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Senior Scientist

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Department	Fish Nutrition and Physiology Division
Institute/ University	Central Institute of Freshwater Aquaculture (<i>Indian Council of Agricultural Research</i>)
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Tel	
Fax	91 6742465407
Date of Birth	31 October, 1958
Sex	Male

Academic qualification

1.	D.Sc. (2005) in Environmental Sciences from Utkal University, Odisha, India
2.	Aquaculture: Production & Management (1999). From The Hebrew University Israel
3.	Ph.D. (1994) in Zoology from Utkal University, Odisha, India
4.	M.Sc. (1980) in Zoology from Utkal University, Odisha, India

Research Experience	<ul style="list-style-type: none"> <input type="checkbox"/> Worked 30 years in the field of Fish reproduction, endocrinology, breeding, hatchery management, cryopreservation of spermatozoa, Farm made fish feed preparation and demonstration.
Major contribution during professional career	<ul style="list-style-type: none"> <input type="checkbox"/> Multiple breeding of carps through improved brood husbandry <input type="checkbox"/> Modification of eco-carp hatchery (construction & operation) <input type="checkbox"/> Non-stripping breeding of grass carp in eco-carp hatchery by improved brood management <input type="checkbox"/> Mass scale production of common carp seed in eco-carp hatchery <input type="checkbox"/> Cryopreservation of carp spermatozoa in bulk & its utilization for seed production <input type="checkbox"/> Farm made feed development for Indian major carps <input type="checkbox"/> Non-conventional fish feed ingredient identification and incorporation in fish feed
Award/ Recognition	<ul style="list-style-type: none"> <input type="checkbox"/> One-time ICAR special team award on cryopreservation of carp milt (1997) <input type="checkbox"/> Special appreciation for best research team, by CIFA, ICAR (2007) <input type="checkbox"/> Best Division Award, by CIFA, ICAR (2008 and 2011) <input type="checkbox"/> Krushak Bandhu Award for best extension worker by Odisha Krushak Samaj, a Branch of Bharat Krushak Samaj, (2011) <input type="checkbox"/> Krushak Bandhu Team Award for improving livelihood of rural poor by Odisha Krushak Samaj, a Branch of Bharat Krushak Samaj, (2011) <input type="checkbox"/> Best Extension Worker Award, by CIFA-ICAR (2011)
Foreign Assignment	<ul style="list-style-type: none"> <input type="checkbox"/> Israel (1999) : Aquaculture : production and management <input type="checkbox"/> Malaysia (2007) : Genetic improvement of <i>Macrobrachium rogenbergii</i>
Ph.D. Guide and examiner for fisheries courses	<ul style="list-style-type: none"> <input type="checkbox"/> Recognised as Ph.D. guide by Utkal University and CIFE Mumbai <input type="checkbox"/> Three students are awarded with Ph.D. and Three more students yet to submit the thesis <input type="checkbox"/> Recognized examiner for UG and P.G courses of fisheries in Odisha University of Agriculture and Technology; West Bengal University of Animal and Fishery Sciences. Central

	Agricultural University, Agartala and Central Institute of Fisheries Education Mumbai.
Consultancy	<ul style="list-style-type: none"> <input type="checkbox"/> Established 3 carp hatcheries (modified version) of 50 Million spawn production capacity each, financed by FFDA, Orissa <input type="checkbox"/> Extended consultancy to establish two fish farms and carp hatcheries at Darbhanga, Bihar, financed by DRDA, Darbhanga, Bihar
Patent filed/ Granted	<ul style="list-style-type: none"> <input type="checkbox"/> Patent filed (CRYO-CIFA, 'A manually operated low cost handy cryofreezer for gamete cryopreservation) No. 1123/DEL/ 2005 and granted Patent No. 251022 on 16.02.12. (Associated as one of the founder scientist)
Commercialization	<ul style="list-style-type: none"> <input type="checkbox"/> CIFA-CRYO, commercialized to M/S Biotechnika, Bhubaneswar for Rs. 2.51 lakh (2008) (Associated as one of the founder scientist)
Project operated in farmers field to disseminate the proven technology	<p>a) <u>Jayavigyan National Science and Technology Mission 2000-2004: (As co-PI)</u> The project was operated in Kalahandi, Orissa and Vaster, Chhattisgarh where fish polyculture was demonstrated to tribal communities as nutritional security.</p> <p>b) <u>Livelihood project of NAIP 2008- 2012 (As Co-PI)</u> Operating in three tribal district of Orissa, i.e. Keonjhar, Maurbhanj and Sambal pur</p> <p>c) <u>Outreach project in Fish feed 2008-2012 (As Nodal officer)</u> Demonstrated the farm made fish feed preparation, storage and application in farmer's pond of Mayurbhanj, Bhadrakh, Jajpur, Cuttack, Kendrapada, Khurda and Puri districts in Odisha.</p>
National/ international meet/ workshop/ seminar organized	<ul style="list-style-type: none"> <input type="checkbox"/> International Brain Storming Meet on 'Recent Advances in Fish Reproductive Physiology' on 16th August 2011 at CIFA, Bhubaneswar, (Co- organising Secretary) <input type="checkbox"/> National Workshop and Stakeholder Meet on Fish Feed during 1-2 November 2011 at CIFA, Bhubaneswar. (Co-Organising Secretary) <input type="checkbox"/> National Seminar on 'Fish for Billion', 16-17 March 2012 at CIFA, Bhubaneswar (co-convenor).

Mass Media programmes for Orissa Fish Farmers	<ul style="list-style-type: none"> a) Delivered 21 AIR programmes, 14 Doordarshan programmes & 11 GRAMSAT programmes b) Represent CIFA in all rural programme subject committee of All India Radio Cuttack and Rural Advisory Committee of Door Darshna Kendra Bhubaneswar since 2000.
ICAR Nominee for Krishi Vigyan Kendra	<ul style="list-style-type: none"> <input type="checkbox"/> Nominated Member of Scientific Advisory Committee for 4 KVKs under OUAT since 2010
Documentary Film for Farmers	<ul style="list-style-type: none"> <input type="checkbox"/> Two film in Oriya i) Carp culture ii) CIFA: The gateway if Freshwater Aquaculture
Front Line Demonstration of New technology in different states	<ul style="list-style-type: none"> <input type="checkbox"/> Modified hatchery technology in Orissa, Andhra Pradesh, Karnataka, Tamil Nadu, Bihar, Mdhya Pradesh, Uttar Pradesh, Rajasthan and Punjab <input type="checkbox"/> Use of cryo-preserved milt for carp stock improvement in Orissa, Andhra Pradesh, Tamil Nadu, Rajasthan, and Karnataka <input type="checkbox"/> Farm made feed preparation and performance demonstration in carp polyculture
Publications	<ul style="list-style-type: none"> <input type="checkbox"/> Books -3 <input type="checkbox"/> Book chapters -11 <input type="checkbox"/> Book chapter review -2 <input type="checkbox"/> Invited lead paper presentation -8 <input type="checkbox"/> Full length research papers in peer review journals -32 <input type="checkbox"/> Seminar presentation (Research abstracts - 45) <input type="checkbox"/> Extension booklets & pamphlets -18 <input type="checkbox"/> Technical articles-21 <input type="checkbox"/> Popular articles -8

List of Publications

1.	Books	<ol style="list-style-type: none"> 1. Thomas, P.C., S.C. Rath and Kanta Dasmohapatra (2003). BREEDING AND SEED PRODUCTION OF FINFISH AND SHELL FISH, published by Daya Publishers New Delhi.
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		<ol style="list-style-type: none"> 2. Rath S.C. (2001). 'MADHURA JALA MACHHA CHASA' a book in <i>Oriya</i> published by J.M.M.S, Brahmagiri, Puri, Orissa 3. Rath S.C. (2003). 'GAON POKHARIRE MACHHA CHASA' a book in <i>Oriya</i> published by CIFA, Kausalyaganga, Bhubaneswar.
2.	Book Chapters	<ol style="list-style-type: none"> 1. Gupta, S.D. and S.C. Rath, (1997). Himankan bidhi dwara karp shukranu ka parirakhan: in jalkrishi ki naye dishaen. A book in Hindi published by Central Institute of Freshwater Aquaculture (ICAR), Bhubaneswar. pp. 89-96. 2. Gupta, S. D., S.C. Rath, S. Dasgupta, Radheysham and S. K. Singh (1997). Karp bahu prayanan ebam hatchery prabandh. <i>Ibid</i>. pp. 81-88 3. Rath, S.C., S. D. Gupta, S. Dasgupta and K. C. Pani (1998). A case study of recycling of water in carp hatchery at Central Institute of Freshwater Aquaculture. In: Current and Emerging Trends in Aquaculture (Edt.) P. C. Thomas. Daya publisher, New Delhi. pp 102-104. 4. Gupta, S.D., S.C. Rath, S. Dasgupta and K. C. Pani (1998). Effect of total alkalinity of water on carp seed production. In: <i>Ibid</i> pp105-106. 5. Rath, S.C. (1999). Carp Breeding And Hatchery Management: In Aquaculture in Vidarbha, published by Dr. Ppnjabrao deshमुख krishi vidyapitha, Akola, India. pp 136-153. 6. Gupta, S.D. and S.C. Rath (2002). Cryopreservation of carp milt: In fish genetics and biotechnology, ICAR publication 7. Gupta, S.D and S.C. Rath (2005) Carp Breeding And Seed Production: In Hand Book of Fisheries and Aquaculture , ICAR Publication , Pp 248-264 8. Gupta S.D. and S.C. Rath (2008). Induced breeding experiments of an Indian major carp, <i>Labeo rohita</i>, a case study. In Applied Bioinformatics, Statistics and Economics in Fisheries Research, (eds.) A. K. Roy and N. Sarangi, Published by CIFA, Bhubaneswar. pp 121-129. 9. Gupta S.D. and S.C. Rath (2009) Cryopreservation of carp milt in French straw, tarson tubes and visitubes: A step towards preservation in bulk. In Recent Advances in Hormonal Physiology of Fish and shellfish Reproduction.

		<p>Eds. B. N. Singh and A. K. Pandey; Narendra Publishing House, New Delhi. pp 299-303</p> <p>10. S. K. Sarkar and S.C. Rath (2009). Breeding of Indian major carps - An over view: In New frontiers of Zoology Eds B. N. Pandey & P. N. Pandey, Narendra Publishing House New Delhi.</p> <p>11. Mohanty, S. N. S. S. Giri, S.C. Rath and K.N. Mohanta (2011). Nutrition of finfish and shellfishes In: Hand book of Fisheries and Aquaculture eds: Sharma R. P., Verma S.A, Kumar A.T, Pradhan, S., Pati, D and Agrawal, M, an ICAR publication pp 734-761.</p>
<p>3.</p>	<p>Book Chapter Review</p>	<p>1. Rath, S.C. (2003) Updated chapter 9 ‘Fish farm and Hatchery’ of Fish and Fisheries of India V. G. Jhingran, Published by Hindusthan Publishing Corporation New Delhi.</p> <p>2. Gupta S.D. and S.C. Rath (2011) Updated the chapter ‘Carp breeding and seed production’ in Hand Book of Fisheries and Aquaculture an ICAR publication pp. 358-379</p>

<p>Invited Lead Paper Presentation</p>	<p>1. Rath, S.C. and S.K. Sarkar (2003). Captive breeding and seed production of Indian major carps: an overview. U.G.C. Sponsored National Seminar on Aquaculture Biotechnology & Fisheries Extension</p> <p>2. Mohanty S.N. and S.C. Rath 2008 Terrestrial and plant ingredient sources accessibility for aqua feed. Special Symposium on Fish Nutrition, 8th Indian Fisheries Forum Kolkata 22-26 Nov.2008 pp 28-29.</p> <p>3. Rath, S.C. 2009. Present Scenario of Carp Hatchery in India. National Seminar on Aquaculture researches in India – Status and strategies for Future Development held at Utkal University Vanivihar, Bhubaneswar, 26- 27 March pp41-45.</p> <p>4. Joy, K. P and S.C. Rath (2009) Off Season and Multiple Breeding in Carps & New Potential Players in Fish Breeding Indo-French Seminar on Recent Advances in Aquaculture, supported by CEFIPRA/IFCPAR, New Delhi, held at CIFA, Bhubaneswar 30-31 August</p> <p>5. Giri S. S., S. K. Sahoo, S.C. Rath, B. N. Paul, P. V. Rangacharyulu and S. N. Mohanty (2010) Fish nutrition, feeds</p>
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	<p>and feeding with special emphasis to Indian major carps polyculture. A lead paper, Proceeding (I) of 7th Biennial Conference of Animal Nutrition Association pp 96-98.</p> <ol style="list-style-type: none"> 6. Rath, S.C. (2011) Brood management and multiple breeding of carps. International Brainstorming Meet 'Recent advances in Fish reproductive Physiology, at Central Institute of freshwater Aquaculture, Bhubaneswar, 16 August. 7. Rath, S.C. (2011) Freshwater Bio-resources for rural economy. UGC sponsored Statelevel Seminar on 'Use of Bioresources for the Development of rural Economy', 9-10 Dec. at Betanati College, Orissa. 8. Rath, S.C. (2012) On-farm Feeds for Carp Culture. National Workshop on Application of Solid State Fermentation Technology in Aquaculture 29 May, at CIFA, Bhubaneswar
<p>Peer Reviewed Research Papers</p>	<ol style="list-style-type: none"> 1. Rath, S.C. and P. C. Thomas (1990). Histomorphology of hypothalamo-hypophysial stalk and neurohypophysis of a teleost <i>Mystus gulio</i>. <i>J. Zool. Res.</i> 3 (2): 101-105. 2. Rath, S.C. and P. C. Thomas (1991). Functional pituitary cytology of <i>Mystus gulio</i> (Ham.) I. Cells of rostral pars distalis. <i>J Appl. Zool. Res.</i> 2(1): 47-50. 3. Rath, S.C. and P. C. Thomas (1991). A Golgi-Cox study of tancytes in third ventricle of a brackish water teleost, <i>Mystus gulio</i> <i>Vet. Arhiv.</i> 61: 387-393. 4. Gupta, S.D., P. V. G. K. Reddy, E. Natrajan, U. K. Sar, S. K. Sahoo, S.C. Rath and S. Dasgupta (1991). On the second breeding and some aspect of culture of <i>Wallago attu</i> (Boch & Schnelder.) <i>J. Aqua</i> 2: 47-50. 5. Rath, S.C. and P. C. Thomas (1992). Cytophysiology of pars intermedia cells of a teleost, <i>Mystus gulio</i> (Ham.). <i>Ad. Bios.</i> 11 (1): 79-82. 6. Rath, S. C. and P. C. Thomas (1992). Some observations on the Balbiani's vitelline body in the oocytes of a teleost, <i>Mystus gulio</i> (Ham.) <i>J. Zool. Res.</i> 3 (1): 22-25. 7. Rath, S. C. and P. C. Thomas (1992). Functional pituitary cytology of <i>Mystus gulio</i>(Ham) II, Cells of proximal pars distalis. <i>J. Appl. Zool. Res.</i> 3(1):22-25. 8. Thomas, P. C., S.C. Rath and T. L. Murthy (1992). Effect of monocrotophus on superoxide dismutase in heteropneustes fossilis (Bloch). <i>Geobios</i> 19 (1): 25-28.

9. **Rath, S.C.;** and P. C. Thomas (1993). Histomorphology of hypothalamo-hypophysial neurosecretory complex in a brakishwater teleost *Mystus gulio* (Ham.)
Vet. Arhiv. 63:145-154
10. Gupta, S. D; and **S.C. Rath** (1993): Cryogenic preservation of carp milt and its utilization in seed production. Proceeding Third Indian Fisheries Forum. 77-79.
11. Gupta, S. D., P.V.G.K. Reddy, **S.C. Rath**, S. D. Dasgupta and S.K. Sahoo (1994). Induced breeding and larval rearing of Indian catfish *Mystus aor*. *J.Inland Fish Soc.* 52: 51-53.
12. **Rath, S.C.,** S.D. Gupta S. Dasgupta (1995). Common embryonic abnormalities of Indian major carps in indoor hatchery system *J. Aqua. Trop.* 293-299.
13. **Rath, S.C.** (1995) Histomorphology and structural peculiarity of pars intermedia cells of pituitary gland of a brakishwater teleost, *Etroplus suratensis* (Bloch). *Vet. Arhiv.* 66(1):35-41.
14. Gupta, S.D., **S.C. Rath** and S. Dasgupta (1995) Fertilization efficiency of cryopreserved carp spermatozoa over four calendar years at different time intervals after thawing . *Geobios.*22: 208-211.
15. Gupta, S.D., **S.C. Rath**, S. Dasgupta and S. D. Tripathi (1995). A first report on quadruple spawning of *Catla catla* (Ham.). *Vet. Arhiv.* 65(5) 143-148.
16. **Rath, S.C.,** S.K. Mahanty and P.C. Thomas (1996). Effect of thyroxin on the acid phosphatase, catalase and oxygen uptake on the hepatic tissue of *Anabas testudineus*. *J.Aqua.*4 : 9-13
17. Gupta, S.D., P. V. G. K. Reddy, **S.C. Rath**, S. Dasgupta, S. K. Sahoo and U. K. Sar (1998). A note on artificial propagation of a teleost, *Pangasius pangasius* (Ham.). *J. Aqua.* 6 .23-26
18. **Rath, S.C.,** S. D. Gupta and S. Dasgupta (1999). Non-Stripping induced spawning and deouble spawning of grass carp in a hatchery system with foliage free diet. *Vet. Arhiv.* 69 (1) 7-15
19. Mohanty, S. K., **S.C. Rath** and P.C. Thomas (2000). Effect of thyroxin on acid phosphatase and alkaline phosphatase of ovary in a teleost *Anabas testidunius*. *J. Asian Zool. Res.*33-36
20. Mandal, B. and **S.C. Rath** (2001). Micro morphology of third ventricular ependyma in *Catla catla* (Ham.). *Indian J. Fish.* 48(4), 383-390.

21. Ghumare, S; H. Jagtap, H. Borate, R. Wakharkar, T. Ravindran, B. Mondal, S.D. Gupta and **S.C. Rath** (2001). Quantitative assessment of milt in prostaglandin induced milters of *Labeo rohita* *J. Aqua trop*
22. **Rath, S.C.**, B. Mondal, S. D. Gupta (2002). Observations on embryolic motality of Indian major carps in some eco-hatchery system. *J. Indian. Fsih.* 49 (3) 287-297.
23. **Rath, S.C.**, B. Mondal and S. D. Gupta (2002). Histomophology of ovary through multiple breeding of Indian major carps. *Proc. Fifth Asian Fish Forum* pp 183-188.
24. **Rath, S.C.**, B. Mondal, S. K. Sarkar and S. D .Gupta (2004). Unilateral regressed ovary in a teleost, *Labeo rohita* (Ham.) *Indian J. Fish.* 51 (4) 505-510.
25. **Rath, S.C.**, B. Mondal, S.K. Sarkar and S. D. Gupta (2006). Fate of unspawned oocytes in the ovary of *Labeo rohita*(Ham.) during inter spawning period through multiple breeding *Indian J.Fish.* 53(1)103-108
26. **Rath, S.C.**, S. K. Sarkar, S. D. Gupta and B. Mondal (2007). Gonadal Development and induced spawning in spontaneously bred *Labeo rohita* (Ham.) *Indian J. Fish* 54(2):163-170
27. **Rath, S.C.**, S. K. Sarkar, S. D. Gupta and N. Sarangi (2007). Comparative account of induced breeding of Indian major carps with ovaprim, ovatide ova-FH and carp pituitary extract. *Indian J. Anim Sc.* 77(10), 1057-1060.
28. Pillai, B.R., **S.C. Rath** and S. Sahu (2007). Evaluation of a visible implant fluorescent elastomer internal tag in juvenile freshwater prawn, *Macrobrachium rosenbergii* (de Man) *Indian J. Anim Sc.* 77(10), 1054-1056.
29. Nandi. S, P. Routray, S. D. Gupta, **S.C. Rath**, S. Dasgupta, P. K. Meher and P.K. Mukhopadhyay (2007). Reproductive performance of carp, *Catla catla*, reared in a formulated diet with PUFA suplimentation. *J. Appl. Ichthyology.* 23 684-691.
30. Verma D K, P. Routray, A. D. Sahu And **S.C. Rath** (2010) Qualitative and quantitative changes in testes of *Cirrhinus mrigala* (Ham.) through multiple induced stripping *Indian Journal of Animal Sciences* 80 (11): 1157–59
31. Bindu R. Pillai, Kanta DasMahapatra, Raul W. Ponzoni, Lopamudra Sahoo, P.L. Lalrinsanga, Nguyen H. Nguyen, Swagathika Mohanty, Swagathika Sahu, Vijaykumar, Sovan Sahu, Hooi L. Khaw, Gunamaya Patra, Sivani Patnaik, **Suresh**

	<p>Chandra Rath (2011) Genetic evaluation of a complete diallel cross involving three populations of freshwater prawn (<i>Macrobrachium rosenbergii</i>) from different geographical regions of India. <i>Aquaculture</i>.</p> <p>32. Rath, S.C. B.R.Pillai, S.N.Mohanty and S.Sarkar (2011) Growth and survival of <i>Macrobrachium rosenbergii</i> (de Man) post larvae fed with iso-proteic diets incorporated with fishmeal and its substitution exclusively by plant protein. <i>Journal of Animal Sciences</i> 81(12): 1272-1275</p>
<p>Extension Booklets, Handout, Pamphlet and Audiocassette</p>	<ol style="list-style-type: none"> 1. Rath, S.C. (1997) <i>Pragati Pathe Machha Chasi</i> (booklet in Oriya), Published by Central Institute of Freshwater Aquaculture. 2. Sarkar, S. K., B. B. Satpathy, Radeysham, D. N. Chattopadhyay, J. P. Verma, B. K. Sharma, B. Behera, P.K. Nayak, S.C. Rath and S. Ayyappan (2003). <i>Portable carp hatchery for small farmers: Innovative, feature packed and field tested device</i>. Published by Central Institute of Freshwater Aquaculture. 3. Rath, S.C. (2000). '<i>Matshya Darpana</i>' a hand-out for fish farmers in Oriya. Publishd by Jayanti Fishries Club, Gop, Puri, Orissa 4. Rath, S.C. (2001) <i>Karp Prajanan "O" Janala Utpadana</i> (carp breeding and seed production) an extension pamphlet published by Central Institute of Freshwater Aquaculture. 5. Rath, S.C. (2003) <i>Karp MachhaNka Prabhabita Prajajana 'O' Janla Chasa</i>. (Induced breeding and seed production of carp) an extension pamphlet published by Central Institute of Freshwater Aquaculture. 6. Rath S.C, S. S. Giri, and S. N. Mohanty (2009) <i>Farm Re Machha Khadya Prastuti</i> (in Oriya) 7. Rath, S.C., B. L. Dhir and S.K. Mohanty (2010) Improved disease resistance of rohu carp farmed in India: Developing and implementing advance molecular methods, and streamlining access to and use of genetic resources. Pamphlet No 1 8. Rath, S.C., B. L. Dhir and S. K. Mohanty (2010) Isolation and identification of bacteria from freshwater eco systems. Pamphlet No 2 9. C. Das, S.C. Rath and A. E. Eknath (2010) <i>Karp Machha Chasa</i> (in Odia) Pamphlet No 4

	<p>10. Rath, S.C., S. S. Giri and K. N. Mahanta (2011) <i>Machha pain khadya</i> (in Oriya), Published by Central Institute of Freshwater Aquaculture pp 1-10</p> <p>11. Rath, S.C., S. S. Giri and K. N. Mahanta (2011) <i>Farm made fish feeds</i> Published by Central Institute of Freshwater Aquaculture pp 1-10</p> <p>12. Rath, S.C., B. L. Dhir and S. K. Mohanty (2010) Improved disease resistance of rohu carp farmed in India: Developing and implementing advance molecular methods, and streamlining access to and use of genetic resources. Pamphlet No 1</p> <p>13. Rath, S.C., B. L. Dhir and S. K. Mohanty (2010) Isolation and identification of bacteria from freshwater eco systems. Pamphlet No 2</p> <p>14. Rath, S.C., B. L. Dhir and S. K. Mohanty (2010) Quality seed production and stock upgradation of carp through use of cryopreservation technology in the selected hatcheries of India. Pamphlet No. 3</p> <p>15. P. C. Das, S.C. Rath and A.E. Eknath (2010) <i>Karp Machha Chasa</i> (in Odia) Pamphlet No 4</p> <p>16. Rath, S.C., S. S. Giri and K.N Mahanta (2011) <i>Machha pain khadya</i> (in Oriya), Published by Central Institute of Freshwater Aquaculture pp 1-10</p> <p>17. Rath, S.C., S. S. Giri and K.N Mahanta (2011) <i>Farm made fish feeds</i> Published by Central Institute of Freshwater Aquaculture pp 1-10</p> <p>18. Chatopadhyay, D.N., Mukhopadhyay, P.K., Mandal, R.N., Paul, B.N., Chakraborty, P.P., Rath, S.C. and Giri, S.S. (2011). Pona Machher Paripurak Khadda (In Bengali language), published by Central Institute of Freshwater Aquaculture & Indian Council of Agricultural Research joint publication. Booklet No. 4, pp. 8.</p> <p>19. Rath, S.C. (1997). <i>Machhya Dhara</i>, An audio cassette in Oriya produced & released by Central Institute of Freshwater Aquaculture.</p>
Technical Articles	<p>1. Rath, S.C. and S. D. Gupta (1997). Improvement and management of eco-hatchery systems for carp seed production. <i>Fishing chimes</i> 17(4) 42-44.</p> <p>2. Mishra, S. and S.C. Rath (1999). Environmental implication of aquaculture. <i>Aquaculture Asia</i>. Vol. IV. (4) 33-36.</p>

3. Gupta, S.D., **S.C. Rath** and S. Ayyappan (2000). Design and management of eco- hatchery complex for carp seed production. *Fishing Chimes*. Vol. 19 (10-11), 27-33.
4. Gupta, S.D., **S.C. Rath** and S. Ayyappan (2000). Spawn mortality in major carp hatcheries: Possible causes and remedies. *Fishing chimes* Vol. 20 (2) 20-21.
5. Gupta, S.D. **S.C. Rath** (2000) Grass carp seed production (in Hindi) *Nilitima* pp 26.
6. **Rath, S.C.** and S. D. Gupta (2000). About male brood of Indian major carps. *Fishing Chimes* Vol.20 (9) 35-37.
7. Sahoo, C. D., P. B. Bhakat, S. D. Gupta and **S.C. Rath** (2001). Design and estimation of medium carp hatcheries for Indian farmers. *Fishing chimes* Vol. 20(12)51-52
8. Gupta, S. D., **S.C. Rath** and K. Janki Ram (2002). Possibility of use of homeopathic drug in the research of carp brood farming and induced breeding. *Souvenir*, 19th National Homeopathic Congress, Indian Institute of Homeopathic Physicians, Bhubaneswar 227-29 Dec. pp 88-89.
9. **Rath, S.C.** and S. K. Sarkar (2003). Captive breeding and seed production of Indian major carps: an overview. A lead paper in U.G.C. Sponsored National Seminar on Aquaculture Biotechnology & Fisheries Extension in India ,U.N. College Soro,Balasore,12-13 Sep.pp1
10. **Rath, S.C.** and S. K. Sarkar (2004). Utilization of eco-carp hatchery for mass seed production of common carp (*Cyprinus carpio*). *Fishing Chimes* Vol. 24. No. 7 , 38-39.S
11. **Rath, S.C.**, S. D. Gupta, P. R. Raut, S. C. Mohanty, and P. K. Parija (2005). Mass spontaneous captive spawning of Indian major carps: A case study. *Fishing Chimes*.
12. **S.C. Rath**, S. K. Sarkar, S. D. Gupta and N. Sarangi (2007). Eco-carp hatchery—guidelines for construction. *Indian Farming* 56(10) 6-10.
13. Bindu R Pillai, **S.C. Rath**, S. Sahu and N. Sarangi(2007) Grow-out technology of giant freshwater prawn *Indian Farming*, 56(10) 2-3
14. **Rath, S.C.** (2007) Fish food organism for aquaculture In: Course manual for the “ToT on Capacity Building of the Primary Stakeholders in sustainable Management of Aquaculture in Western Orissa” Pp. 124-132. Sponsored by OWDM and N. R. International Ltd., held during 3-7 November for State Fisheries Officials.

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