematodes were sorted out from the soil samples during the period of 2003-2005. The results showed 4 orders, 9 families, 9 genera and 10 species of nematodes with various unidentified species. The orders were recognized as Enoplida (45.86%), Chromadorida (17.67%), Monhysterida (11.78%), Plectida (3.13%) whereas 21.55% nematodes remained unidentified. The hydrographic parameters, pH, temperature, salinity and dissolved oxygen were also measured from the creeks water. The combination of fine sand and clay size sediments of Ambrah Creek presented low diversity of free living nematode, while density of the nematode seemed to increase during winter months with respect to low temperature and high salinity.

Key words: Free-living marine nematodes, Ambrah Creek, Ghorabari, Thatta, Sindh

INTRODUCTION

In aquatic environments the free living nematodes are most diverse, but remained relatively unstudied (Heip *et al*., 1985). They are small in size but play a significant part in the diet of many aquatic organisms (Gee, 1989), and in turn facilitate the mineralization of organic matter (Riera and Hubas, 2003). Nematodes depend on the water films around soil or organic material and move within existing pathways of soil pores of 25 to 100 µm diameter (Neher, 2010). Besides an important group of meiofauna, until now very little work has been carried out on the aquatic nematodes present near the coastal zones of Pakistan . In Pakistan Maqbool and Kazi (2000) described the distribution of free living nematodes from various coastal localities of Sindh and Balochistan. Their occurrence in Ambrah Creek, Ghorabari has not been reported until now. The purpose of the study is to investigate the existence of free living nematodes in the Ambrah Creek area and to find out the hydrographic effect on their abundance.

MATERIALS AND METHODS

The study area is located along the Ambrah Creek (Lat. 24° 23' 38.81" N: Long. 67° 49' 33.31" E), Ghorabari, District Thatta, situated at the Southeast of Karachi, Pakistan. Ambrah Creek is a tidal creek and linked with network of creeks in the Indus Delta, it is connected at the East-Western end to the Mithri and Richhal Creeks and located at a distance of approximately 5 km from Garho Town and about 114 km away from Karachi city. The freshwater channels that discharge into the Ambrah Creek are the Ghorari and Sakro Drains and Kherro Nala (Fig. 1). The present study was conducted under a PSDP (Public Sector Development Program) project on *Artemia* culture funded by Ministry of Science and Technology, Pakistan (Sultana, 2007).

The sampling was carried out during three years (2003-2005). Soil (sediment) samples were collected (during 12:00 to 3:00 pm) in triplicates along the bank of Ambrah Creek by using cylindrical core having 2.4 cm internal diameter and 5 cm in length. The auger was pushed into the plastic bags and stored in ice bags; creek water was also stored for washing these samples. At the sampling time the physical parameters, like atmospheric and water temperature (^{0}C) was recorded by using standard centigrade hand thermometer; salinity (‰) of the water was estimated with the help of ATAGO refractometer; pH was measured by PICCOLO-1290 hand pH meter; for dissolved oxygen (mg/L) creek water was fixed in glass bottles and later estimated in lab by Winkler's method. The soil samples were brought to the lab, suspended into 3 liters of creek water and churned vigorously, the water was passed through 62 µm mesh net. The collected nematodes were sedated by gentle heat and fixed in 4% formalin solution. The preserved organisms were processed according to Hopper (1986). Nematodes were enumerated, identified up to species level and kept in 2% glycerin; later they were transferred in anhydrous glycerin and mounted on glass slides with ZUT cement seal.

RESULTS AND DISCUSSION

During the study period, the atmospheric temperature varied from 23 to 34°C. Minimum (23°C) was recorded during the winter monsoon (December 2003 & 2005) and maximum (34°C) during the transitional period (October 2003). The surface water temperature correspond to the atmospheric ones, lowest value (19°C) was recorded during monsoon (January 2005) and highest value (32°C) during transitional period (October 2003). Salinity varied from 4 to 21 ppt; Minimum (4 ppt) value was recorded during the summer monsoon (June and August 2005) and the maximum (21 ppt) during winter monsoon (December 2004). The DO fluctuated from 3.3 to 8.5 mg/L. The lower value (3.3 mg/L) was estimated during transitional period (October 2003) and higher value (8.5 mg/l) was estimated during winter monsoon (December 2004); water pH varied from 7.5 to 8.5, the minimum (7.5) was recorded during winter monsoon (November 2005) and the maximum (8.5) was recorded both during winter and summer monsoon (December 2003 and September 2005). The hydrographic parameters recorded are given in the Table 1.

Fig. 1. Map of study area, Ghorabari, located at Thatta, Sindh, Pakistan.

The results showed that a total of 4 orders, 9 families, 9 genera and 10 species of Nematoda were recorded from the Ambrah Creek, Ghorabari, Thatta, Pakistan. The order Enoplida constituted about 45.86% includes 5 families Anoplostomatidae, Enoplidae, Oncholaimidae, Oxystominidae and Leptosomatidae; 5 genera and 6 species; the Order Chromadorida constituted about 17.67% includes 2 families Microlaimidae and Ethmolaimidae with 2 genera and species; the Order Monhysterida constituted 11.78% and occupy single family Monhysteridae with one genus

and species; the Order Plectida constituted 3.13% and represented one family Plectidae with one genus and species; whereas 21.55% nematodes were unidentified. The highest number of nematodes occurred in the winter months (∑322; mean 64.4;.n=5) than in the summer months (∑409; mean 58.42;.n=7) The total list of nematodes recorded is given in the Table 2.

Table 1. Physico-chemical parameters of Ambrah Creek, Ghorabari during the period of 2003-2005.

Months	Temperature ^{0}C (Atmosphere)	Water	Salinity ‰	pH	Dissolve Oxygen mg/L	Time
30-10-2003	34	32	12	8.0	3.3	1.30 pm
18-12-2003	23	20	20	8.5	5.0	1.30 pm
28-07-2004	33	31	10	8.2	5.7	1.0 pm
04-12-2004	26	23	21	8.0	8.5	3.00 pm
03-01-2005	24	19	15	8.0	8.4	2.00 pm
12-06-2005	33	31	4	8.0	6.5	3.00 pm
18-06-2005	33	31	9	8.0	5.8	12.00 pm
16-07-2005	31	30	5	8.0	5.7	1.00 pm
27-07-2005	31	29	5	8.3	4.5	1.30 pm
07-08-2005	30	28	4	7.7	6.2	1.20 pm
29-09-2005	32	30	5	8.5	6.8	3.00 pm
18-11-2005	27	25	15	7.5	5.5	2.30 pm
12-12-2005	23	20	13	8.0	4.8	12.30 pm

Earlier, some studies were carried out in Ghorabari district Thatta to determine their soil physico-chemical properties. According to Sultana *et al*. (2011, 2012) the soil of Ambrah Creek is compact, fine grain, range between fine sand and clay size fractions. The water turbidity high and area is without mangrove plantation. The results of Chohan *et al*. (2015) showed that soil of Ghorabari is heavy in texture, moderately saline, highly alkaline, highly calcareous in nature, and low in organic matter; as well as poor in total nitrogen, deficient in available phosphorus while exchangeable potassium is adequate. Clay correlated negatively with P and K and positively with N, while sand correlated positively with K. The soil pH is correlated negatively with P and K. Organic matter correlated significantly with N, P and K. Heokstra *et al*. (1997) climatically regarded the Ghorabari area as subtropical maritime desert and classify it into two distinct seasons; summer (March – June) and winter (November to February). Further the annual rainfall is sometimes heavy and otherwise low during the monsoon season. Winds blow from the west during March to October and from north-east during November to January. During peak monsoon season, wind speed rises to an average of 8 knots.

According to the Venice System of salinity classification the Ambrah Creek is more inclined to Mesohaline characteristics (5-18 ‰ saltity). The salinity of the interstitial water in this area makes it quite peculiar and interesting. Some of the studies point out various ecologicals as well as hydrographical factors related to the abundance and distribution of free living nematode population (Warwick, 1971; Heip *et al*., 1985; Zaki *et al.*, 2012). Soetaert *et al*. (1995) suggested that in microtidal estuarine environment the species composition of free living nematode is a function of salinity and the sand grain size. Hodda (1990) attributed the variations of nematode fauna more related to DO penetration, organic content and grain size composition. According to Kapusta *et al*. (2006) the interaction of salinity, hydrostatics, availability of food and temperature influenced the community structure of nematodes.

Table 2. List of free-living marine nematodes collected from the Ambrah Creek, Ghorabari during the period of 2003-2005.

	30-10-2003	18-12-2003	28-07-2004	04-12-2004	03-01-2005	12-06-2005	18-06-2005	16-07-2005	27-07-2005	07-08-2005	29-09-2005	18-11-2005	12-12-2005	Total
Order Enoplida														
Family Anoplostomatidae														
Anoplostoma sunderbanae Timm, 1967	2	4	2	4	5	Nil	5	10	6	Nil	6	3	8	**55**
Family Enoplidae														
Enoplolaimus karachiensis Maqbool, Nasira & Turpeenniemi, 1999	Nil	2	Nil	5	Nil	4	5	Nil	3	7	4	Nil	4	**34**
Family Oncholaimidae														
Oncholaimus oxyuris Ditlevsen 1911	5	8	6	11	10	2	Nil	4	6	10	Nil	5	12	**79**
Family Oxystominidae														
Oxystomina elongata Butschli, 1874	7	9	5	8	Nil	7	2	4	6	4	2	Nil	3	**57**
Oxystomina tenuis Thorne, 1939	Nil	3	4	7	1	Nil	4	2	Nil	6	14	12	Nil	**53**
Family Leptosomatidae														
Orhophallonema ranjhai Bongers, 1983	8	10	5	11	3	2	6	15	7	4	7	4	6	**88**
Order Chromadorida														
Family Microlaimidae														
Microlaimus amphidius Kamran, Nasira & Shahina, 2009	14	13	6	Nil	5	7	6	Nil	8	2	11	5	7	**84**
Family Ethmolaimidae														
Paraethmolaimus appendixocaudatus Jensen, 1994	7	4	2	3	5	Nil	Nil	4	11	9	2	6	4	**57**
Order Monhysterida														
Family Monhysteridae														
Monhystrella gracilis Kherra, 1966	12	5	9	2	7	4	Nil	6	4	10	5	13	17	**94**
Order Plectida														
Family Plectidae														
Wilsonema promissum Khan, Seema & Khan, 1990	Nil	2	3	Nil	4	2	2	Nil	Nil	3	5	Nil	4	**25**
Unidentified species	12	7	15	4	16	11	9	17	15	21	14	13	18	**172**
	67	**67**	**57**	**55**	**56**	**39**	**39**	**62**	**66**	**76**	**70**	**61**	**83**	**798**

Another study revealed that population of nematodes in intertidal mud is highest at the surface (1 cm) and decreased in densities as the depth of mud increased to 5 cm (Rees, 1940). More conclusions described that physical factors (temperature, grain size, salinity, in frequent tidal inundation limiting dispersal) accounted for the free living nematode population rather than biological variables (Alongi, 1990). Subtidal nematode community along salinity gradient was investigated by Adão *et al*. (2009), their findings show that diversity of nematodes is reaches to a peak in polyhaline to Mesohaline and decline in the Mesohaline to oligohaline zones. The present study revealed that the diversity of free living nematode is generally low in fine sand and clay size sediments of Ambrah Creek. The effect of low temperature and high salinity during winter months showed increase of nematode density, as was observed by Anbuchezhian *et al*., (2010) in Palk Bay, Southeast Coast of India.

It is suggested to investigate this area in more detail to figure out the distribution and composition of free living aquatic nematodes. This preliminary study helps to explore the hidden treasure of this meiofaunal diversity in Ambrah Creek, Ghorabari, Sindh.

REFERENCES

Adão, H., A.S. Alves, J. Patricio, J.M. Neto, M.J. Costa and J.C. Marques (2009). Spatial distribution of Subtidal nematode communities along the salinity gradient in southern European estuaries. *Acta Oecologica*, 35: 287-300.

Alongi, D.M. (1990). Community dynamics of free-living nematodes in some tropical mangroves and sandflats habitats. *Bull. Mar. Sci*., 40: 358-373.

Anbuchezhian, R., S. Ravichandran, J. S. Serebiah and C. Ramprabu (2010). Composition and Seasonal Fluctuations of Nematodes in Palk Bay, Southeast Coast of India. *Middle-East J.Sci.Res*., 6: 189-197.

Chohan, M., R.N. Panhwar, M.I. Mastoi, N. Gujar, A.H. Mari and M.A. Gadehi (2015). Relationship of physico-chemical properties and macronutrients indexing at soils of Ghorabari area, district Thatta, Sindh, Pakistan. *Soil Environ*., 34(1): 9-14.

Gee, J.M. (1989). An ecological and economic review of meiofauna as food for fish. *Zool. J. Linnean Soc*., 96: 243-261.

Heokstra, D.A., N. Mahmood., G.R. Shah, W.A. Shah., M.A. Domki and Q.M. Ali (1997). Diagnostic study – Indus delta mangrove ecosystem, main sub-system characteristics, problems, potentials, proposed interventions and pilot sites, Subproject, RRIDM (World Bank/GoS funded). 76 pp.

Heip, C., M. Vincx and G. Vranken (1985). The Ecology of Marine Nematodes. *Oceanogr. Mar.Biol.Ann.Res*., 23: 399-489.

Hodda, M. (1990). Variation in estuarine littoral nematode population over three spatial scales. *Est.Coast.Shelf Sci*., 30: 325-340.

Hooper, D.J. (1986). *Handling, fixing, staining and mounting nematodes. In*: *Laboratory methods for work with plant and soil nematodes* (Ed.: Southy, E.D.), pp. 59-80 pp, HMSO, London.

Kapusta, S.C., N.L. Wurdig, C.E. Bemvenuti and T.K. Pinto (2006). Spatial and temporal distribution of nematodes in a subtropical estuary. *Acta Limnol. Bras*., 18: 133-144.

Maqbool, M.A. and N. Kazi (2000). *Systematic and Distribution, Free-Living Marine Nematode Fauna of Pakistan*. National Nematological Research Centre, University of Karachi, Pakistan. 90 pp.

Neher, D.A. (2010). Ecology of plant – free living nematodes in natural and agricultural soil. *Ann.Rev.Phytopath*., 48: 371-394.

Rees, C.B. (1940). A preliminary study of the ecology of a mud flat. *J.Mar.Biol.Assoc. UK*, 24: 185-210.

Riera, P. and C. Hubas (2003). Trophic ecology of nematodes from various microhabitats of the Roscoff Aber Bay (France): Importance of stranded microalgae evidenced through δ13C and δ15N. *Mar.Ecol.Prog.Ser*., 260: 151-156.

Soetaert, K., M. Vinck, J. Wittoeck and M. Tulkens (1995). Meiobanthic distribution and nematode community structure in five European estuaries. *Hydrobiol.*, 311: 185-206.

Sultana, R. (2007). *Production of Artemia cyst, biomass and its products*. Tech.Rep. PSDP project. Food and Marine Resources Research Center, PCSIR Laboratories Complex, Karachi. 190 pp.

Sultana, R., Q.B. Kazmi, M. Nasir, F. Amir, W. Ali, and N.V. Shadrin (2011). *Indomysis annandalei* W. Tattersall, 1914 (Mysidacea: Mysidae) from Pakistan coastal waters - extremely eurythermal and euryhaline opossum shrimp. *Mar.Ecolol.J.*, 10: 57-66.

Sultana, R., W. Ali, F. Ameer, A.B. Munshi and M. Nasir (2012). Accumulation of pesticide residues by shrimp, fish and brine shrimp during pond culture at Ghorabari (District Thatta). *J.Chem.Soc. Pak.*, 3: 541-549.

Warwick, R.M. (1971). Nematode associations in the Exe Estuary. *J.Mar.Biol.Assoc. UK*, 51: 439-454.

Zaki, M. J., D. Khan and M. Abid (2012). Nematodes in the saline environment: A mini overview. *Int. J. Biol. Biotech.*, 9 (1-2): 99-113.

(*Accepted for publication March 2017*)