Applied Fisheries & Aquaculture 2002Vol. II(1):47-50

Studies on the Effect of Shrimp Farming on Adjacent Agricultural Land and Underground Water in Cuddalore District of Tamil Nadu

B.P. Gupta, K. K. Krishnani, K. O. Joseph, M. Muralidhar, A. Nagavel & V. Parimala
Central Institute of Brackishwater Aquaculture
75 Santhome High Road
Chennai- 600 034(TN) India

Abstract

In order to assess the soil and drinking water salinisation due to shrimp farming, if any, a survey was conducted in coastal areas of Cuddalore District of Tamil Nadu during October 1999 to March 2000. In Kandakkadu village, EC of soil ranged from 0.01 to 1.6 dSm^{-1} and the bore well contained chlorides and total dissolved solids (TDS) in the range of 168 to 322 mg l^{-1} and 301 to 522 mg l^{-1} respectively. In Parangipettai village, EC of soil ranged from 0.12 to 0.94dS m^{-1} and the bore well water contained chlorides and TDS in the range of 412 to 630 mg l^{-1} and 1300 to 1645mg l^{-1} respectively.

Key words: shrimp aquaculture; soil salinity

Introduction

Salinisation of soil and drinking water is one of the major concern of the environmentalists. Aquaculture merges and interacts with the environment. It utilise the resources and may cause slight environmental changes. Many reviews lead one to conclude that aquaculture had both positive and negative impacts and some of these occasional negative impacts – soil salinisation (Phillip *et al.*, 1993; *Csavas*, 1993; Newport & Jawahar, 1995) and drinking water salinisation (Lee & Wickins, 1992; Csavas, 1994) have received wide publicity. Many times the range and severity of this adverse effects have been exaggerated, possibly due to the high visibility of the aquaculture sector, failure to distinguish between actual and hypothetical hazards and inadequate coverage of its beneficial impact (Jerald, 1996). It is therefore essential to conduct studies on the soil and drinking water salinisation in villages nearer to shrimp aquaculture areas.

The present study was conducted in coastal areas of Cuddalore district of Tamilnadu (India) during October to March 2000.

Materials & Methods

The study area included adjoining lands of shrimp farms in Cuddalore district. Two villages namely Kandakkadu and Parangipettai were selected, where two different crops, onion and paddy were being grown respectively. In both the villages shrimp farms drew water from nearby brackishwater creek/estuary and discharged the effluent of shrimp farm back into the creek/estuary. Soil samples were collected from village adjoining lands away from the farms at a distance of 0, 50, 100, 250 and 500 meters. The soil samples were dried, powdered and analysed for electric conductivity (1: 25 soil: water ratio) following the method given by Richards (1968). Water samples were collected from bore wells situated in the agricultural field nearer to the shrimp farm in villages. Water samples were also analysed for measurement of pH, chloride content

and TDS as per standard procedures of APHA (1989).

Results & Discussion

The pH and electrical conductivity of soil samples and pH, chloride contents and TDS in drinking water samples from adjoining lands from shrimp farms of Cuddalore district are presented in Table 1 -4. In both the villages, there is absolutely no salinisation of soil as indicated by the low electrical conductivity values. In Kandakkadu village, where onion was being grown, EC ranged from 0.01 to 0.16 dS m^{-1} and soils are slightly acidic to alkaline (pH 5.6 to 8.2) in reaction. In this village, the bore well water is slightly alkaline in reaction (pH 5.6 to 8.1) and contained chlorides and TDS in the range of 168 to 322 mg l^{-1} and 522 mg l^{-1} respectively.

In Perrangipettai village where paddy was being grown, EC was in the range of 0.12 to 0.94 dSm^{-1} and solids are highly alkaline (pH 7.5 to 9.5). In this village, bore well water was neutral to slightly alkaline in nature (pH 7.2 to 7.5) and contained chlorides and TDS in the range of 412 to 630 mg l^{-1} and 1300 to 1645 mg l^{-1} respectively.

Considering the permissible levels of chloride (200 and 600 mgl^{-1}) and TDS (500 to 1500 mgl^{-1}), both parameters were within the normal range in Kandakkadu village where onion crop is done and in Perrangipettai village where paddy crop is dominant. Chlorides and TDS were slightly higher than the permissible level. However, in both villages, water was potable.

Table1. Soil salinization study in agricultural field nearer to shrimp farm at Kanadakkadu

Distance from farm (m)	Depth of sampling (cm)	Electrical conductivity (dS m^{-1})					pH				
		Oct	Nov	Dec	Feb	Mar	Oct	Nov	Dec	Feb	Mar
0	0	0.02	0.02	0.02	0.05	0.05	5.8	6.1	6.4	7.2	6.8
	50	0.02	0.02	0.03	0.03	1.12	6.1	5.7	5.6	7.5	6.9
	100	0.02	0.03	0.06	0.05	0.04	6.0	5.6	7.3	7.6	7.1
50	0	0.02	0.03	0.02	0.02	0.04	5.9	6.8	6.4	5.6	5.8
	50	0.01	0.03	0.04	0.01	0.04	6.2	7.7	6.4	6.0	5.9
	100	0.02	0.03	0.05	0.01	0.04	6.2	7.8	7.4	7.0	5.8
100	0	0.05	0.02	0.04	0.09	0.08	6.4	5.9	6.9	6.7	6.3
	50	0.02	0.02	0.03	0.07	0.05	6.0	6.1	6.4	6.9	6.5
	100	0.02	0.02	0.03	0.06	0.05	6.2	6.0	6.6	6.7	6.6
250	0	0.04	0.03	0.05	0.09	0.10	6.5	6.2	6.4	5.9	7.7
	50	0.03	0.03	0.03	0.10	0.07	6.9	6.3	7.2	6.1	8.2
	100	0.03	0.02	0.04	0.16	0.12	6.1	6.0	7.0	6.5	7.8
500	0	0.07	0.03	0.07	0.10	0.10	7.6	7.6	7.3	7.0	7.4
	50	0.03	0.06	0.07	0.08	0.09	7.8	7.7	7.6	7.2	6.8
	100	0.04	0.06	0.06	0.08	0.12	7.7	7.8	7.6	7.3	6.8

Parameters	Agricultural field borewell					
	October	November	December	January	February	March
pH	7.8	7.3	7.8	7.9	7.9	8.1
Chloride (ppm)	266	273	322	280	266	168
TDS (ppm)	499	448	522	494	490	301

Table 2 Water quality of bore wells in agricultural field nearby shrimp farm at Kandakkadu

Distance from farm(Meter)	Depth of sampling(cm)	Electrical conductivity (dSm^{-1})					pH				
		Oct.	Dec.	Jan.	Feb.	March	Oct.	Dec.	Jan.	Feb.	March
0	0	0.28	0.20	0.12	0.50	0.50	9.5	8.7	8.7	7.9	8.8
	50	0.31	0.16	0.15	0.44	0.53	9.5	8.6	8.8	8.5	8.8
	100	0.37	0.35	0.38	0.45	0.49	9.2	8.6	8.7	8.3	9.1
50	0	0.37	0.41	0.16	0.51	0.53	8.5	8.7	8.9	8.4	8.3
	50	0.27	0.18	0.12	0.84	0.89	8.4	8.5	9.2	8.7	8.5
	100	0.36	0.25	0.16	0.92	0.94	8.5	7.5	8.9	8.8	8.6
100	0	0.19	0.45	0.27	0.57	0.27	9.1	8.7	8.4	8.1	8.8
	50	0.22	0.25	0.26	0.66	0.20	9.0	9.0	8.5	8.0	8.7
	100	0.16	0.16	0.25	0.34	0.19	8.4	8.9	8.6	8.3	8.2
250	0	0.35	0.35	0.43	0.41	0.38	8.7	8.3	8.6	8.3	8.2
	50	0.34	0.33	0.37	0.41	0.45	8.9	8.4	8.5	8.5	8.3
	100	0.39	0.31	0.46	0.36	0.38	8.6	8.4	8.5	8.7	8.2
500	0	0.45	0.26	0.18	0.36	0.26	8.7	8.2	8.7	8.3	8.7
	50	0.40	0.32	0.30	0.38	0.19	8.9	8.6	8.8	8.4	8.4
	100	0.32	0.41	0.31	0.38	0.23	8.9	8.6	8.3	8.5	9.0

Table 3. Soil salination study in agricultural field nearer to shrimp farm at Parangipettai

Parameter	Agricultural field borewell					
	October	November	December	January	February	March
pH	7.4	7.3	7.2	7.2	7.3	7.5
Chloride(mgl^{-1})	615	510	432	412	630	490
Total Dissolved Solids (mgl^{-1})	1606	1376	1298	1098	1645	1300

Table 4. Water quality of borewell in agricultural field nearby shrimp farm at Parangipettai

In the present study area of coastal aqua farms at Tamil Nadu, there was no salinization of soil in agricultural fields even adjacent to shrimp farms. There was no drinking water salinisation in one village as evidenced from the low value of TDS and chlorides throughout the study period and water was potable. In another village, TDS and chlorides were slightly higher than permissible limits. Drinking water salinization cannot be attributed to shrimp farm as these farms mostly remain in hard clayey soil and seepage is almost nil or in its minimum percentage. Furthermore, the salinization of ground water in coastal villages is known to occur much before the initiation of shrimp farming. The charges that large aquaculture units render adjoining farmlands unfit for cultivation as the brackish water seeps in and contaminates the adjoining lands is baseless. Shrimp farming has been targeted as the root cause for salinization which can't be true in all the circumstances. Shrimp farms are located in already salinated areas, which is not suitable for agriculture and all fresh water areas where agriculture is practiced are not conducive for shrimp culture.

Acknowledgements

Authors are grateful to Dr. G.R.M. Rao, former Director, Central Institute of Brackishwater Aquaculture, Chennai for his encouragement and facilities provided.

References

APHA. 1989. Standard methods for the examination of water and waste water. 15th ed. American Public Health Association. Washington, USA.

Csavas, I. 1993. Perspectives and critical success factors in shrimp farming. Paper presented at World Aquaculture, 1993, Torremolians, Spain.

Csavas, I. 1994. Important aspects in the success of shrimp farming. World Aquaculture 25(1): 34-56.

Lee, D' OC and J.F. Wickins 1992. Crustacean Farming Blackwell Scientific Publications, Oxford, 392p.

Jerald, I.J.A.1996. Aquaculture Pollution: A fallacy. Fishing Chimes, 16(3): 19-20.

Newport, J.K & G.G.P. Jawahar 1995. Brackishwater shrimp farming Culture; Impact on Eco-environment and Socio-economic aspects of rural fisher folk. Fishing Chimes, 15(5): 15-16.

Phillips, M.J., C.K. Lin, & Beveridge 1993. Shrimp culture and environment; Lessons from the most rapidly expanding warm water aquaculture sector, 171-197. In: R.S.V. Pullin, H. Rosenthal and J.L. Maclean (eds,), Environment and aquaculture in developing countries. ICLARM Conference Proc,, 36, 359 pp.

Richards, L.A. 1968. Diagnoses and improvement of saline and alkali soils. USDA Hand Book No. 60, Oxford and IBH Publishers, New Delhi. 159 pp.