ABOUT THE BOOK

The present book entitled 'Environment and Ecology' comprises chapters by well known experts and research workers in their respective fields. With its application oriented and interdisciplinary approach, we hope that the students, teachers, researchers, scientists, policy makers and environmental lawyers in India and abroad will find this volume much more useful.

ABOUT THE AUTHORS

Dr. C.M. Bharambe is working as an Associate Professor in the Department of Zoology, Vidnyan Mahavidyalaya, Malkapur (Maharashtra). He has 27 years experience as an outstanding teacher and researcher He Has Published 5 books from reputed publishers. He is an excellent personality development and academic trainer for students in higher education and adhyatmic trainer at Shri Ramakrishna Mission, India.

Dr. Bharambe has chaired a number of sessions of various conferences and seminars. He has been invited to different colleges/institution to deliver lectures on different topics in the field of bioremediation and personality development.

Dr. V.B. Sakhare is Head and Associate Professor, Post Graduate Department of Zoology, Yogeshwari Mahavidyalaya, Ambajogai. He has 21 years' experience as an outstanding teacher and researcher. He has done pioneering work in the field of Reservoir Fisheries and Limnology. Dr.Sakhare has successfully organized National Seminar on Changing Perspectives in Inland Fisheries (CPIF-2018),Workshop on Culture and Breeding of Ornamental fishes (CBOF-2017), National Workshop on Techniques of Scientific Writing (TSW-2014) National Conference on Emerging Trends in Fisheries and Aquaculture (ETFA-2012), National Conference on Current Perspectives in Limnology (NCCPL-2009) and Regional Workshop on Water Quality Assessment (Implications in Potability, Productivity and Pollution control).

Dr. Sakhare has authored/edited more than 30 books. He is a recognized post graduate teacher and research guide of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad and Solapur University, Solapur. Under his guidance three students have completed Ph.D. He has published more than 55 research articles and reviews in peer reviewed journals.

Dr. A.D. Chalak is working as Assistant Professor in Department of Zoology at Kai. Shankarrao Gutte Mahavidyalaya, Dharmapuri, Maharashtra. She obtained her Ph.D. from Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. She has more than five years teaching and research experience. Dr. Chalak is also working as Associate Editor of an international journal 'Ecology and Fisheries' (ISSN 0974-6323). She has published more than 15 research papers and one book.

R.P PUBLICATIONS
[illegible]

₹995/-

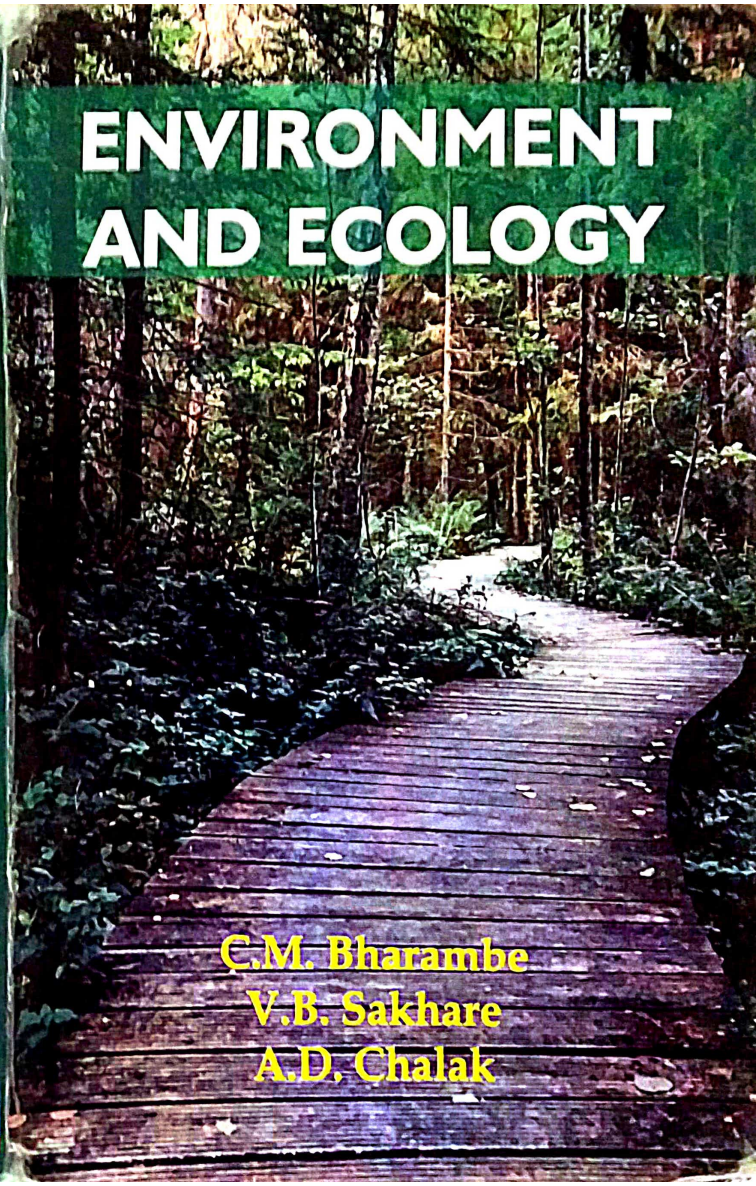
ISBN 978-93-82398-85-1

Environment and Ecology

C.M. Bharambe • V.B. Sakhare
A.D. Chalak

RP PUBLICATIONS

ENVIRONMENT AND ECOLOGY



C.M. Bharambe
V.B. Sakhare
A.D. Chalak

Chapter–6

Biochemical Variations of Lipid Contents in Freshwater Bivalves, *L.Corrianus* and *L. Marginalis* from Different Habitats

–S. D. Gulbhile

Abstract

Freshwater bivalves, *Lamellidens corrianus* and *Lamellidens marginalis* were collected from different localities and habitats of Marathwada region. Their gonads were screened for the determination of the sex by taking the smear from different regions and the data was prepared to study the sex composition. *Lamellidens corrianus* and *Lamellidens marginalis* after screening for the sex showed males, females and few hermaphrodites. Variations in the food value with respect to lipid contents among various sexes from lentic and lotic environment were studied from dry powders of gonads and whole body by estimating lipid contents using the method of Barnes and Blackstock (1973). The results are given and discussed in the paper.

Department of Zoology, Vaishnavi Mahavidyalaya, Wadwani-431144

Key words: *Lipid, Lamellidens marginalis, Lamellidens corrianus, lentic, lotic.*

Introduction

The unlimited aim of living organism is reproduction and hence maximum biochemicals are channelised to gonads as per the stage of reproduction. Some biochemicals are utilized for growth and some for respiration to produce energy for metabolic and vital activities. Excess of absorbed food materials are deposited in tissues which are utilized during scarcity of food or high demand of energy. It therefore reflects on the biochemical composition of different parts of organism. Many of the molluscs being the source of food to man are studied in respect to their seasonal biochemical changes.

Among various classes of molluscs the nature of reserve food material is variable. One can therefore classify molluscs depending on the type of stored material. Lamellibranches may be considered to be polysaccharide oriented (Martin and Goddard, 1966) and amphineurons lipid oriented (Giese, 1966) while cephalopods do not preferentially accumulate nutrients (Chaige, 1933; Giese, 1959).

Mudkhede (1974) studied seasonal changes in whole body of *Corbicula reticularis*. Jadhav and Lomte (1982) and Mule (1988) made extensive work on seasonal variations in biochemical composition of different organs of *Lamellidens corrianus*. Bayne and Thompson (1970) determined biochemical composition of mantle, gonad (germinal) and non mental (somatic) tissues of *Mytilus edulis* where mantle serve as a storage site of nutrients as well as for gamete production. Wenne and Styczynska (1987) studied biochemical composition of *Macoma balthica* while Polak *et al* (1987) made seasonal estimation of lipids in it.

Materials and Methods

Lamellidens corrianus and *Lamellidens marginalis* were brought from different localities as per their availability to the

laboratory during the first week of each month. November 2004 to October 2005, *L. corrianus*, and *L. marginalis* and were screened for sex composition. Males, females and the hermaphrodites from each locality and habitat were separated. After separation of bivalves, gonads and whole body of each sex of each species were separated and dried at 80°C in the oven. Barnes and Blackstock's method (1973) was used by extracting the lipids in Methanol: Chloroform to estimate the total lipid contents from the dry powders of gonads and whole soft body. The data prepared is given is the table.

Results and Discussion

Monthly changes in lipids content in dry powders of gonad and whole body of *Lamellidens corrianus* and *Lamellidens marginalis* as estimated from November 2004 to October 2005 are listed in table. In *Lamellidens corrianus* average percentage of lipids in the dry powder showed maximum lipids in gonad (27.08 %) as well as minimum in gonad (10.03 %) depending on the maturation stage of gonad while in whole body maximum lipids were (19.85%) and minimum lipid (9.89 %). In *Lamellidens marginalis* average percentage of lipids in the dry powder showed maximum lipids in gonad (23.65 %) as well as minimum in gonad (12.23 %) depending on the maturation stage of gonad while in whole body maximum lipids were (19.46 %) and minimum lipid (9.45 %).

Piretti *et al.*, (1987) made investigation on seasonal variations of sterols and fatty acids in *Venus gallina* and *Scapharce inequivalvis* (Bruguiere). Total lipid contents of *Crassostrea gigas, Mytilus edulis, Ruditapes philippinarum* and *Cerstoderma edule* were estimated by Deslous-Paoli *et al.*, (1988) and of *Macoma balthica* by Wenne and Styczynska (1987) and Polak *et al.*, (1987). Toshima *et al.*, (1988) studied anatomical distribution of sterols and fatty acids in the bivalve, *Mactra chinensis*. A review of lipids in marine invertebrates including bivalves was given by Giese (1966) and Voogt (1983).

Nagabhushanam and Lomte (1972) in *Parreysia corrugate* and Jadhav and Lomte (1982) in *Lamellidens corrianus* found

Table 1: Monthly variations lipid content in gonads and whole soft body of *L. corrianus* and *L. marginalis* with reference to their habitat and sex

Sr. No	Month	Habitat	Sex	*Lamellidens corrianus*		*Lamellidens marginalis*	
				Gonad %	Whole soft body %	Gonad %	Whole soft body %
1	November 2004	Lentic	Male	19.78	15.21	19.74	15.89
			Female	16.15	18.23	21.65	16.25
			Hermaphrodite	17.16	16.25	17.16	12.56
		Lotic	Male	21.32	12.26	18.32	16.23
			Female	20.63	14.56	21.48	17.21
			Hermaphrodite	27.08	12.36	18.98	16.34
2	December 2004	Lentic	Male	20.74	13.69	18.36	16.23
			Female	18.16	15.36	23.65	18.46
			Hermaphrodite	14.16	15.46	19.62	17.97
		Lotic	Male	10.03	11.36	20.03	15.64
			Female	20.61	10.23	20.63	13.14
			Hermaphrodite	22.08	9.891	17.09	14.34
3	January 2005	Lentic	Male	18.74	15.69	18.36	15.65
			Female	15.65	15.36	20.29	14.35
			Hermaphrodite	12.16	12.46	19.96	13.34
		Lotic	Male	18.15	11.26	20.16	18.95
			Female	21.51	12.36	21.89	19.65
			Hermaphrodite	19.93	11.39	19.93	18.47

(Contd...)

Sr. No	Month	Habitat	Sex	*Lamellidens corrianus*		*Lamellidens marginalis*	
				Gonad %	Whole soft body %	Gonad %	Whole soft body %
4	February 2005	Lentic	Male	16.74	16.59	18.96	16.23
			Female	16.65	14.25	21.56	15.32
			Hermaphrodite	11.15	18.93	19.36	14.56
		Lotic	Male	19.74	14.56	19.74	18.23
			Female	22.16	18.96	20.16	18.12
			Hermaphrodite	22.39	16.59	19.39	17.61
5	March 2005	Lentic	Male	21.22	15.46	18.36	19.86
			Female	17.26	17.98	20.25	16.32
			Hermaphrodite	18.39	16.45	18.69	13.56
		Lotic	Male	14.12	14.89	14.13	13.56
			Female	15.89	17.56	15.89	16.54
			Hermaphrodite	13.24	13.65	13.24	15.78
6	April 2005	Lentic	Male	19.57	16.69	17.58	18.45
			Female	22.16	18.68	19.89	16.21
			Hermaphrodite	20.36	15.45	19.65	14.45
		Lotic	Male	15.26	18.69	15.89	14.56
			Female	21.69	16.56	16.98	12.23
			Hermaphrodite	16.58	14.65	13.24	11.23

(Contd...)

Sr. No	Month	Habitat	Sex	*Lamellidens corrianus*		*Lamellidens marginalis*	
				Gonad %	Whole soft body %	Gonad %	Whole soft body %
7	May 2005	Lentic	Male	21.41	19.56	17.36	14.23
			Female	24.36	17.58	20.56	16.56
			Hermaphrodite	22.86	16.45	18.26	14.78
		Lotic	Male	21.19	12.36	17.19	12.23
			Female	22.96	11.98	19.96	9.89
			Hermaphrodite	17.66	13.25	17.66	11.23
8	June 2005	Lentic	Male	21.57	17.89	18.23	18.61
			Female	24.36	16.58	18.36	17.89
			Hermaphrodite	21.25	17.46	16.31	13.21
		Lotic	Male	42.39	13.24	18.39	10.25
			Female	19.44	19.85	15.44	9.45
			Hermaphrodite	20.33	18.75	13.33	11.98
9	July 2005	Lentic	Male	21.83	17.25	14.83	16.14
			Female	18.93	19.45	15.93	13.31
			Hermaphrodite	19.58	18.75	18.58	12.87
		Lotic	Male	21.23	12.36	12.23	12.32
			Female	15.33	15.24	15.33	14.15
			Hermaphrodite	14.61	16.45	13.63	13.45

(Contd...)

Sr. No	Month	Habitat	Sex	*Lamellidens corrianus*		*Lamellidens marginalis*	
				Gonad %	Whole soft body %	Gonad %	Whole soft body %
10	August 2005	Lentic	Male	17.68	18.26	17.69	18.56
			Female	21.23	21.24	11.23	14.25
			Hermaphrodite	19.46	19.45	12.46	14.12
		Lotic	Male	20.86	18.12	13.86	12.24
			Female	19.44	18.45	14.46	14.15
			Hermaphrodite	15.32	14.16	15.33	15.64
11	September 2005	Lentic	Male	17.81	19.45	13.25	17.45
			Female	22.99	14.87	12.99	16.64
			Hermaphrodite	18.76	16.87	16.74	13.45
		Lotic	Male	21.64	18.12	14.89	12.31
			Female	19.56	18.45	16.36	14.61
			Hermaphrodite	15.36	14.16	15.65	6.12
12	October 2005	Lentic	Male	19.31	14.56	14.83	14.26
			Female	18.36	15.46	13.19	13.32
			Hermaphrodite	18.23	17.87	14.76	16.23
		Lotic	Male	19.65	16.12	15.89	15.56
			Female	17.61	17.45	15.36	13.26
			Hermaphrodite	21.56	14.16	15.65	15.46

accumulation of fat in developing gonads. Similarly in *Meretrix meretrix* (Nagabhushanam and Deshamukh, 1974) fat accumulates in developing gonads and reduces during spawning. The seasonal changes in lipid content of *Mytilus edulis*, the lipid level is generally higher in females than the males due to its accumulation in eggs (Lubet and Longcamp, 1969). In the Mediterranean waters, *Mytilus edulis* spawns repeatedly during the spring and early summer, and between each successive period the gonad is reconstituted. The lipid levels fall rapidly after spawning and then increase again as the gametes mature. In the model of summer during non reproductive period, The level of triglycerides and phospholipids remain low (Lubet and Longcamp,1969), where as during winter highe. fat levels occur due to increased lipid reserves in the developing eggs.

Nagabhushanam and Mane (1975) in *Katelysia opima* reported that lipid level of the whole body showed correlation with maturation and spawning of the mussels, increasing to peak level in mature mussels and decreased during spawning . Foot and mantle have low lipid level in *Parreysia corrugata* (Nagabhushanam and Lomte, 1972), high in gonad, highest in gravid and decreased after spawning. Giese *et al.*, (1967) observed relatively stable fat content for most of the year in *Tivela* except the small in gonad where lipid reaches the peak value of mature condition. John (1980) in *Anadara rhombea* found 32.1% to 16.4% lipid in hepatopancreas, 29.8% to 21% lipids in gonad while 20.5% to 17.4% lipids in foot. Nagabhushanam and Deshamukh (1974) in *Meretrix meretrix* found maximum in digestive gland (9.29%), Moderate in foot, gonads and rest of the body (2.0% to 3.5%) while very less in mantle (1.97%) and adductor muscles (1.42%) Jadhav and Lomte (1982) in *Lamellidens corrianus* observed high fat level in gonad (4.61% to 6.74%), Low in mantle (2.23% to 3.62%) and moderate in mid gut gland (3.73% to 5.62%), foot (2.26 to 4.17%), adductor muscles (2.27% to 3.64%) and gill (2.29% to 3.86%).

REFERENCES

Barnes, H. and Blackstok, J. (1973): Estimation of lipids in marine animals and tissues: detailed investigation of the sulpho-phosphovanillin method for total lipids. *J. Expt. Mar. Biol. Ecol.*12(1):103-118.

Bayne B. L. and Thompson R. J.(1970): Some physiological consequences of keeping *Mytilus edulis* in the laboratory. *Hegol. Wiss. Meeresunter*, 20: 526-552.

Chaige, M. (1933): Sur la repartition du glycogene dans les organs de la seiche.*C.R. Soc. Biol. Paris*, 114: 1103-1105.

Deslous-Paoli, J.M., Heral, M., Iousset, M. (1988). Total lipid content and lipid energetic values of bivalve molluscs. *Comp. Biochem. Physiol. B. com.Biochem.*89 (1):51.54.

Giese, A.C. (1959): Comparative Physiology: annual reproductive cycles of marine invertebrates. *An. Rev. Physiol.* 21:547-576.

Giese, A.C. (1966): Lipids in the economy of marine invertebrates. *Physiol.Rev.*, 46:244-298.

Giese, A.C. and Hart M.A. (1967): Seasonal changes in component indices and chemical composition in *Katherina tunicate*. *J. Exp. Mar. Biol. Ecol.*, 1:34-46.

Jadhav, M. L. and Lomte V. S. (1982) : Seasonal variation in biochemical composition of the freshwater bivalve, *Lamellidens corrianus*. *Riv. Idrobiol*, 21: 1-3.

John, G. (1980): Studies on *Andara rhombea* (Born) (Mollusca: Bivalvia: Arcidae) from Porto Nova Coastal water. *Ph. D. Thesis Annamalai university Annamalainagar*.

Lubet, P. and Le Feron de Longcamp, D.(1969): Etude des variations annuelles des constituents lipidiques chez *Mytilus edulis* (L) de la Baie de seine (Calvados). *Comp. Ren. Sean. Soc. Biol.* 163: 1110-1112.

Martin, A. and Goddard, C. (1966): Carbohydrate metabolism in : Physiology of Mollusca" (Eds. Wilbur, K. and Younge, C) *Academic Press, New York, Vol.* 2: 275-308.

Mudkhede, L. M. (1974): Some biological aspects of the clam *Corbicula regularis*. *Ph. D. Thesis, Marathwada University, Aurangabad.*

Muke S. D. (1988): Reproductive physiology of *Lamellibranch* Molluscs from Maharashtra State. *Ph. D. Thesis, Marathwada University, Aurangabad.*

Nagabhushanam, R. and Lomte V. S. (1972): Biochemical composition of the different body components of the fresh water Mussel, *Parreysia corrugata*. *Marath. Univ. J. Sci.*, 11:299-303.

Nagabhushanam, R. and Deshmukh R. S. (1974): Seasonal changes in body component indices and chemical composition in the esturian clam, *Meretix meretix*. *Indian J. Fish.*, 21:531-542.

Nagabhushanam, R. and Mane U. H. (1975): Seasonal variation in the biochemical composition of the clam, *Kateylsia opima*. *Rev. Bio.*, 67: 279-301.

Piretti, M.V., Taioli, F. and Pagliuca, G.(1987): Investigation of the seasonal variation of sterol and fatty acids constituents in the bivalve mollusc *Venus gallina and Scapharca ineqivalvis*. (Bruguiere). *Comp. Biochem. Physiol. B.com. Biochem.* 88(4): 1201-1208.

Polak, Lucyna, Andrezej Jarzebski, Roman Wenne and Leonard Falkowski (1987): Seasonal changes in conditions and lipid composition of the bivalve *Macoma balthica (L)* from the gulf of Gdansk (Southern Baltica) (Poland). *Comp. Biochem. Physiol. B. com. Biochem.* 88(3): 881-886.

Toshima, Shin-Ichi, Akio Kenazawa and Ryuji Shimamoto (1988): Anatomical distributation of steroids and fatty acids in the bivalve, *Mactra chinensis*. *Bull. Jpn. Soc. Sci. Fish.* 54(2): 293-298.

Voogt, P. A. (1983): Lipids: There distribution and metabolism in: the Mollusca (Ed. Hochachka, P.W.), *Academic Press, New York and London, Vol.* 1, 329-370.

Wenne R. and Styczynska-Jurewicz, E. (1987): Gross biochemical composition of the bivalve, *Macoma balthica* from the gulf of Gdansk (Southern Baltica) *Mar. Biol.* (Berl) 96(1): 73-78.