



***DEPARTMENT OF  
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# Empowerment of Indian women in the 21<sup>st</sup> Century – A General Perspective

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“Women entrepreneur according to Government of India is an entrepreneur, who runs an enterprise owned and controlled by her and having minimum financial interest up to 51% of the capital giving at least 51% of the employment to women.” Women entrepreneur is one, who initiates, organize and operate a business enterprise. In developing countries like India such Innovations are found less in number when compared with advanced countries.

The following are some of the reasons for emerging women entrepreneurship

- a) Not finding a job
- b) Unable to work in her house
- c) New challenges and opportunities for self – fulfillment
- d) Proving their innovative skills
- e) Need for additional income.

Swami Vivekananda observed that lack of education weakens the self – confidence of majority of women in India. He drew pointed attention of the people towards the fact that self – confidence was more than half of the “Secret of Success” in life. Women education of the right type which leads to characters, foundation, strengthening of mind, development of the intellect and self – reliance.<sup>1</sup>

According to Rammanohar Lohia, the emancipating of women was the foundation of social revolution, without this there can be no prosperity. Mahatma Gandhi was a strong advocate of women’s rights. His successful call to women to join the national movement served as a catalyst for the wider participation of women in Public affairs.

## Historical Background of Women Empowerment in India

The status of Women in India has been subject to many great changes over the past few millenium. In early Vedic period Women enjoyed equal status with men. Rigveda & Upanishads mention several names of women sages and seers notably Gargi & Maitrey. However, later the status of women began to deteriorate approximately from 500 B.C., the situation worsened with invasion of Mughals and later on by European invaders.

Some reformatory movements by Guru Nanak, Rajaram mohan Rai, Ishwarchandra Vidya Sagar, Pandita Rama Bai and others did give some relief. It is not that Britishers didn’t do anything for improving the condition of women. Some laws were enacted such an “Abolition of practice of Sati”, Widow Remarriage Act 1856 etc.

The real change came after independence. Constitution of India guarantees equality to women (Article 14). There are other articles too which ensure rights of women e.g. no discrimination by the state [article 15 (1)] equality of opportunity (Article 16) etc. Feminist activism picked up momentum in India during later 1970's. Later on many groups and NGO's have been working for the Empowerment of women. We are proud that in India Women got voting right much before USA and some other European countries.

#### Women Associations

1. The international council of women convened its first meeting in Washington in 1888 to advance to women's social, economic and political rights.
2. The founding members of women Indian Association in 1917 were Mrs. Annie Besant, Mrs. Margaret Cousins and Dorothy Jinarajadasa.
3. The National council of women in India was renamed as All India women's organization established in 1925.
4. The eighth session of the Andhradesa constituency conference was held on 17<sup>th</sup> November 1934 at the Besant Hall, Madanapalle, under the presidency of Srimati. G. Durgabai Deshmukh.<sup>3</sup>

#### Empowerment – Conceptual Framework

The origins of the concept of empowerment go back to the civil rights movement in the USA in the 1960. The empowerment of women is located within the discourse and agenda of gender equality and is increasingly being taken in the agendas of international development organizations, perhaps more as a means to achieve gender equality than as an end in itself. At the Social Summit in Copenhagen in 1993 and the International Conference on Population and Development in Cairo 1994 Governments committed themselves to the empowerment of women. This commitment was operationalised and formulated into a clear action plan at the Fourth World Conference on Women in Beijing 1995 where Governments committed themselves to the "empowerment and advancement of women, including the right to freedom of thought, conscience, religion and belief, thus contributing to the moral, ethical, spiritual and intellectual needs of women and men, individually or in community with others and thereby guaranteeing them the possibility of realizing their full potential in society and shaping their lives in accordance with their own aspirations.

#### Indian Constitution

The constitution of the country provides for equality of opportunities to all citizens irrespective of race, sex, caste and communities. Recently the Supreme Court has highlighted the right of the women in India to eliminate gender based discrimination particularly in respect of property so as to attain economic empowerment.

The Constitution Framers were very much conscious of the problem of women empowerment hence they ensured that the Principle of Gender Equality is enshrined in the Indian Constitution in its Preamble, Fundamental duties and Directive Principles. The various articles mentioned in the earlier paragraph are meant for ensuring gender equality. Moreover the Constitution also empowers the states to adopt measures of positive discrimination in favour of women. The real impetus for this movement was gained when under the Priministership of Mrs. Indira Gandhi, a scheme known as Indira Mahila Yojana was launched, and UNDP also incorporated issues of women upliftment as Primary objective. Various Schemes were later on launched for the empowerment of women such as Rashtriya Mahila Kosh, Mahila Samridhi Yojana, Self help groups at Panchayat level and many more. The establishment of National Women's Commission and State Women's Commissions were important milestones in the direction of Women Empowerment in India.

### National Commission for Women Act, 1990

The Union Government of India under the leadership of V.P. Singh in 1989 felt that the task of the development of women through their empowerment would not be possible in the absence of a commission for women who act as a nodal agency- a watch dog to safeguard the interests of women and advise government on all issues concerning women.<sup>3 (a)</sup>

### National policy for the Empowerment of Women, 2001

The National policy (2001) was formulated with a view to bridging the gap between the goals enunciated in the constitution, legislation, policies, planning, programmes and related mechanisms on the one hand and situational reality of the status of women in India, on the other.

Some of the important features of the policy include their active participation in decision making including the political process at all levels, adopting a gender perspective to ensure main streaming of women in all developmental processes, as catalysts, participants and recipients.<sup>4</sup>

The policy was aimed at ensuring women empowerment through positive economic and social policies for the full development of women, so that they could realize their full potential. The policy assured equal access to women to health care, quality education, participation and decision making in Social, Political and Economical life of the nation. The National Policy also aims at strengthening legal system for eliminating discrimination against Women. It also visualizes strengthening partnership with Civil Society, particularly Women's organizations.

#### Education and Women Empowerment

Education is a powerful tool of social transformation. Hence, education for Women has to be paid special attention. Greater access for women to education must be ensured in the educational system. Gender sensitivity must be developed. A watch has to be kept on dropout rate of girls and corrective measures should be taken to check the dropout rates.

#### Role of NGO's in Women Empowerment

Governmental Organizations are formal agencies working for the empowerment of women. But this work requires multidimensional approach and hence a large number of voluntary organizations / NGO's have gained increased attention in the field from grass – root level to national & international level. Their role is so impressive because they work with missionary zeal and commitment. The working style of NGO's is open, transparent and personal. So, they are more effective in this direction. They organize seminars, conferences and workshops for the awakening of the masses. Their mass appeal – style contributes to a better understanding of women's rights and of the means to ensure the enjoyment of those rights and the elimination of discrimination. They prepare urban and rural uneducated women for self – employment, which is vital for the economic empowerment of the women. In short, all these programs and functions of NGO's contribute towards the realization of sustainable community development and hence women empowerment.

#### Women Welfare and Empowerment in India

In India, policies and programs at different levels of the government cover various dimensions and strategies in gender development. Over the years, efforts have been made to empower women socially, economically, and politically. However, due to a lack of synergy and coordination, the achievements are not satisfactory. It is imperative that an integrated policy and strategy be formulated to address the economic, social, and political issues related to women, along with the requisite programs and schemes. Though India has created protective legislations for women, the enactments have not been easy to implement. The vastness of the country, the scattered nature of women workers, their lack of education and legal literacy, and the indifferent

attitude of government bureaucracy have all contributed to the continuing vulnerability of women. This is true not only for unorganized rural women, but also for urban women workers. Although the constitutional commitments to women find reflections in the planning processes, legislation, policies, and programs of the central and state governments, the current socio-economic status of women is unsatisfactory in terms of almost all important indicators of human development.<sup>5</sup>

#### January 4-10, 2010 is Women's Self-Empowerment Week

The national recognition of women's self-empowerment is intended as an opportunity for women (and men) to reflect on the important roles that women occupy in society. Another intended goal is that women recognize and observe the variety of ways we contribute to making our families and communities better. More specifically, "women's self-empowerment" or "female empowerment" has become synonymous with "feminism" or "women's liberation"— *which is not the case.*

#### Influential Women of 21<sup>st</sup> Century

**Indira Priyadarshini Gandhi** (19 November 1917 – 31 October 1984) was the third Prime Minister of India and a central figure of the Indian National Congress party. Gandhi, who served from 1966 to 1977 and then again from 1980 until her assassination in 1984, she is the second-longest-serving Prime Minister of India and the only woman to hold the office. Indira Gandhi was the only child of Indian Prime Minister Jawaharlal Nehru. She served as the Chief of Staff of her father's highly centralized administration between 1947 and 1964 and came to wield considerable unofficial influence in government. Elected Congress President in 1959, she was offered the premiership in succession to her father. Gandhi refused and instead chose to become a cabinet minister in the government. She finally consented to become Prime Minister in succession to Lal Bahadur Shastri in 1966. As Prime Minister, Gandhi became known for her political ruthlessness and unprecedented centralization of power. She went to war with Pakistan in support of the independence movement in East Pakistan, which resulted in an Indian victory and the creation of Bangladesh, as well as increasing India's influence to the point where it became the regional hegemony of South Asia. Gandhi also presided over a state of emergency from 1975 to 1977 during which she ruled by decree and made lasting changes to the constitution of India. She was assassinated in the aftermath of Operation Blue Star. In 2001, Gandhi was voted the greatest Indian Prime Minister in a poll organized by India Today. She was also named "Woman of the Millennium" in a poll organized by the BBC in 1999.<sup>6</sup>

**Meira kumar** (born March 31, 1945) is an Indian politician and a five time Member of Parliament. She was elected unopposed as the first women Speaker of Lok Sabha on 3<sup>rd</sup> June 2009. She is a lawyer and a former diplomat. Prior to being a member of the 15<sup>th</sup> Lok Sabha, she has been elected earlier to 8<sup>th</sup>, 11<sup>th</sup>, 12<sup>th</sup> and 14<sup>th</sup> Lok Sabha, wherein she remained Cabinet Minister in the Ministry of Social Justice and Empowerment (2004 – 2009).<sup>7</sup>

**Mamata Banerjee** (born January 5, 1955) is the leader of the Trinamool Congress and Leader of the Opposition in the state of West Bengal. She is the founder and Chairperson of the party and has been the held the position of Union Minister for Railways in the Republic India. Mamata is popularly known as "Didi" – the elder sister to all her followers in West Bengal. Now she is the present Chief Minister of West Bengal.<sup>8</sup>

**Jayalalithaa Jayaram** (born 24 February 1948), commonly referred to as Jayalalithaa, is an Indian politician who has been the Chief Minister of Tamil Nadu, a state in southern India, since 2011. Previously she served as Chief Minister from 1991 to 1996, briefly in 2001, and from 2002 to 2006. She was a popular film star in Indian cinema before her entry into politics, having appeared as main female lead heroine in over

140 films which includes films in Tamil, Telugu, Kannada and worked in one Hindi film. She is the incumbent general secretary of All India Anna Dravida Munnetra Kazhagam (AIADMK). She is called *Amma* ('Mother') and sometimes *Puratchi Thalaivi* ('Revolutionary Leader') by her followers.<sup>9</sup>

Indu Jain belongs to the Sahu Jain family and is the current chairperson of India's largest media group, Bennett, Coleman & Co. Ltd., which owns the Times of India and other large newspapers. Her net worth is said to be US Dollars 4.4 billion, making her the 17<sup>th</sup> richest Indian in the world.<sup>10</sup>

Lalita D. Gupte Joint Managing Director of ICICI Bank (India's second largest commercial bank), until October 31, 2006, is an important figure in India's banking and financial services sector. An INSEAD alumnus, Gupte was listed by the Fortune "as one of the fifty most powerful women in international business." She is currently the Chairperson on the Board of ICICI Venture and a board member of Nokia Corporation. On 22<sup>nd</sup> June, 2010 she was appointed as member of Alstom's Board of directors.<sup>11</sup>

Priya Paul (born 1967), is a prominent woman entrepreneur of India, and currently the Chairperson of Appeejay. The Park Hotels chain of boutique hotels. She joined the company, after finishing her studies in Economics at the Wellesley College (US) working under her father, as Marketing Manager at the Park Hotel, Delhi, at the age of 22.<sup>12</sup>

#### Conclusion

The Empowerment of women has become one of the most important Concerns of 21<sup>st</sup> century not only at national level but also at the international level. Efforts by the Govt. are on to ensure Gender equality but Government initiatives alone would not be sufficient to achieve this goal. Society must take initiative to create a climate in which there is no gender discrimination and Women have full opportunities of Self decision making and participating in the Social, Political and Economic life of the Country with a sense of equality.

#### References

- [1]. Chandrababu, B.S., Thilagavathi, L. *Women: Her History and her Struggle for Emancipation*, Chennai, 2009, p. 27.
- [2]. Ramabrahmam, V., & Gangajiah, K. "Women Entrepreneur and Empowerment of Women",
- [3]. *Social Work Intervention in Policy Making*, (ed) by P. Venkatarao, New Delhi, 2013, p. 189. (ISBN 978-93-81142-76-9)
- [4]. Chandrababu, B.S., Thilagavathi, L., *op.cit.* pp. 334, 337, 348.3(a). Act No. 20 of 1990 of Govt. of India.
- [5]. Indu Grover, Deepak Grover (Ed.), *Empowerment of Women*, pp. 14 – 17.
- [6]. Rameshwari Pandya, *Women Welfare and Empowerment in India*.
- [7]. Indira Gandhi 'greatest woman BBC News. 1999-12-01. Retrieved 2013-07-31.
- [8]. India: Woman Wins Post of Speaker New York Times, June 4, 2009. Published by: Sibabrata Kundu on Jul 04, 2011.
- [9]. Srinivasaraju, Sugata (21 Mar 2011). "The Road To Ammahood". Outlook India. Retrieved 10 November 2013.
- [10]. Indu Jain is Chairperson of The Times Group, Retrieved 2012-01-16.
- [11]. Amarnath, Nichinta and Ghosh, Debashish. *The Voyage To Excellence*. (ISBN 81-223-0904-6)
- [12]. *The Voyage To Excellence* by Nichinta Amarnath and Debashish Ghosh. (ISBN 81-223-0904-6)

## A Study on some aspects of Hydrographical Parameters of Water in Vasishtha Godavari River at Narsapur, West Godavari District of Andhra Pradesh

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### ARTICLE DETAILS

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### ABSTRACT

India has a long coast line of 5650 km with a total continental shelf area of 2,59,000sqkms. History reveals that some form of Aqua culture existed around 300 B C in Bengal, Bihar and Orissa and credited with age old practices in this trade. Today Aquaculture has spread to most of the states and is flourishing as a trade on modern lines. Water is said to be the essential medium for aquaculture practices in which various aquatic organisms will be raised. For this purpose quality water is the primary requisite. To maintain the water quality the aquaculturists suppose to maintain various parameters of the water like Physical, Chemical, Nutrients and Gases at their limitations. Water contains various physical and chemical parameters like temperature, turbidity, salinity, dissolved oxygen, carbon dioxide, nitrates, phosphates etc., the poor and lack of proper water quality maintenance effects the growth and yield of the culturing organisms.

### 1. Introduction

Water has attracted the attention of man largely in recent years because of their multiple uses. It is a dynamic and highly productive environment, which can conveniently be utilize in a number of ways for increasing the yield of nutritive fish in close proximity to the human habitations. Man's intimate contact with the aquatic environment occurs in the areas and harvests the largest part of living and non-living resources. The creeks and salt marshes of estuaries are rich in nutrients and considered as an excellent natural nursery grounds for a variety of fish and shrimp.

Water areas are often rich in flora and fauna and act as recreational zones for tourism. They provide natural sites for harbours and play an important role in strategic areas for defense because of their easy access to open sea. They often used as source of water supply for industrial and domestic purposes. Because of their multiple uses, it is not surprising that seven of the ten largest cities in the world are located close to the estuaries.

The water sources in modern times used as outfall sites for disposal of sewage and industrial effluents without imparting much damage. With increasing industrial activity and population, many of the water bodies feared to reach a state of rapidly deteriorating water quality due to accumulation of pollutants. Hence, it is becoming apparent to protect the water quality and ecosystems. This can be possible, if we thoroughly understand their physico-chemical and biological parameters.

### 2. Materials and Methods

For the purpose of present study a single station was fixed at Narsapur and only the physical and some chemical parameters were studied. The physical parameters such as Transparency, Atmospheric and Surface water temperatures and the chemical factors like Salinity, Dissolved oxygen and  $P^H$

measured. To know the parameters it was followed the methods, which were universally accepted standard methods.

The atmospheric temperature recorded with the help of a Celsius mercury thermometer of 0.1° sensitivity.

The surface water collected with a polythene bucket at all the stations and the temperatures recorded with the help of a Celsius mercury thermometer of 0.1° sensitivity.

The water samples for the estimation of Salinity and Dissolved oxygen collected in polythene and glass bottles respectively. Polythene bottles of 100 ml capacity used for the collection of water samples intended for the estimation of Salinity. Few drops of chloroform added to the water samples to store for further analysis. Glass bottles of 250 ml capacity used for collection of water samples intended for the estimation of dissolved oxygen content. Dissolved oxygen content fixed by the addition of Winkler 'A' and Winkler 'B' immediately after collection.

The transparency measured in the field using a Sacchi Disc. For this purpose, a metallic disc of 20 cm diameter with four quadrants on upper surface painted alternate black and white is used. The Sacchi Disc lowered into the water with the help of a rope tied to the hook at the center of the disc. The reading of depth at a point where the disc just disappears recorded in cm.

Salinity was estimated by following Harvey's method of titration using standard silver nitrate ( $AgNO_3$ ) 27.25 gm/l (i.e. 1.604 N) and 0.5% potassium chromate as indicator. After applying the appropriate correction, the salinity expressed as parts per thousand (‰).

The dissolved oxygen content of the water estimated, by following the classical Winkler's method. After fixing the dissolved oxygen content of the sample in the field after the

Winkler 'A' (Manganous Sulphate) and Winkler 'B' (Potassium Iodide) the samples were stored in a dark chamber to avoid possible photochemical changes and allow the precipitate of manganese hydroxide to settle. As soon as the samples brought to the laboratory acidified with the addition of Winkler 'C' (Conc. Sulphuric Acid). When the oxidized manganese again reverts to the divalent state, the liberated iodine equivalent to the original quantity of the dissolved oxygen present in the water. The iodine liberated was titrated against standard Sodium thiosulphate (0.01 N) using starch as indicator. The oxygen content expressed as mg/l by employing the following formula

$$V \times N \times 56$$

Where

V = the volume of sodium thiosulphate (Hypo) required for titration

N = the normality of sodium thiosulphate (Hypo).

And

56 = isa constant factor.

### 3. $p^H$ (Hydrogen Ion Concentration)

$p^H$  was recorded with the help of a portable  $p^H$  meter (Model No. UC 23, digital  $p^H$ /ORP meter manufactured by Central Kagaku Company Ltd., Japan). The instrument was calibrated with standard buffer solution ( $p^H$  7.0) before use. The  $p^H$  was recorded immediately after collection.

### 4. Results

The transparency ranged from 50 cm to 75 cm, and the average mean is 62.5 cm.

The temperature ranged from 26.5°C to 34.0°C and the average mean is 30.25°C

The surface water temperature ranged from 24.5°C to 31.5°C and the average mean is 28.0°C

The surface water temperatures closely followed atmospheric temperatures variations. The low temperatures of the surface water corresponding to the winter and high temperatures to the summer seasons respectively.

The salinity ranged from 09.96‰ to 32.77‰ and the average mean is 21.36‰

The dissolved oxygen ranged from 2.968 mg/l to 4.256 mg/l and the average mean is 3.612 mg/l

### References

1. APHA Standard methods for the examination of water and wastewater (eds. Michel, J.T., Arnold, E.G., Hoak, R.D. and Rand) American Public Health Society (Pub) Washington D.C., 13 Edn. 874 (1971).
2. Ganapati, P.N. & Rama Sarma, D.V., Mixing and Circulation in the Gowthami Godavari Estuary. *Curr. Sci.*, 34 (1965) 631-632.
3. SaiSastry, A.G.R. & Chandra Mohan, P., Physico chemical characteristics of Vasishtha Godavari Estuary, East Coast of

The total results obtained in the present study were very much correlated with results obtained by the earlier workers who studied the area.

### 5. Discussion

India has a long coast line of 6650 km with a total continental shelf area of 2,59,000sqkms. History reveals that some form of Aqua culture existed around 300 B.C in Bengal, Bihar and Orissa and credited with age old practices in this trade. Today Aquaculture has spread to most of the states and is flourishing as a trade on modern lines. Water is said to be the essential medium for aquaculture practices in which various aquatic organisms will be raised. For this purpose quality water is the primary requisite. To maintain various quality the aqua culturists suppose to maintain various parameters of the water like Physical, Chemical, Nutrients and Gases at their limitations. Water contains various physical and chemical parameters like temperature, turbidity, salinity, dissolved oxygen, carbon dioxide, nitrates, phosphates etc., the poor and lack of proper water quality maintenance effects the growth and yield of the culturing organisms.

Water has attracted the attention of man largely in recent years because of their multiple uses. It is a dynamic and highly productive environment, which can conveniently be utilize in a number of ways for increasing the yield of nutritive fish in close proximity to the human habitations. Man's intimate contact with the aquatic environment occurs in the areas and harvests the largest part of living and non-living resources. The creeks and salt marshes of estuaries are rich in nutrients and considered as an excellent natural nursery grounds for a variety of fish and shrimp.

Water areas are often rich in flora and fauna and act as recreational zones for tourism. They provide natural sites for harbours and play an important role in strategic areas for defense because of their easy access to open sea. They often used as source of water supply for industrial and domestic purposes.

The water sources in modern times used as outfall sites for disposal of sewage and industrial effluents without imparting much damage. With increasing industrial activity and population, many of the water bodies feared to reach a state of rapidly deteriorating water quality due to accumulation of pollutants. Hence, it is becoming apparent to protect the water quality and ecosystems. This can be possible, if we thoroughly understand their physico-chemical and biological parameters.

India: Pre pollution status. *Indian J. Mar. Sci.* 19 (1990) 42-46.

4. Srinivasa Rao, D. & Rama Sarma, D.V., Vasishtha Godavari, *Mahasagar*, 16 (1983) 45.
5. Narasimha Rao, Thota.V., Time dependent stratification in the Gowthami Godavari Estuary. *Estuaries*, 24 (2001) 18-29



## MAHATMA GANDHI- JOURNEY AS A JOURNALIST IN THE FREEDOM MOVEMENT OF INDIA

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**Abstract:** Gandhi was not only a freedom fighter or a mass leader but he was a journalist too. He realised that "Pen is mightier than Sword" and so he took up the cause of the people and started publishing the newspapers with his whole hearted dedication. It is unwise to compare Gandhi as the editor of the modern days because he had the noble objective of fighting against apartheid oppression and imperialism.

Mahatma Gandhiji is familiar to an ideal of the political movement of South Africa and this country. But he cannot be recognised considerably as a Journalist. The main objective of his publishing of journals is to propagate and expend the mass-movement.

Gandhi as an editor and also as a journalist emphasized on the importance of the use of language. Be it publishing multilingual newspapers or using plain and simple language -- all were part of Gandhi's communication strategy.

Gandhi believed that it is sincerity sympathy and charity that touch the heart more than anything else. Gandhi as a development journalist showed an example to the present day media how to practice ethic based and development journalism.

Gandhi's views was that the newspapers were meant for public service, they should not compromise on their role in society, and the concept of profits should be regulated to the background advertisements from the businessman, the newspaper tend to be influenced and they yield to the process of those advertisers. Gandhi continued to publish his newspapers to serve the people without compromising on providing free and fair journalism.

**Introduction:** Gandhi was not only a freedom fighter or a mass leader but he was a journalist too. He realised that "Pen is mightier than Sword" and so he took up the cause of the people and started publishing the newspapers with his whole hearted dedication. It is unwise to compare Gandhi as the editor of the modern days because he had the noble objective of fighting against apartheid oppression and imperialism. Starting in South Africa and then coming to India Gandhi understood that it is through the newspapers a steady public opinion could be formed and he gave his effort to bring out four journals consecutively. The analyses of Gandhi's newspapers show that his journals were more of the views papers and with his genius touch he had shown an excellence in the field of journalism too.

The story of miracle is also the story of Gandhiji's life and his journalistic activities for him, more than any other individual was the architect as well as engineer of this historic phenomenon. It is not for nothing his grateful countrymen, have called him the Father of the Nation.

**Journey As A Journalist:** Mahatma Gandhiji is familiar to an ideal of the political movement of South Africa and this country. But he cannot be recognised considerably as a Journalist. The main objective of his publishing of journals is to propagate and expend the mass-movement. He published Indian Opinion in order to make the people aware of his political outlook during the movement in South Africa. Likewise, Gandhi published Young Indian to enrich the people with his opinion as he entered the political movement of this country.

There are certain goals of publishing the newspaper, Navajiban and Harijan to realise the thought and consciousness of public and to express it in language, to create peaceful emotion among the public and

to bring to the fore front of all the common faults in a dauntless manner. This view of Gandhiji regarding the objective and ideology of newspaper was published in the journal 'Young India' on 2nd July, 1919.

Annie Besant said, "the language of Gandhiji's journal is much powerful than that of the others. This helps public mind flaring up". The Journal ceased to be published in 1922. Coming out of the prison in 1924, Gandhiji again took the responsibility of publishing that journal. In an article in the revived Journal Gandhiji said, "I Live for India's freedom and would die for it". In Young India, was published the differences of opinion between Rabindranath and Gandhiji regarding 'Charka'.

Gandhi arrived in India on January 9, 1913. Journalism did not establish as a profession. Advertisement was not playing that important part as of today. Gandhiji was not only connected with Indian opinion, he started contributing articles to other newspapers. In an article to Gujarati daily, "Hindustan" his views on the newspaper is noteworthy.

Under the editorship of Gandhi an unregistered newspaper called the "Satyagrahi" was published from April 7, 1919 protesting against the Rowlett Bill. Subsequently, a band of young Gujarat is started an English Weekly, Young India. The editorship of the Young India was offered to Gandhi, which he gladly accepted. The Gujarati monthly the "Navajivan", under the same management, was also placed at his disposal. The Navajivan first appeared on October 7, 1919. The Young India was published after a day of the Navajivan.

The next paper Gandhi associated was "Harijan". The paper Harijan first appeared on February 11, 1933. Shri R. V. Shastri was editor. Explaining the term "Harijan", Gandhi wrote, "It is not a name of my own coining. Some years ago, several "untouchable" correspondents complained that I used the word "asprishya" in the pages of the Navajivan. "Asprishya" means literary untouchables. I then invited them to suggest a better name and one of the untouchable correspondents suggested the adoption of the name "Harijan", on the strength of its having been used by the first poet saint of Gujarat."

**Language:** Gandhi as an editor and also as a journalist emphasized on the importance of the use of language. Be it publishing multilingual newspapers or using plain and simple language – all were part of Gandhi's communication strategy. He always wanted the language of writing to be clear, simple and effective to move the readers. Tushar Arun Gandhi (2018) writes that Gandhi did not use two different languages while communicating with the elites of the courtroom and talking to the common people in a mass rally. "When he spoke to the farmer of Champaran he used the same language and the farmers of Champaran understood him perfectly. They did not need to have an interpreter to explain what Gandhi spoke to them. And also all the very intelligent, very sophisticated, very erudite western educated elite in Mumbai, when he spoke to them, easily understood the same language," he writes.

**Gandhi's Practice of Journalistic Ethics:** Gandhi believed that it is sincerity sympathy and charity that touch the heart more than anything else. Gandhi as a development journalist showed an example to the present day media how to practice ethic based and development journalism. But where is the place for ethics in the globalized market place and corporatization of media houses, ownership of the media house by the politicians, paid news and propaganda have been the real threat for ethical journalism.

Thus, Gandhi, while favoring press freedom, advised the press to observe self-restraint. Looking at the need of the hour, rural development was given importance in the Gandhian journalism, as he was keen on rural development which would play a key role in national development. Gandhi focused on development journalism and consistently wrote on the subjects that were beneficial for the masses.

The Gandhian Journalism was fully in conformity with his ideology of nonviolence that it did not provide for any content which would cause fear ever in the thought of the reader. The content was selectively so worded that it would put the people on alert and prepare them to face a challenge, provoke for a protest to oppose an unlawful act of the state, but the content was harmless so far as the

prestige of the officer was concerned, while at the same time the opinion and the resolve of the people was clearly communicated to the rulers.

In those difficult days with shattered economy and scarce resources, when the English and vernacular press could be managed without any advertisement, it would not be difficult that the Press and Media today can find any difficulty in running their business of journalism with minimum advertisements and contribute to the need of creating awareness and build public opinion against the wrong and energize the mass with ethical values and support the cause of building a civil society where concepts of Non-Violence and Rule of Law will prevail.

**Conclusion:** Gandhi's views was that the newspapers were meant for public service, they should not compromise on their role in society, and the concept of profits should be regulated to the background advertisements from the businessman, the newspaper tend to be influenced and they yield to the process of those advertisers. Often, adverse news against advertisers is suppressed in support of the advertisers. Being in the service of people, the newspaper cannot 'soil' their pages with such advertisements. Hence, it would be worthwhile to revisit Mahatma Gandhi's philosophy and principle of journalism and his contribution as a journalist.

The journalistic ethics set by persons like Gandhi, who had written with the sole purpose to create public opinion and to bring awareness among the huge mass of illiterate natives of the British India are seen to be followed more in breach today in the background of the liberalized economy which is guided by the market forces rather than the social and national interests. It might be unfair if the Press and the Media are restricted to follow all the parameters and standards of journalism as set by Gandhi, but nevertheless the manner in which Media is allowing itself to be so widely open that it forgets that it ought to be only transparent and not irresponsible by being torn in its approach and contents. Hence, the study of Gandhi's approach and ethical practice to journalism can show the way for mass oriented and responsible practice of journalism.

It is also important to note that Gandhi faced many problems and challenges while running the newspapers but in spite of various problems like financial, administrative pressure, Gandhi continued to publish his newspapers to serve the people without compromising on providing free and fair journalism.

**References:**

1. ' M.K. Gandhi, *Satyagraha in South Africa*, Navjivan Publishing House, Ahmadabad, 1950.
2. Gandhi: M. K., *An Autobiography or The Story of My Experiments with Truth*, Navjivan Publishing House, Ahmedabad, 1956.
3. Gandhi, M.K., *Young India*, 6 October 1921.
4. Gandhi, M.K., *To the Reader, Harijan*, 17 February, 1933.

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**Studies on some aspects of Reproductive Physiology  
of Female Gray Mullet *Mugil cephalus* Linnaeus (1758)  
from Vasishta Godavari Estuary; East Coast of India.**

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**ABSTRACT**

Estuaries have attracted the attention of man largely in recent years because it is a dynamic and highly productive aquatic environment, which can conveniently be utilize in a number of ways. Estuaries increasing the yield of nutritive fish, in close proximity to the human habitations. River Godavari is the second largest in India, divides at Rajhamundry into Gautami and Vasishta the two main distributaries. The Vasishta branch of Godavari meets the sea at Anthervedhi and opens into Bay of Bengal (Plate 1) (Fig. 1). Hydrographical conditions of Vasishta Godavari estuary influenced by the prevailing climate and weather conditions over the adjoining Bay of Bengal.

Studies on the reproductive biology of fishes are useful to understand the reproductive potential and annual regeneration capacity of the fish stocks. Reproductive parameters such as sex ratio, size at first maturity, maturation stages, fecundity, spawning and recruitment are of great value in fishery predictions and management. Sex ratio of a fish population during different months / seasons is useful in estimating relative abundance of the sexes in spawning stock, constituent length group and growth rate of either sex (Kesteven, 1942 and Qasim, 1966). In order to assess the reproductive activity, fishes of various size groups are frequently sampled. The age and size of sexual maturity are essential among others to decipher the optimum marketable size of a fish. Thus size at first maturity is important for the management point of view of fisheries. Normally all fishes do not attain maturity or same maturity length at once and the same age. Considerable differences do exist among various individuals. Qasim (1973) ascertained that maturity is closely related to the growth rate of fishes and hence the two phases of maturity (pre and post) should be clearly distinguished.

[Key Words: Estuaries, Bay of Bengal, Vasishta Godavari, *Mugil cephalus* & Anthervedhi]

## INTRODUCTION

The Godavari is the second largest river in India and also the largest sediment-carrying river in South India. The siltation and sedimentation patterns bring major changes in the river course from time to time. During the times of severe floods, neighboring villages and agricultural lands get inundated with flood waters. Lack of scientific information regarding the tidal propagation and salt water incursion into the estuary is a serious limitation for the flood control methods.

The Vasishta branch of river Godavari did not receive adequate attention of the Scientists so far, hence meager work was done on this branch. The Vasishta Godavari Estuary which is one of the main distributaries of river Godavari in which the area investigated includes a 15 km stretch of the Vasishta Godavari from the confluence at Anthervedhi (Lat. 16°18.990'N; Long. 81°43.538'E) towards the up stream direction up to Narsapur (Lat. 16°26.900'N; Long. 81°42.340'E). Three Stations were selected for the collection of the samples for the study of different hydrographical parameters.

The coastal and brackish water regions of Andhra Pradesh coast support several species of mullets. Three species namely - *Mugil cephalus* (Linnaeus), *Liza macrolepis* (Smith) and *Valamugil cunnesius* (Valenciennes) are commonly occur in Vasishta Godavari Estuary. Faunistically, the estuary is rich in coelenterates, polychaets, crabs, gostropods, mussels and holothurians.

Maturation of gonads refers to the cyclic morphological changes taking place in the male and female reproductive organs as they grow up fully to ripen and release out the gametes. Significant changes in colour visibility shape and size of the gonads reflect various maturity stages in many fishes. Determination of maturity stages provides information of the reproductive biology of a fish. This knowledge reveals the age and size at first maturity of species, spawning time, ground and period.

Fecundity is defined as the number of ova present in the gonad of a female fish prior to spawning. Some times fecundity is termed as the number of ova laid during the average life of a fish. This is estimated by different means and expressed in many ways.

Spawning is the processes of emission of gametes from the body of fishes to the exterior environment where the process of fertilization takes place generally. Determination of spawning potential within the lifespan, spawning season within the year and frequency of reproduction within the season of a fish are essential to assess the reproductive ability of a population. Spawning is confined to short spells of time (summer) in most of the fishes inhabiting temperate waters with sharp temperature differences between summer and winter

seasons. Where as in tropical and sub-tropical waters with relatively minor temperature fluctuations, the spawning period is usually prolonged extending almost throughout the year, but of course with one or two peaks of profuse spawning. Physical and chemical parameters, such as temperature and salinity of the external environment and internal biological conditions, such as feeding and growth in addition to migration which influences spawning in fishes.

Breeding biology of a number of marine, estuarine and freshwater fishes was studied and the literature is replete with several works. Some landmark works are cited here.

Kesteven (1942) studied on the biology of Australian mullet. The biology of, *Mugil tade* (Forsk.) with notes on its fishery in Bengal was observed by Pillay (1954). Jhingran (1958) made some observations on the seaward migrations of *Mugil cephalus* for breeding from the Chilka Lake. Sex ratio of fish populations as a function of sexual difference in the growth rate was studied by Qasim (1966). Spawning conditions of mullets of Caspian Sea studied by Avanesov (1972). Qasim (1973) worked on maturation, spawning in marine teleosts from the Indian waters. Das (1978) studied the maturity and spawning in *Mugil cephalus* Linnaeus in Goa waters. Reproduction of, green back mullet *Liza subviridis* (Valen.) was studied by Chan and Chua (1980). Silva and De Silva (1981) investigated the biology of *Mugil cephalus* from a coastal lagoon in Sri Lanka. Reproductive biology of Western Atlantic blue fin tuna was investigated by Baglin (1982). *Liza richardsoni* of the Algoa Bay of South Africa was studied by Lasiak (1982). Gopalakrishnan and Thaker (1988) observed the maturation and spawning of gray mullets of Okhamandal (Gulf of Kutch). The reproductive biology of gray mullet *Valamugil seheli* (Forsk.) from Mangalore waters was studied by Gowda and Shanbhogue (1988). Wijeyaratne (1988) worked on the food, fecundity and gonadal maturity of *Valamugil cunnesius* (Pisces: Mugilidae) in the Negombo Lagoon, Sri Lanka. Hoda and Qureshi (1989) studied the maturity, sex ratio, ova diameter and fecundity of the mullet *Liza kluzingeri* (Day) from Karachi Sind waters. Some aspects on the biology of, *Trachnocephalus myops* was studied by Appa Rao (1991). Fedulina (1991) observed the influence of the male germ cells on egg fecundation in mullets. The first maturity, seasonal variations of gonado somatic index, spawning time and annual migrations of gray mullets *Liza ramada* from the Eastern Adriatic was studied by Modruson *et al.*, (1991). Moiscycva *et al.*, (1991) studied the features of gonadal development in the mullet brood stocks (leaping gray mullet, gray mullet and pacific mullet) raised at the experimental mullet hatchery. Gopalakrishnan and Pillai (1993) studied on some aspects of the reproductive physiology of the female gray mullet *Mugil cephalus* Linnaeus. The

reproductive biology of the mullet *Valamugil cunnesius* of Karachi Sind waters was observed by Hoda and Qureshi (1993). Joseph and Rao (1993) worked on the histological and biochemical changes during spermatogenesis in *Mugil cephalus* Linnaeus and related species from Cochin-India. The effect of certain environmental factors on developing eggs and early larvae of the mullet *Liza parsia* (Hamilton – Buchanan) was studied by Pillay and Krishnan (1993). Manipulation of ovarian development and spawning in gray mullet *Mugil cephalus* Linnaeus observed by Kuo (1995). Abundance, age, growth and reproduction of gray mullets in Obidos lagoon, Portugal was studied by Moura and Gordo (2000).

Although revision of the literature reveals considerable knowledge on the reproductive biology of numerous fishes, information on the breeding biology of *Mugil cephalus* Linnaeus is lacking. Therefore investigations were made to find out important parameters such as sex ratio, size at first maturity, gonado somatic index and other breeding aspects of *Mugil cephalus* Linnaeus (Plate 2).

#### MATERIAL AND METHODS

After measuring the total length and weight of each specimen, its belly was cut open. The sex, color and general appearance of the gonads was noted, and the gonad was then removed and preserved in 5% formalin. Observations on the maturation of the gonads were made mainly on the ovaries. Testes were found to be very thin, delicate and strand like structures. Further examination of the testes was not possible due to their delicate nature.

Gonads (Plate 3) were removed and weighed to the nearest milligram to calculate the Gonado Somatic Index (GSI). Initially GSI for each fish was determined and then monthly averages were computed. Gonado Somatic Indices were calculated using the formula.

$$GSI = \frac{\text{Weight of the Gonad}}{\text{Weight of the Body}} \times 100$$

In order to ascertain maturity stages the six-stage classification of Kuo (1995) and Nash (1982) was adopted. The various stages described in the classification are

1. Immature-Ovaries dull brownish, occupying half of body cavity; ova irregular and transparent, testes whitish, thread like occupying half of body cavity.
2. Maturing I- Ovaries dull brownish, accepting half to two thirds of body cavity; ova round, partially yolk laden, testes whitish, occupying half of body cavity.

3. Maturing II – Ovaries blood red in colour occupying half to two thirds of body cavity; ova round, fully yolk laden, testes whitish, occupying half of body cavity.
4. Mature- Ovaries yellowish, occupying half to two-thirds of body cavity; some ova visible externally, yolk vacuolated, peri-vitelline space present, testes creamy or whitish, occupying half to two thirds of body cavity.
5. Ripe – Ovaries yellowish or brown, occupying nearly the entire body cavity; testes creamy white, occupying two thirds of body cavity.
6. Spent –Deep red, hollow sacs, flaccid with blood vessels prominent over the surface, occupying not more than half of the body cavity; ova few often degenerating stages.

During the present study only four stages of ova were observed i.e. Immature, Maturing I, Maturing II and Mature could only be discerned while ripe and spent stages were absent. In fishes of less than 15 cm length differentiation of maturity stages was not possible and hence all the specimens of this length class were considered as Juveniles.

Fecundity estimations were based on ovaries in mature stage. Ovaries after removal of excess formalin were weighed to the nearest milligram in monopan electrical balance. Afterwards, a small piece of ovary about 1mg was removed and weighed accurately. The ova were separated from the adherent tissue with fine needles on to a rafter cell and counted. Fecundity of each fish was estimated from the equation.

$$\text{Total Weight of Ovary} \times \frac{\text{No. of Opaque Ova in the sample}}{\text{Weight of the sample}}$$

However a calamitous event resulted in the future of relevant data and hence, the discussion is limited to the meager details that could be retrieved hoping that they would serve to generate at least a broad picture of the breeding biology.

## RESULTS

In fishes below 25 cm length, differentiation of the gonads was not possible and hence considered as Juveniles. Fishes in between 28-30 cm. considered as immature, where the ovaries are white colour structures extending less than half of the length of the body cavity. Ova were irregular and transparent. Immature stage I gonads extend more than ½ of the body cavity, but at this stage the eggs were round and translucent. The size of the fish, ranging from 35 – 45cm length the maturing stage II, gonads extending up to 2/3 of the body cavity. Eggs are round and fully laden Yolk. The size of the fish ranging, from 45 – 50 cm. mature stages were observed ovaries occupying almost the entire area of the body cavity (Plate 10).

### Gonado somatic Index

The gonado somatic index of *Mugil cephalus* was very much variable though out the year. Highest GSI values were encountered during the month of February 2006 and February.



2007. While lowest indices existed in the month of August 2006. During March 2006 to July 2006 no traces of development of Gonads hence the GSI values are nil. In *Mugil cephalus* the development of gonads shows very fast rate of growth during breeding season (Table 1).

#### Fecundity

Fecundity was estimated from the total number of mature ova destined to be shed (0.3 mm and above) during a spawning season and was based on ovaries (Mature II and Mature) from fishes of the size range 45.0 to 52.4 cm. The lowest and highest fecundity of 25,98,199.340 and 38,56,559.200 were in the fishes of total length 44.7 and 52.4 cm. respectively (Table 2).

#### DISCUSSION

The grey mullets form one of the important fisheries of the estuaries and coastal waters of the tropical and sub-tropical regions of all seas. Their abundance in the coastal and estuarine regions may be related to their food and feeding habits. Generally they are very hardy and capable of tolerating wide ranges in salinity and temperature and as a result they are extensively cultured in the Indo-Pacific region, and in some of the European countries. In India, mullets are cultured in estuaries and ponds, are much relished, owing to their good flavour. The mullets, though essentially herbivorous, feeding on algae and diatoms, consume zooplankton as well as artificial food when cultured in ponds. Artificial manuring of fish ponds, using organic or inorganic manures, has been found to have a remarkable effect on the growth of mullets. Though mullets grow to a large size and mature in ponds, spawning has not been occurred in enclosed waters (Kurian, 1975). *Mugil cephalus* has been observed to migrate into the estuaries after the onset of the south-west monsoon, for spawning purposes. In the estuaries, mullets are lured towards light, green light.

During the period of study, the gametes in female *Mugil cephalus* developed normally up to entry of the oocytes into vitellogenesis, whereas in the males it was developed up to concluding stages of gametogenesis and spawning. *Mugil cephalus* males became sexually mature at 3 years and females probably at 3<sup>+</sup> or 4 years (Moiseyeva *et al.*, 1991).

The investigation reveals that the testis of grey mullets belongs to lobular structure. According to the characteristics of spermatogenesis, the development of testis was divided into five stages: the multiplicative spermatogonia stage, primary spermatocyte stage, secondary spermatocyte stage, spermatogenesis stage and mature sperm stage. According to the development and mature seasons of sperm of male fish, it was suggested that the

reproductive season of grey mullets in Xiamen is from November to December every year and is one time released type.

Intensive spawning of this mullet species was noted at a temp of 20 - 22°C, some considerable distance from the shore where the depth ranged between 400 - 600 m (Avanesov, 1972).

The results on the maturity stages, clearly indicates that in *Mugil cephalus*, ripe gonads were observed during November to February which is said to be as breeding season for *Mugil cephalus* on the East Coast of India. The gonads observed during January and February was at maturing II and mature stages and contains ripe ova. This clearly indicates that fishes of size more than 40 cm alone can attain sexual maturity and contains gonads.

The fecundity of *Mugil cephalus* increases at the rate of three times the total length (F-L-SUP-3). The relationship between fecundity and fish weight, gonad weight were linear (Das, 1977).

In *Mugil cephalus*, Das (1978) estimated the size of the fish at first maturity as 28 - 30 cm for males and 30 - 32 cm for females. But the females measures less than 40 cm does not have well grown gonads, however these fishes contains strands like gonads without any clear indications.

The Gonado Somatic Index values could be well attributed to the impact of environmental factors. The maximum GSI recorded as 17.443 during the month of February 2007 indicates more maturity stages present.

Though the period of study extends from October 2005 to December 2006, the fecundity was estimated in a spawning season which extends up to February in case of *Mugil cephalus*, gravid fishes (females) were collected during the month of February 2007 for the purpose of study and was based on ovaries (Mature II and Mature) from fishes of the size range 45.0 to 52.4 cm. The lowest and highest fecundity of 25,98,199.340 and 38,56,559.200 were in the fishes of total length 44.7 and 52.4 cm respectively.

In *Mugil cephalus* the results of fecundity exhibits that the relation between fish length and fecundity is quite significant ( $R^2 = 0.9112$ ) (Fig. 2) and the relation between gonad weight and fecundity is also very significant ( $R^2 = 0.8076$ ) (Fig. 3).

The results of fecundity observed in the present study are very much correlated with the results of the earlier workers who recorded the fecundity of mullets Das, (1977) on *Mugil cephalus* from Goa; Gowda and Shanbhogue, (1988) on *Valamugil seheli* from Mangalore; Romagosa *et al.*, (2000) on *Mugil platanus* from Brazil.

The size at first maturity is important for the management point of view of fisheries. Normally all fishes do not attain maturity or same maturity length at once and at the same age. Considerable differences do exist among various individuals.

The breeding biology (fecundity) of *Mugil cephalus* was studied as a part of investigation. The Gonado somatic Indices of the female fishes are also studied. All the observations made during the period of study are quite correlated with the observations made by earlier workers.

#### ACKNOWLEDGEMENT

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#### REFERENCES

1. Kesteven, G.L. 1942. Studies on the biology of Australian mullet. Council of Scientific and Industrial Research. *Australian Bulletin*, 157: 1 – 147.
2. Qasim, S.Z. 1966. Sex ratio in fish populations as a function of sexual difference in growth rate. *Curr. Sci.*, 35: 140 – 142.
3. Qasim, S.Z. 1973. An appraisal of the studies on maturation and spawning in marine teleosts from the Indian waters. *Ibid*, 20: 166 – 181.
4. Pillay, T.V.R. 1954. The Biology of gray mullet *Mugil tade* Forskal with notes on its fishery in Bengal. *Proc. Nat. Inst. Sci. India*. 20: 187 – 217.
5. Jhingran, V.G. 1958. Observations on the seaward migrations of *Mugil cephalus* from the lake Chilka for breeding. *Curr. Sci.*, 27: 181 – 182.
6. Avanesov, E.M. 1972. Present spawning conditions of mullets (genus: *Mugil*) in the Caspian Sea. *J. Ichthyol. Vopr. Ikhtiol. Eng. Ed.*, 12 (3): 419 – 425.
7. Das, H.P. 1978. Maturity and spawning in *Mugil cephalus* Linnaeus in Goa waters. *Ibid*. 11: 63 – 71.
8. Chan, E.H. and T.E. Chua. 1980. Reproduction in the green back mullet *Liza subviridis* (Valen). *J. Fish. Biol.*, 16: 505 – 519.
9. Baglin, R.E. 1982. Reproductive biology of Western Atlantic blue fin tuna. *Fishery Bulletin*, 80 (1): 121 – 134.
10. Baglin, R.E. 1982. Reproductive biology of Western Atlantic blue fin tuna. *Fishery Bulletin*, 80 (1): 121 – 134.
11. Lasiak, T.A. 1982. Aspects of the reproductive biology of the Southern mullet *Liza richardsoni* from Algoa Bay. South Africa. *South Africa Zool.*, 18: 89 – 95.
12. Gopalakrishnan, P. and S.R. Thaker. 1988. Studies of the maturation and spawning of gray mullets of a reservoir fishery in Okhamandal (Gulf of Kutch). *CMFRI Spec. Publ.* 40: 56.
13. Gowda, G. and S.L. Shanbhogue. 1988. on the reproductive biology of gray mullet *Valamugil seheli* (Forsk.) from Mangalore waters. *Mahasagar*, 21 (2): 105 – 112.
14. Wijeyaratne, M.J.S. and H.H. Costa. 1988. The food, fecundity and gonadal maturity of *valamugil cunnesius* (Pices: Mugilidae) in the Negombo Lagoon, Sri Lanka. *Indian J. Fish.*, 35: 71 – 77.

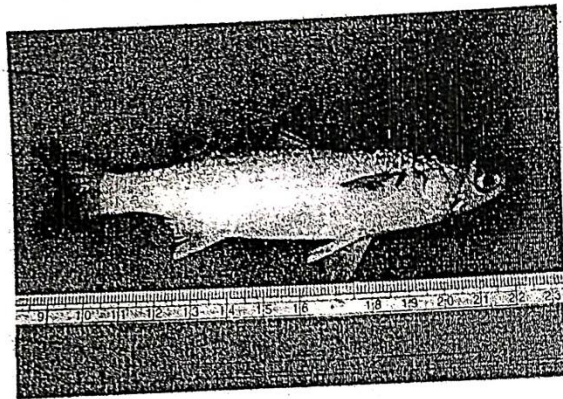
15. Hoda, S.M.S. and N. Qureshi. 1993. Aspects of the reproductive biology of the mullet *Valamugil cunnesius* in Karachi Sind waters. *J. mar. boil. Ass. India*, 35 (1 and 2): 123 – 130.
16. Appa Rao, T. 1991. Some aspects on biology of *Trachnocephalus myops*. *J. mar. biol. Ass. India*. 33 (1 and 2): 433 – 436.
17. Fedulina, V.N. 1991. Influence of the male germ cells on egg fecundation in mullets. *Can. Transl. Fish. Aquat. Sci.*, 5547: 16.
18. Modruson, Z., E. Teskeredzic, and D. Margus. 1991. Frist maturity, seasonal variations of gonadosomatic index, spawning time and annual migrations of gray mullet *Liza (Liza) ramada* Risso, 1826 and *Chelon labrosus* Risso, 1826 from Eastern Adriatic. *Oebalia*, 17 N.S.: 145 – 157.
19. Moiseyeva, E.B., N.A. Mogilmaya, and L.I. Starushenko. 1991. Features of gonadal development in mullet brood stocks (leaping gray mullet, gray mullet, and pacific mullet) rose at the experimental Mullet Hatchery. *J. Ichthyol.*, 31(3): 1 – 15.
20. Gopalakrishnan, A. and P.P. Pillai. 1993. Studies on some aspects of the reproductive physiology of the female gray mullet *Mugil cephalus* L. Mariculture Research under the post graduate programme in Mariculture part – 5 Cochin India *CMFRI* 56 : 129 – 132.
21. Joseph, E. and P.V. Rao. 1993. Studies on the histological and biochemical changes during spermatogenesis of *Mugil cephalus* Linnaeus and related species. Mariculture Research under the post graduate programme in Mariculture part – 5 Cochin India *CMFRI* 56: 37 – 41.
22. Pillay, R.S. and L. Krishnan 1993. Effect of certain environmental factors on developing eggs and early larvae of the mullet *Liza parsia* (Hamilton- Buchanan) Mariculture Research under the post graduate programme in Mariculture part – 2 Cochin India *CMFRI* 53 : 26 – 29.
23. Kuo, Ching-ming. 1995. Manipulation of ovarian development and spawning in gray mullet, *Mugil cephalus* L. *ISR J. Aquacult. Bamidgeh.*, 47 (2): 43 – 58.
24. Moura, I.M. and L.S. Gordo. 2000. Abundance, age, growth and reproduction of gray mullets in Obidos lagoon, Portugal. *Bulletin of Marine Sciences (Bull-Mar-Sci.)*, 67 (2): 677 – 686.

**PLATE - 1**



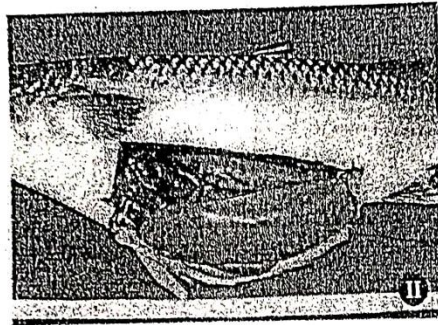
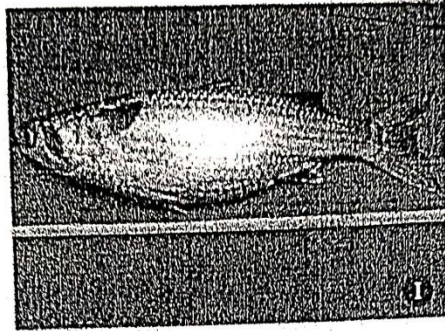
**SATELLITE PHOTOGRAPH SHOWING THE STUDY AREA**

PLATE - 2



**PHOTOGRAPH OF MUGIL CEPHALUS LINNAEUS, 1758**

PLATE - 3



PHOTOGRAPH SHOWING GONADS OF *MUGIL CEPHALUS*

**Table 1**  
**Gonado Somatic Indices (GSI) of female *Mugil cephalus***

S. No.	Month	GSI
1	October, 2005	6.179
2	November, 2005	8.705
3	December, 2005	11.512
4	January, 2006	13.532
5	February, 2006	17.203
6	March, 2006	
7	April, 2006	-
8	May, 2006	
9	June, 2006	-
10	July, 2006	
11	August, 2006	1.276
12	September, 2006	3.268
13	October, 2006	5.325
14	November, 2006	8.547
15	December, 2006	11.214
16	January, 2007	12.588
17	February, 2007	17.443



Table 2  
Fecundity data in females of *Mugil cephalus*

S. No	Length of the fish (cm)	Weight of the fish (gm)	Length of the gonads (cm)	Weight of the gonad (gm)	Fecundity
1	52.4	1.620	19.7	181.670	34,36,184.700
2	48.8	1.360	17.6	171.210	30,68,562.240
3	45.0	1.100	15.3	152.830	26,09,071.980
4	49.0	1.340	18.7	230.530	31,97,428.860
5	52.2	1.620	19.2	286.520	38,56,559.200
6	48.3	1.340	17.2	169.810	29,83,435.420
7	51.3	1.580	19.0	274.640	36,29,890.160
8	45.8	1.250	15.9	154.720	26,91,119.600
9	47.2	1.320	16.4	162.450	28,79,986.930
10	44.7	1.080	14.8	150.230	25,98,199.340
11	49.3	1.310	18.3	227.380	32,63,439.720
12	46.7	1.290	16.5	160.910	27,72,692.380
13	52.1	1.580	19.1	278.640	38,53,462.190
14	45.4	1.220	15.2	158.530	26,82,074.980
15	47.6	1.360	16.7	165.410	28,92,543.470
16	49.8	1.380	18.8	242.580	31,09,376.610
17	48.2	1.330	17.1	210.690	29,79,864.620
18	46.5	1.300	16.3	159.170	27,69,432.170

Figure 2  
Relation between fish length and fecundity in *Mugil cephalus*

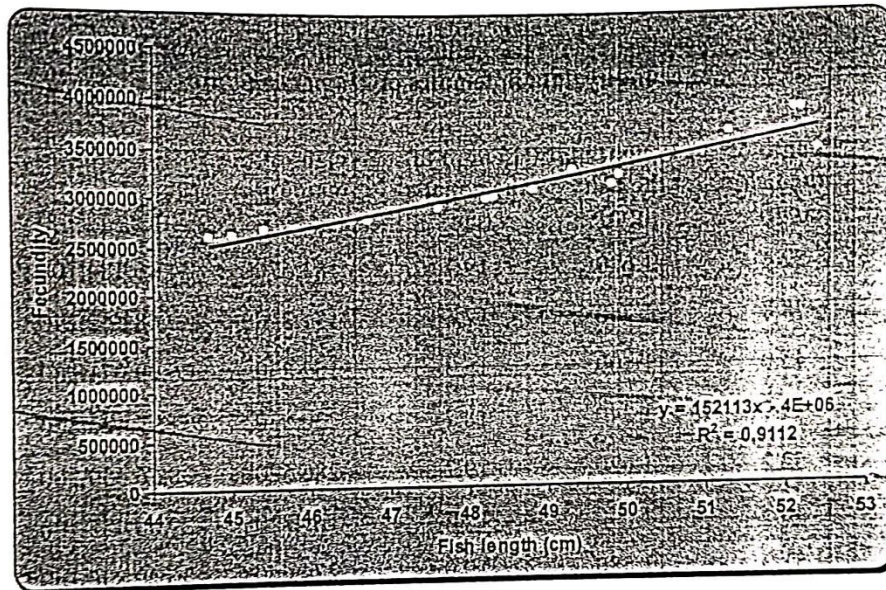
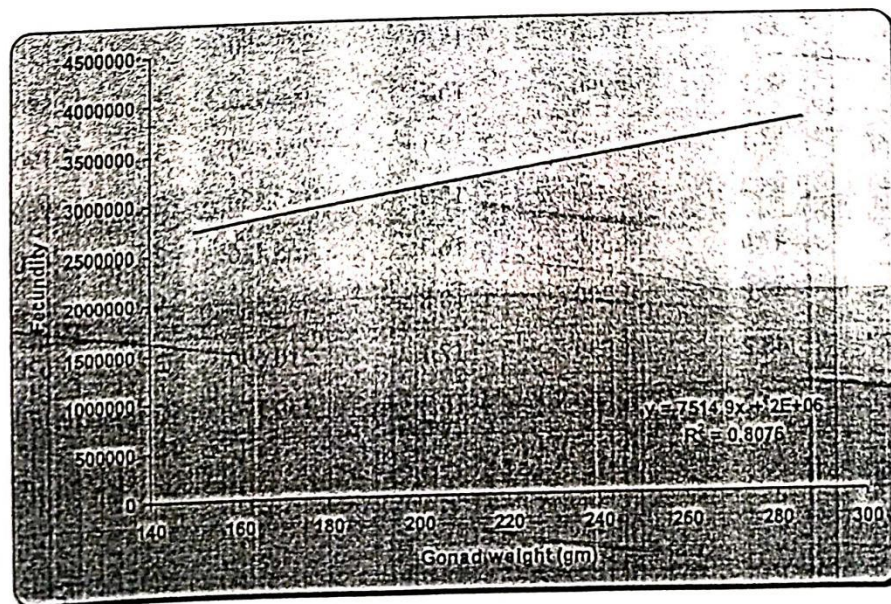


Figure 3  
Relation between gonad weight and fecundity in *Mugil cephalus*



## ORIGIN AND EVOLUTION OF NARSAPUR FROM PRE-HISTORY TO MODERN TIMES

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### Introduction

Narsapuram originated on the bank of the Vasista Godavari, its uniqueness is having a canal on one side and a river on the other. The word Narsapuram is a combination of two words 'Narasa' 'puram'. Based on the epics and puranas like Nrusimha purana says that because of the famous temple of Narasimha swamy, this town was called "Nrusimhapura or Narasimhapura", (the abode of Narasimha). In another view says that it was an abode of nine rishes (nine sages) it was also called "Navarasyran". There is a village called 'Navarasapuram' adjacent to Narsapur.

By the time the Dutch traders came to Narsapur in A.D. 1626, the town was famous for manufacturing the most coveted superfine cloth called "Modupollam" which had a great demand in the European countries. The Dutch called the town "Modapollam" which in course of time called as "Modapallam" and subsequently became famous for the temple of "Madhava" (Sri Krishna) and hence Known as "Madhavapalem".

In the pre- independent days the west Godavari district of the Madras Presidency in which "Narsapur" is an important town. The west Godavari district was formed in A.D. 1925 with its head quarters at Eluru. Among the taluks of west Godavari district, Narsapur taluk is the most populous one.

The Godavari is an important river flowing in the west Godavari district and it is the eastern boundary of Narsapur town. The river falls into the Bay of Bengal near Antervedipalem, which is 9.6 kms of Narsapur. The climate of Narsapur is characterized by a suppressive summer season and good seasonal rainfall. The towns nearer to Narsapur are Palakol, Mogalthur and Anthervedhi. The circumference of Narsapur town is about 11.32 sq. kms.

Narsapur was a Panchayat before A.D. 1901, as per the Madras local Board Act of 1884, the taluk Board of Narsapur was constituted in 1884. A new district board of west Godavari district was constituted in May 1927 after the constitution of new districts in 1925.

### Narsapur from Stone Age to Modern Era

Coming to the pre-historic times, traces of Microlithic culture appeared in the lower Godavari basin. Microlithis were found in association with coarse handmade pottery. After the disintegration of the Maurya Empire, the west Godavari district passed into the hands of the Satavahanas. Inscriptions and coins fixed their home in the area between the Godavari and the Krishna rivers. Narsapur area was ruled and developed for by Gautamiputra satakarni (A.D. 62-86) of the Satavahana dynasty and later by Ikshvakus and Brihatapalayanans ruled the west Godavari district.

Later the Salankayanas 4<sup>th</sup> century A.D. held their sway over the west Godavari district. Ptolemy referred them as 'Salakenoi' with their capital at 'Benagouron' which was identified with 'Vengipura', the modern 'Pedavegi' near Eluru. Hastivarma of Vengi was defeated by Samudragupta, later the Vishnukundins held their sway over this area.

Later Pallavas, Chalukyas ruled this area; western chalukyas king Pulakesin II (A.D. 609 to 642) defeated Madava varma at Kotheti Cheruvu Durgam and occupied west Godavari area by A.D. 611. In a short time, Kubja vishnuvardhana assumed independence and established the Eastern Chalukyan Empire (Vengi Chalukyas) in A.D. 624 with vengi as his capital. Later in A.D. 815 the Eastern chalukyan king Vijayaditya II over ran the Rashtrakutas from Vengi and re-established its glory. Hiuen Tsang travelled in this Telugu country (A.D. 630 - 644) with its capital Vengi (modern Pedavegi)

and noted that the country had a rich fertile land. Later in A.D. 1126 Katama Nayaka appeared to have ruled this area from A.D. 1140-1151. Rajaraja II of the Chalukya-Chola dynasty died in A.D. 1172.

Coming to the medieval period Rudradeva, son of Prola II of the Kakatiya dynasty invaded Vengi in about A.D. 1210. Rudramadevi (A.D. 1259-95) was married to Virabhadra of Niravadyapuram (Nidadavole). In A.D. 1328 Md. Bin Tughlaq defeated Prataparudra of Kakatiya dynasty and occupied Andhradesa.

Among the Reddis of Kondavidu, Anavema Reddy reduced Vengi and other places. The Gajapatis ruled over the west Godavari district as evidenced by an epigraph of A.D. 1448 at Penugonda in Tanuku Taluk. After the Reddis of Kondavidu, west Godavari area was absorbed in the Vijayanagara Empire. Later the district was under the Qutub shahis during the reign of Quli Qutub shah (A.D. 1518-43). It was during the time of Abdullah Qutub shah (A.D. 1556-1605) the Mughals began to interfere actively in the politics of the Deccan.

In the modern period the European came to trade with India. After the death of Nizam-ul-mulk in A.D. 1748 the succession to the throne was disputed and the French raised Salabat Jung. Salabat Jung in A.D. 1753 granted the provinces of Kondapalle, Eluru, Rajahmandry and Chicacole to the French. Gradually by A.D. 1769 the whole of west Godavari came under the control of the British. Subba reddy, a leader of the uprising, gathered a large number of Koyas and killed the village Magistrate of Buthayagudem but later subba reddy and six leaders were captured and hanged. In the ding-dong battles among the Europeans, the English became rulers of this Andhradesa in which Narsapur was a part. By 1901 Eluru, Narsapur and Palakol were recognized as towns.<sup>1</sup>

#### **Madhavayyapalem- A Dutch Port**

The Dutch were the first to break through the commercial monopoly of the Portuguese in the East. They were an adventures maritime people. With a view of getting direct access to the spice markets in South East Asia, the Dutch undertaken several voyages from 1596 and eventually formed the Dutch East India Company in 1602.<sup>2</sup>

Coastal Andhra region has unique importance in the History of India as it was the cradle of the Indo-European maritime trade which contributed mightily to the prosperity of India itself. It is also marked the emergence of Andhra as an important commercial and trading region. Masulipatnam, Nizampatnam and Narsapore were famous for the production of printed cloth.<sup>3</sup>

There were many people and Valendhar came to India and landed at the port of Narsapur. After some time it became popular as Valendhar Port (Revu). Even now it is called the 'Valendhra Revu'. The Dutch buildings, housing the educational institutions, hospitals and port stand as witness of Dutch History.

The Dutch in India it established factories at Surat, Machilipatnam, the other Dutch settlements were at Nagapatnam, Narsapur, Bhimilipatnam and Chinsurah.<sup>4</sup>

#### **Dutch Building: 1626-1873- The Main Building of Sri. Y. N. College, Narsapur**

The Dutch (Holland) came here in 1626 to trade. They constructed factories in the commercial purposes. So Narsapur become a Dutch colony. Here at Madhavayyapalem, they constructed their dwellings, many buildings at Narsapur for carrying their trade. The Dutch carried on the propagation of Christianity. And the missionaries got the women trained in sewing lace.

The buildings, they constructed, were not damaged and they are causing wonder to the spectators. They remained as testimony to the architectural taste of the Dutch. The lace became worldly famous. Madavayyapalem served as port. For navigation purpose they constructed the building. Now they call it as Taylor High school. The Government Hospital building served as Go down to them. One more Castle, another large building used to be their dwelling.

By the time the Dutch left this place, then the sub-collector Taylor entrusted *Atmuri Sarvesam* to convert the Go down building into college. In this connection, Sri Grandhi Venkata Reddy Naidu took so much pain. In construction the main building, the architects displayed wonderful skill. In the

construction of this building, stone-lime, burnt bricks and Burma or Teak wood were used. Though 200 years lapsed, the building remained undamaged. The management of Sri. Y. N. College is taken every step to preserve it safely.<sup>5</sup>

#### References

1. Henry David, *Glimpses of Narsapur*, Narsapur, 2012.
2. Satyanarayana, A, *Madhavayyapalem- A Dutch Port (near Narsapur, West Godavari District, - A.P. Socio-commercial study*, Unpublished M.Phil Thesis submitted to Acharya Nagarjuna University, Guntur, 2005, p. 29.
3. Satyanarayana, K, *A Study of the History & Culture of Andhra*, Vol. II, p. 553.
4. Rao, P.R, *Modern History of Andhra Pradesh*, p. 21.
5. Under the Research Guidance, Dept. of History, Sri. Y.N. College.



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Original Article

Copepod parasites of *Mugil cephalus* Linnaeus (1758) of Vasishta Godavari  
Estuary; East Coast of India  
Family: Anthosomatidae

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Abstract

Studies on parasitic copepods started as early as in 18<sup>th</sup> century. However, in 19<sup>th</sup> century, great strides have been made by many European authors. In India considerable work on copepod parasites of fishes has been attempted. A significant contribution to the knowledge of copepod parasites of West Coast emerged through the works, have been described in a series of papers. Knowledge on copepod parasites of fishes of the East Coast mainly based on the studies. Mulletts occur in abundance in several brackish water localities such as Estuaries, Lakes and Lagoons. The parasitic fauna of mulletts is influenced by the physico-chemical conditions of the environment.

The present study was the first investigation on copepod parasites of commercially important fish from Vasishta Godavari Estuary, East Coast of India. Mulletts were most promising in view of their abundant occurrence in brackish waters in India and their importance as source of inexpensive protein rich food source for man. Economically important fish *Mugil cephalus* Linnaeus (1758) has examined for copepod parasites. Single known species of *Lernanthropus shishidoi* Shiino, 1955, has found from the gills of the host. At present, the material was lodged in the Dept. of Zoology, Andhra University, and Visakhapatnam, India.

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Key words: Vasishta Godavari Estuary, *Mugil cephalus*, Copepod Parasites, *Lernanthropus shishidoi*.

1. Introduction

Mulletts are euryhaline teleosts with circumglobal distribution. They are important in commercial fisheries in several regions of the world including India and in aquacultural operations in many countries where they grow in fresh, brackish or salt waters. While mulletts has been identified as hosts in many general surveys on fish parasites in many regions, detailed knowledge of parasite fauna of mulletts is limited to few regions.

Work on parasites of estuarine fishes is meager despite the fact that the estuarine environment is complex and offers extremely diverse and variable habitats for the hosts and their parasites. A study of host parasite relationship from this zone seemed to make a useful contribution to ecology of fish parasites of the various

species of fish available. Mulletts were most promising in view of their abundant occurrence in brackish waters in India and their importance as source of inexpensive protein rich food source for man.

Studies on the parasitic copepods started as early as in 18<sup>th</sup> century, when Linnaeus [29] reported the *Lerne*a and this was followed by the record of *Caligus* by Muller [31]. However, it was in the 19<sup>th</sup> century, great strides have been made by many European authors. Studies on copepod parasites began to receive increased attention of workers in various parts of the world and accumulated a voluminous literature scattered in many journals of different languages.

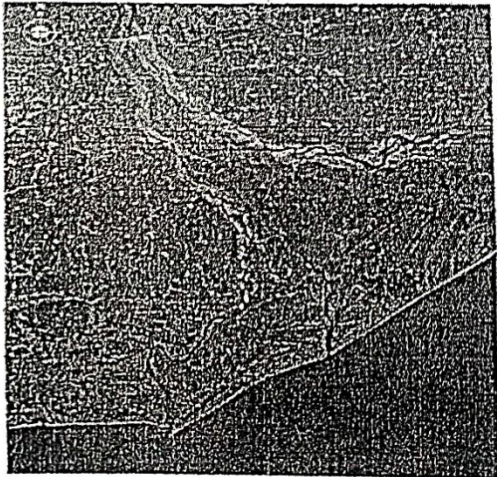
In India considerable work on the copepod parasites of fishes have been attempted. The study received impetus with the work of Bassett-Smith [1-6] who in a

of papers described 30 species which were collected from Bombay, Ceylon and Persian Gulf. Kirtisinghe [24] contributed much to the study of the systematic of copepod parasites of fishes. Yamaguti [56-59] described various copepod parasites from the fishes of Japan. Our knowledge on copepod parasites of fishes of the East Coast is mainly based on the studies of Gnanamuthu [12-22]. Shiino [47-50] worked on copepod parasites of Japanese fish. Yamaguti and Yamasu [60] contributed their descriptions on 26 new species with remarks on 2 known species from the fishes of Japan. Significant contribution to the knowledge of copepod parasites of West Coast emerged through the works of Pillai [32-39] who made an extensive research and obtained rich collections, which have been described in a series of papers. He reviewed the work on copepod parasites in the waters around Indian peninsula and described several species. El-Rashidy and Boxshall [9-11] collected Ergasilid copepods from the gills of grey mullets.

Among other investigators who contributed to the knowledge of copepod parasites of Indian waters are Kurian [25-28], Rao [40, 41], Tripathi [53, 54] Sam Bennet [42, 43], Sebastian [44-46], Silas and Ummerkutty [51], Danifi and Rama Rao [7], Srinivasachar and Sundarabai [52], Malhotra and Jyothi [30], Devaraj and Sam Bennet [8] and John and Nair [23]. Uma Devi and Shyamasundari [55] worked on the parasitic copepods from coastal waters of Visakhapatnam. The works of Rao [40, 41] needs special mention as these studies relate to the fish of Visakhapatnam Coast.

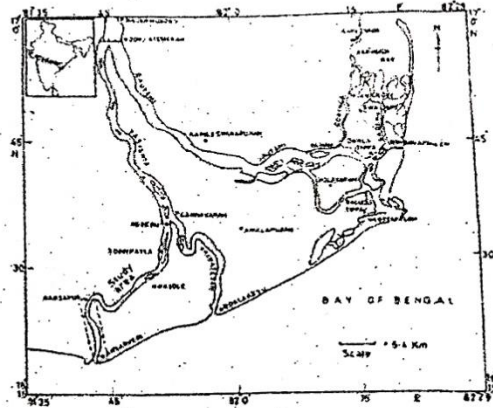
## 2. Materials and Methods

The Coastal and brackish water regions of Andhra Pradesh coast support several species of mullets. Of these, three species namely *Mugil cephalus* (Linnaeus), *Liza macrolepis* (Smith) and *Valamugil cunnesius* (Valenciennes) are commonly occur in Vasishta Godavari Estuary (Fig.1, Fig. 2).



SATELLITE PHOTOGRAPH SHOWING GODAVARI ESTUARINE SYSTEM

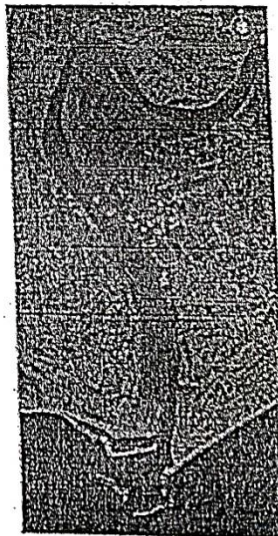
Fig.1.



GODAVARI ESTUARINE SYSTEM

Fig.2.

Practically no information, except only a handful of taxonomic descriptions is available on the parasitic fauna of these fishes. In view of this, the present investigation on parasites of *M. cephalus* (Linnaeus) from Vasishta Godavari Estuary has been undertaken for the first time (Fig.3, Fig. 4), with a view to make an analysis of the parasitic fauna of the fish and effects of various macro and micro environmental factors on the parasitic fauna.



SATELLITE PHOTOGRAPH SHOWING THE STUDY AREA

Fig.3

The mullet samples required for the present study were collected from selected locations in the Vasishta Godavari Estuarine system at Anthervedhi (Lat. 16°18.990'N; Long. 81°43.538'E) towards the upstream direction up to Narsapur (Lat. 16°26.900'N; Long.

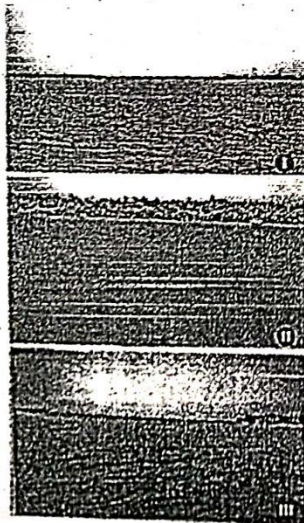


STUDY AREA WITH SURROUNDING CREEKS

Fig.4

81°42.340'E) during the period from October 2005 to December 2006.

Altogether, three sampling stations fixed in the study area (Fig. 5). The first station (Station I) is located



FIELD PHOTOGRAPHS OF SAMPLING STATIONS

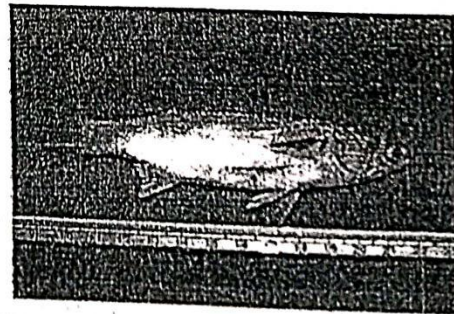
Fig.5

near the confluence of the river which is about 1km from its mouth at Anthervedhi. The second station (Station II) is located at Darbharevu, which is about 8 km from the

confluence between Station I and Station III. The third station (Station III) is located at Narsapur, which is about 15 km from the confluence in the upstream direction.

Monthly trips were organized to these stations, for collecting fish samples, a fishing boat was engaged and anglers were employed. Anglers operated four different types of nets for collection of mullets namely the cast net, bag net, drag net and enrich circling net.

The fish *M. cephalus* (Fig. 6) brought to the laboratory with plastic bags and buckets. The host data such as standard length, weight etc., of the fish noted. All the organs of the fish including scales, fins, gills, stomach, intestine liver and muscles examined separately for parasites. The parasites found collected and preserved for further studies.



PHOTOGRAPH OF MUGIL CEPHALUS LINNAEUS, 1758

Fig.6

Copepod parasites commonly found on both Elasmobranch and Teleost fishes. These parasites inhabit



various regions in the body of the fishes. Most of the parasites found in the branchial chamber attached to the gill filaments. These parasites which inhabiting the branchial chamber attached to the gill filaments remain undisturbed even after the death of the host. However, those parasites attached to the skin of the host are likely to get detached while handling the fishes.

To collect these parasites, which inhabits at gill filaments, the gill filaments cut and carefully teased with a fine needle into a petri plate. Little quantity of water added to the residue and examined under a binocular microscope. The parasites collected from the branchial cavity covered with mucous. Instead of putting the parasites directly into the fixative, it is necessary to remove the adhering mucous with sodium bicarbonate solution. After this the parasites were washed with tap water and then put in 5% Formalline, which makes the parasites opaque and make the observation difficult. For this purpose, Lactic Acid is used to get the material transparent. For making whole mounts, Formalline fixation is sufficient. After fixing the parasites in Formalline for few hours, the specimens were washed with tap water and stained with Alum Caramine followed by Rhodamine B and then washed in a graded series of alcohol, cleared in Xylene and then mounted with Canada balsam.

Diagrams were drawn with the aid of Camera Lucida. Measurements were taken with the help of Ocular Micrometer. All the measurements in the text were given in millimeters.

### 3. Results

Order: Copepoda  
 Sub order: Caligoida  
 Family: Anthosomatidae  
 Genus: *Lernanthropus* Blainville  
 Species: *Shishidoi* Shiino, 1955a.

*Lernanthropus shishidoi* Shiino, 1955a.

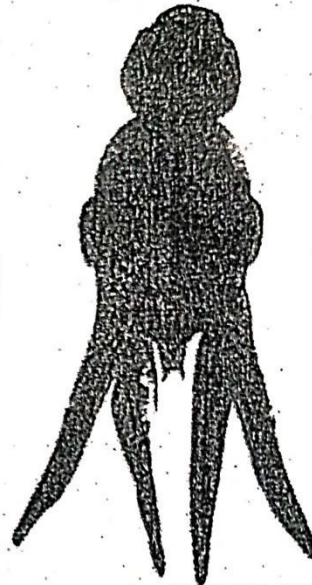
*Lernanthropus shishidoi* Shiino, 1955a; Yamaguti, 1963; Kirtisinghe, 1964; Pillai, 1964.

The copepods are crustaceans, like shrimps or crabs, with the segmented body covered with a chitinous carapace similar to the pieces of armour. Their size ranges from some tenths of a millimeter to a couple of centimeters, although most commonly they are around one millimeter in length. In general, their body is semitransparent, but in occasions they exhibit different colours, from reddish or green. They are the most frequent organisms of the zooplankton, can be found at all latitudes and depths.

#### 3.1 Female

Cephalothorax, anterior division of trunk and the dorsal plate nearly circular and sub equal in size. Cephalothorax with antero-lateral and postero-lateral parts somewhat angular. Antennular lobe large and well defined. Anterior division of trunk is longer than cephalothorax and connected to the later by a short neck. Dorsal plate postero-laterally produced into large rectangular lobes with rounded tips. Fifth and genital segments fused. Abdomen is long and swollen. Caudal rami oblong with five setae (Fig. 7, Fig. 8).

Antennule is six-jointed, basal segment very large. Antenna is strong, basal segment swollen, with proximal



PHOTOGRAPH SHOWING DORSAL VIEW OF FEMALE LERNANTHROPUS SHISHIDOI SHIINO, 1955

Fig.7



TOP : DIAGRAM (DORSAL VIEW) OF FEMALE LERNANTHROPUS SHISHIDOI SHIINO, 1955  
 BOTTOM : DIAGRAM (VENTRAL VIEW) OF FEMALE LERNANTHROPUS SHISHIDOI SHIINO, 1955

Fig.8

inner spine, distal segment short, stout, very slightly curved claw with a proximal spine. Each lobe of the maxillulae is with two spines. Basal segment of maxilla is stout, distal half of inner border of distal segment serrate. Maxillipedis

well curved stout distal segment carrying a median inner spine, proximal part of basal segment with two prominent swellings carrying strong spines.

Basipod of first leg is with rows of sharp denticles and inner stout spine and outer slender seta. Exopod is comparatively very broad, with five short but stout irregularly barbed teeth, endopod small, without armature. Second leg similar to first but much smaller, inner seta on basipod absent, exopod with one of the five teeth small, endopod longer than that of first. Third leg small, uniramous and longitudinally folded. Fourth leg is biramous, exopod longer than endopod, as long as the body. Fifth leg is absent.

### 3.2 Male

Segmentation of the body is distinct. Cephalothorax is large and circular. Antennular lobe is distinct but less projecting than in female. Second, third, fourth and fifth trunk segments and genital segment free. Abdomen is nearly as long as broad. Caudal rami are oblong, with two proximal and two distal setae. Genital segment posterolaterally produced on either side of the abdomen. Third leg is uniramous, narrowing and directed outwards. Fourth leg long and biramous, similar to that of female. Fifth leg is setiform (Fig. 9, Fig. 10).



PHOTOGRAPH SHOWING DORSAL VIEW OF  
MALE LERNANTHROPUS SHISHIDOI SHIINO, 1955  
Fig. 9

Host- *Mugil cephalus*

Habitat- Vasishtha Godavari Estuary, East Coast of India.

The present specimens have the divisions of the body more clearly marked than shown by Shiino. The claws on the exopod of legs one and two are dentate. This species has several unique characters making its recognition easy. This species is the major gill parasite of Anthosomatidae occurring on the host. It is interesting to



TOP : DIAGRAM (VENTRAL VIEW) OF  
MALE LERNANTHROPUS SHISHIDOI SHIINO, 1955  
BOTTOM : DIAGRAM (VENTRAL VIEW) OF  
MALE LERNANTHROPUS SHISHIDOI SHIINO, 1955

Fig. 10

note that while *L. Shishidoi* occurs on both the gill filaments. A total of six females and three males were obtained in the present study.

### 4. Discussion

Mulletts are important in commercial fisheries in several regions of the world including India and in aquacultural operations in many countries where they grow in fresh, brackish or salt waters. The Vasishtha Godavari Estuary is one of the major Estuaries, which opens into Bay of Bengal on the East Coast of peninsular India. During the present study on the metazoan parasite fauna of *M. cephalus* of Vasishtha Godavari Estuary revealed that mulletts acts as hosts for many species of metazoan parasites comprising one species of parasitic copepod *M. cephalus* had a species rich copepod fauna. Six parasitic copepods were recorded from *M. cephalus*. Even though the fish species has a circumglobal distribution and it has been studied well for copepod parasites.

Seventy-four species of parasites so far recorded from mulletts from Indian region. It is possible that the mulletts restricted diet and predilection for benthic food would result in less diversity. The rather exceptional nature of the parasite fauna may be explain by the hydrographic regime of the estuary where the salinity fluctuates markedly and only few intermediate hosts that could withstand variations in salinity in the estuary. This results in depletions in the parasitic fauna of fishes, in the estuary of which the mulletts are dominant.

In any study dealing with parasitism, attention must be on the aspects of the host biology. Therefore, in the course of pre investigation, to fulfill this requirement, the size, sex and maturity state of each fish were examined. Copepod parasites commonly found on both Elasmobranch and

host fishes. These parasites inhabit various regions in the body of the fishes. Most of the parasites found in the branchial chamber attached to the gill filaments. These parasites which inhabiting the branchial chamber attached to the gill filaments remain undisturbed even after the death of the host. The present specimens have the divisions of the body more clearly marked than shown by Shiino. The claws on the exopod of legs one and two are dentate. This species has several unique characters making its recognition easy. This species is the major gill parasite of Anthosomatidae occurring on the host. It is interesting to note that while *L. Shishidoi* occurs on both the gill filaments. A total of six females and three males were obtained in the present study.

The present results, however, clearly show that despite the high variability in body size of the female when compared with male. The results obtained in the present study are very much correlated with the results expressed by the earlier workers revealed world over.

#### 5. Conclusions

During the past few decades, there is growing interest in the study of ecological aspects of parasitism in fishes with the principal aim of unraveling in the intricate interrelationship that exists among the host, parasite and environment. Work on parasites of estuarine fishes is meager despite the fact that the estuarine environment is complex and offers extremely diverse and variable habitats for the hosts and their parasites. The physico-chemical and biotic features of the brackish waters are complex and ecological factors such as transparency, temperature, salinity, dissolved oxygen and pH are subjected to extensive variations, which made an extensive research and obtained rich collections. The brackish water environment of the estuary does not prevent disease outbreaks due to parasitic copepods by preventing pathogenic marine or fresh water species to enter the estuary.

Vasistha Godavari Estuary is one the major estuaries of East Coast of India which opens into Bay of Bengal. It supports several species of mullets, of these, three species namely *Mugil cephalus* (Linnaeus), *Liza macrolepis* (Smith) and *Valamugil cunnesius* (Valenciennes) are commonly occur.

The present study on the metazoan parasite fauna of *M. cephalus* of Vasistha Godavari Estuary revealed that mullets acts as hosts for many species of metazoan parasites comprising one species of parasitic copepod *M. cephalus* had a species rich copepod fauna. Six parasitic copepods were recorded from *M. cephalus*. Even though the fish species has a circumglobal distribution and it has been studied well for copepod parasites. A total of six females and three males were obtained in the present study.

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#### References

1. Bassett-Smith, P.W. A list of the parasitic copepoda of fish obtained at Plymouth. Mar. boil. Ass. n. s. 4 (2) (1896) 155-163.
2. Bassett-Smith, P.W. Notes on the parasitic copepoda of fish obtained at Plymouth, with description of new species. Ann. Mag. Nat. Hist. 18 (1896) 8-16.
3. Bassett-Smith, P.W. Some new parasitic copepods found on fish at Bombay. Ibid. 1 (7) (1898) 1-17.
4. Bassett-Smith, P.W. Further new parasitic copepods found on fish in the Indo tropic region. Ann. Mag. Nat. Hist. 2 (7) (1898) 77-98.
5. Bassett-Smith, P.W. Some new or rare parasitic copepods found on fish in the Indo tropic region. Ann. Mag. Nat. Hist. 2 (7) (1898) 357-372.
6. Bassett-Smith, P.W. A systematic description of parasitic copepoda found on fishes, with an enumeration of the known species. Proc. Zool. Soc. London. Pt. 2 (1899) 438-507.
7. Danil, A. and K.V. Rama Rao. Parasitic copepoda, *Caligus polycanthi* Gnanamuthu infesting a halistil fish, from South Eastern Indian Ocean. Curr. Sci. (India) 36 (21) (1967) 582-583.
8. Devaraj, M. and P. Sambennet. *Pennellainstrueta* Wilson (copepoda) parasitic on the sail fish *Istiophorus platypterus* (Shaw and Nodder). Indian J. Fish. 19 (1/2) (1972) 171-175.
9. El-Rashidy, H. and G.A. Boxshall. Ergasilid Copepods (Poecilostomatoida) from the gills of primitive mugilidae (gray mullets). Syst. Parasitol., 42 (3) (1999) 161-186.
10. El-Rashidy, H. and G.A. Boxshall. Biogeography and phylogeny of Paraergasilus Markevich, 1937 (Copepoda: Ergasilidae) with descriptions of two new species from the gills of grey mullet. Jour. of nat. Hist. 35 (12) (2001) 1807-1819.
11. El-Rashidy, H. and G.A. Boxshall. New species and new records of Ergasilus Nordmann (Copepoda: Ergasilidae) from the gills of grey mullet (Mugilidae). Syst. Parasitol. 51 (1) (2002) 37-53.
12. Gnanamuthu, C. P. A new copepod parasite *Clavellius dussumieriae* belonging to the subfamily Clavellinae from the gills of Madras fish. Proc. Zool. Soc. Lond., 117 (1947) 743-755.
13. Gnanamuthu, C. P. *Lernanthropus clavae* sp. nov. a copepod parasite on the gills of *Scoenoglaucus* from Madras. Rec. Indian Mus., 45 (1947) 291-298.
14. Gnanamuthu, C. P. *Caligus clavae* n. sp. parasitic on *Scoenoglaucus* from Madras. Proc. Indian Acad. Sci., 25 (1947) 43-49.
15. Gnanamuthu, C. P. Notes on the anatomy and physiology of *Caligus clavae* sp. a parasitic copepod from Madras plankton. Proc. Zool. Soc. Lond. 118 (1948) 591-606.
16. Gnanamuthu, C. P. A new copepod parasite *Lernanthropus dussumierian* sp. from the gills of a marine fish. Parasitology. 39 (1948) 209-213.

- Gnanamuthu, C. P. Two male parasitic copepods from Madras. *Ann. Mag. Nat. Hist.*, (12) 2 (1949) 359-367.
18. Gnanamuthu, C. P. *Lernaepodas tromatei* n. sp. a copepod parasite of the gray pomfret. *Proc. Indian Acad. Sci.*, 31 (1950) 175-180.
19. Gnanamuthu, C. P. Three new species of lernaecid copepods parasitic on South Indian fish. *Ann. Mag. Nat. Hist.*, (12) 4 (1951) 77-86.
20. Gnanamuthu, C. P. Studies on a lernaecid copepod *Cardiodectes anchorellae* Brain and Gray. *Proc. Zool. Soc. Lond.*, 121 (1951) 237-252.
21. Gnanamuthu, C. P. Three lernaecid copepods parasitic on South Indian fishes. *J. Parasit.* 39 (1953) 1-8.
22. Gnanamuthu, C. P. Lernaecid copepods parasitic on flying fish. *Parasitology*, 47 (1957) 119-125.
23. John, S.E. and N.B. Nair. Structure of the mouth tube and method of feeding in *Lernaenicus hemirhamphi* Kirtisinghe - a parasitic copepod. *Zool. Anz.* 190 (1/2) (1973) 35-40.
24. Kirtisinghe, P. *Gloiopotes watsoni* n. sp. and *Lernaenicus seeri* n. sp. parasitic copepods of fish from Ceylon. *Parasitology*, 26 (1934) 167-175.
25. Kurian, C.V. Diconomic structure and development of *Caligus russellii* sp. nov. parasitic copepod on the scorpion fish *Pterols russellii* (Van Hass) Bull. Res. Inst. Univ. Travancore. 1 (1950) 1-21.
26. Kurian, C.V. Parasitic copepods of Travancore-Cochin. *Ibid.* 4 (1955) 103-116.
27. Kurian, C.V. Parasitic copepods of fishes from Kerala. Bull. Res. Inst. Univ. Kerala. 8 (1961) 63-77.
28. Kurian, C.V. Mulllets and mullet fisheries of India. *Aquaculture*, Vol. 5(1) (1975) 114.
29. Linnaeus, C.A. *Fauna suecica*. Stockholmiae 1<sup>st</sup> ed., (1746).
30. Malhotra, Y.R. and M.K. Jyoti. A new copepod parasite *Lernaea kashmirensis* n. sp. (Lernaecidae, Lernaecinae) infecting stone bach of Kashmir. *Vestn. Cesk. Spol. Zool.* 36 (2) (1972) 119-122.
31. Muller, O.F. Entomostraca, seu Insecta testacea quae in aquis Daniae et Norvegiae reperit, descripsit, et iconibus illustravit. Leipzig and Copenhagen (1785).
32. Pillai, N.K. Copepods parasitic on South Indian fishes. Pt. I. Caligidae. *Bull. Res. Inst. Univ. Kerala*, 8 (1961) 87-130.
33. Pillai, N.K. Copepods parasitic on South Indian fishes. Families Lernaepodidae and Neobranchidae. *J. mar. biol. Ass. India*, 4 (1962) 58-94.
34. Pillai, N.K. Three new species of anthosomid copepods parasitic on South Indian fishes. *J. Parasit.* 48 (1962) 613-617.
35. Pillai, N.K. Copepods parasitic on South Indian fishes. Family Anthosomidae I. *J. Bombay nat. Hist. Soc.*, 60 (1963) 570-655.
36. Pillai, N.K. Copepods parasitic on South Indian fishes. Family Caligidae. *J. mar. biol. Ass. India*, 5 (1963) 68-96.
37. Pillai, N.K. Copepods parasitic on South Indian fishes. Family Anthosomidae 2. *J. Bombay nat. Hist. Soc.*, 61 (1964) 45-59.
38. Pillai, N.K. Copepods parasitic on Indian marine fishes. A review. *Proc. Symposium on Crustacea, Cochin* 1967. 5: 1556-1680.
39. Pillai, N.K. Description of a new species of *Norion* (Copepoda Anthosomatidae) and re-description of the type species *N. expansus* Nordmann. *Crustaceana*, 15 (1968) 1-14.
40. Rao, T.S.S. On a new Caligid parasite from the Indian hammer headed shark. *Proc. Indian Acad. Sci.* 31 (1950) 302-307.
41. Rao, T.S.S. On a new Caligid parasite *Gloiopotes zeugopteri* sp. nov. from *Xiphias zeugopteri*, Lawsons Bay Waltair. *Ibid.* 34 (1951) 249-255.
42. Sam Bennet, P. *Peroderma cylindricum* Heller. a copepod parasite of *Sardinella albella*. *J. Mar. Biol. Ass. India* 3 (1/2) (1961) 70-74.
43. Sam Bennet, P. *Pumiliopsis spathepedes* sp. nov. of acyclopoid copepod parasitic in the eye of *Sardinella sirm.* *J. Mar. Biol. Ass. India* 16(1) (1974) 156-160.
44. Sebastian, M.J. Observations on a few parasitic copepods from South India. *Bull. Dep. Mar. biol. Oceanogr. Univ. Kerala*, 2 (1966) 19-25.
45. Sebastian, M.J. *Cardiodectes krishnai* a new species of lernaecid copepod from the fish *Vinciguerria lucetia* (Garman). *Crustaceana*. Suppl. 1 (1968) 136-140.
46. Sebastian, M.J. and K.C. George. *Lernaenicus anchoviellae* n. sp. (Copepoda, Lernaecidae) parasitic on *Anchoviella bataviensis* (Hardenberg) with descriptions of its three post-larval stages. *Ibid.* 6 (1964) 235-240.
47. Shiino, S.M. Copepods parasitic on Japanese fishes 5. Anthosomidae. *Rep. Fac. Fish. Perfect. Univ. Mie*, 2 (1955) 50-69.
48. Shiino, S.M. Copepods parasitic on Japanese fishes 12. Family Lernaepodidae. *Rep. Fac. Fish. Perfect. Univ. Mie*, 2 (1956) 269-311.
49. Shiino, S.M. On *Lernanthropus cornutus* Kirtisinghe found in Japanese waters. *Rep. Fac. Fish. Perfect. Univ. Mie*, 5 (1965) 375-380.
50. Shiino, S.M. Parasitic copepods of Eastern Pacific fishes. 7. *Lernaenicus Hemirhamphi* Gnanamuthu. *Rep. Fac. Fish. Perfect. Univ. Mie*, 5 (1965) 435-440.
51. Silas, E.G. and A.N.P. Ummerkutty. Parasites of Scombroid fishes, Part II. Parasitic copepoda. *Proc. Symposium on Scombroid Fishes*, held at Mandapam Camp from Jan. 12-15, 1962. Part III (1967) 886-993.
52. Srinivasachar, H.R. and A. Sundarabai, A new copepod parasite *Lernaea* sp. nov. on a Cyprinodont fish *Lebistes reticulatus* (Peters). *Curr. Sci.* 40 (17) (1971) 453-455.
53. Tripathi, Y.R. Parasitic copepods from Indian fishes. 1. Family Chondracanthidae. Milne Edwards 1840. *J. zool. Soc. India*. 12 (1960) 51-59.
54. Tripathi, Y.R. Parasitic copepods from Indian fishes III.

- Family Anthosomatidae and Dichelesthiidae.  
*Proc. First All India Congr. Zool.*, 2 (1962) 191-217.
55. Uma Devi, D.V. and K. Shyamsundari. *Ph. D. Thesis submitted to Andhra University, Visakhapatnam.* Copepod Parasites of Marine Fishes of Andhra Coast including some aspects of Histo-chemistry. 1976.
56. Yamaguti, S. *Parasitic copepods from fishes of Japan* Pt. 2 Caligoida I (1936) 1 - 22.
57. Yamaguti, S. *Parasitic copepods from fishes of Japan* Pt. 3 Caligoida II (1936) 1 - 21.
58. Yamaguti, S. *Parasitic copepods from fishes of Japan* Pt. 5 Caligoida III Vol. Jubil, Yoshida, 2 (1939) 443-527.
59. Yamaguti, S. *Parasitic copepods from fishes of Japan* Pt. 6 Lernaeopodidae I. Vol. Jubil, Yoshida, 2 (1939) 529-627.
60. Yamaguti, S. and T. Yamasu. Parasitic copepods from fishes of Japan with descriptions of 26 new species and remarks on two known species. *Biol. J. Okayama Univ.*, 5 (1959) 89-165.

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**ASSESSMENT OF ENVIRONMENTAL POLLUTION OF  
WATER FROM IRRIGATION CANALS OF GODAVARI DELTA  
SYSTEM**

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**INTRODUCTION:** Water is one of the most precious component of our natural resources, and responsible for the existence of life on earth. It supports life system and its shortage has been to main concerns of human beings. Environmentalists and social scientists are warning about the availability of fresh water to human consumption after 2020 AD. Almost all the developing countries are going to face shortage of fresh water for human consumption 2020 AD. Industrialization, development of civilization and population growth have increased dependence on natural resources, Which are fast depleting. Availability of fresh water is a must for human consumption. The present paper mainly deals with the fresh water pollution in irrigation canals of Godavari delta system from its source of generation (Dowlaiswaram Barrage) up to the field input.

Generally the canal water in Godavari delta system will be utilized for water requirements of irrigable crops as well as for drinking purpose in the region.

As regards pollution of fresh water in irrigation canals of Godavari Delta system, two important aspects are to be considered. One is pollution of canal water from source of generation (Dowlaiswaram barrage) to field input, while the fresh water is being carried through



irrigation canals. Another is due to pollution caused to canal water by disorderly development of prawn / fish culture in the region.

Apart from the above, there are industrial pollutants (due to large scale industrialization) etc. while they being allowed to flow into irrigation canals and drains causes pollution.

**MATERIALS AND METHODS** : water samples were collected from the irrigation canal of Gdari at seetharampuram over a period of 4 months from Jan 2016 to April 2016. Water quality parameters were studied through standard method by Qadir et al.(2008).  $p^H$  was recorded by Digital  $p^H$  meter.

Dissolved Oxygen in water sample is calculated by Classic Winkler's titration method. Conductivity is calculated by Digital conductivity meter and Turbidity by Digital Turbidity meter. Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) were estimated by using the standard methods for examination of Water (APHA., 1995).

#### **RESULTS AND DISCUSSION :**

1. Pollution of canal water from its source of Generation (Dowlaiswaram Barrage) To field input due to human activity.

Generally the canal water, from reservoirs or barrages are drawn through main canal, and distributed through branch canals, distributaries, field channels to the field. As far as Godavari deltas is concerned, the irrigation canals and branch canals are passing through many of the towns, village, hamlets, hutments etc. The main source of drinking water in the villages is through village drinking water tanks, fed by irrigation water.

The million dollar questions asked now are : 1) Who is responsible for the above situation 2. What are the existing Acts/ laws to control the situation 3. What are the remedial measures?



The people at large and encroachers and hutment dwellers who have encroached into govt. land/ poramboke in particular are responsible for the above situation.

The water (Prevention and control of pollution ) Act, 1974 authorized Central government to constitute the central pollution control Board” to exercise the powers conferred on and to perform the functions assigned to the board under the Act and Section -4 of the above Act, authorized the State Government, to constitute State Boards.

If the canal water are to be made, free from pollution, the encroachments on the either side of the canals and canal berms (public lavatories) are to be evicted. All the sewage water freely flowing into the canal is to be stopped. Public awareness is to be created among the people not to throw objectionable matter such as garbage, sewage waste, human and animal wastes etc. into the irrigation canals. It is a socioeconomic problem; the State Government must take) effective measures to maintain drinking water quality parameters as shown in the table : 1.

Supreme Court in M.C. Mehta Vs. Union of India in Ollium Gas Leakage case (AIR 1987, Sc 1086) have evolved “the Rule of absolute Liability” developed from the rule of Strict liability and awarded damages to the Victims. The Wrong doers are to be punished under “absolute liability” for which on defence is available. The same principle must be applied in case of offenders of water pollution, who ever may be.

Civilization and Industrialization has made mans pursuit for development more difficult. From the time immemorial, the drinking water tanks are source of fresh water for drinking purpose in the villages, in preference to urban areas. Now the position has change. They are no more fresh water or private water resources for drinking





purposes. This is due to large scale water pollution in canals from its source of generation to field input.

All the irrigation canals are passing by the towns, Villages, hamlets hutments, carrying fresh water. There is considerable waste land i.e. government or poramboke (canal poramboke or drain poramboke) available on either side of delta canals or drains, allowing for possible widening of canals / drains at a later stage. Thanks to the foresightedness of "Apara Bhagiratha" Sir Arthur Cotton, the eminent british Engineer, who constructed Godavari Anicut (old) and canal system in the year 1854. At present all the canal banks and berms are encroached and occupied by local people for construction of dwelling houses, pucca lavatories etc. thus allowing all human waste/effluents into fresh water canal. The canal banks and berms are the open lavatories on the village nearby. For many of the Villages and towns, the main outlets of drainage and sewage water are irrigation canals only. The irrigation canals which are passing nearby the villages and towns are the dumping yards for the human and animal wastes sewage etc. In some places, the medical and surgical wastes and industrial wastes are dumped into fresh water canals. By the time the water reaches the tail end, it is contaminated with the full of the said effluents

S.NO.	Name of the Sample	Sample Value
1	Drinking Water	
2	Conductivity	121 $\mu$ S
3	p <sup>H</sup>	7.5
4	DO	3 PPM
5	Turbidity	2 NTU
6	BOD	1.5
	COD	2.5



Canal Water		
1	Conductivity	0.459 ms
2	p <sup>H</sup>	8.0
3	DO	5 PPM
4	Turbidity	15 NTU
5	BOD	2.6
6	COD	20.5

TABLE : 1 SHOWING DRINKING AND IRRIGATION CANAL WATER PARAMETERS

NTU = Nephelometric Turbidity Unit

ppm = parts per million (mg / lt)

p<sup>H</sup> = Hydrogen Ion Concentration

ms = milli semines

μs = micro semines

## II. Pollution of fresh water due to disorderly development of prawn / Fish Culture:

Seafood has created a sensation in the world trade because of its health attitude. It is the fastest moving commodity with persistent demand and high unit value. Seafood sector is growing into a multibillion dollar, with immense potential for the future.

Prawns are the largest contribution to Indian fishing exports, accounting for an export share of 22 in volume, 48 in value prawns exports have been growing steadily from India in the recent years, mainly due to increase in production from capture as well as from culture. The export of marine products from India amounted to 3500 crores in the year 1995-96 and it stood at 6400 crores in the year 2000-



01. Sea food exports alone constitute above 3.14 of the gross export earnings of our contry, which is a vital to the Indian economy.

In view of the good return of prawn / fish culture, many of the irrigation lands under paddy cultivation are being converted into prawn/fish tanks, in Godavari Delta, Including that of "Coastal Regulation Zone". This indiscriminate conversion of paddy fields is causing water pollution, including imbalance in eco-system.

In general the  $p^H$  values ranges from 7.4 to 8.0 in seetharampuram canal water from Jan 2016 to April 2016. DO content of canal waters showed a variation ranging from 3 ppm to 5.6 ppm. DO concentrations were observed lowest from April and highest from March. Lowest BOD were observed from 2.0 to 2.9 mg/lit. COD varied from 12.0 to 23.0 mg/lit during Jan and April. Highest COD were observed in the month of February and followed by April. When DO is reduced to 3 ppm, the fishes will die, high BOD level indicates that the levels of DO are falling with its potentially dangerous effect on living organisms in the water body. COD is always higher then BOD because more compounds are chemically oxidized than those which are Biologically degraded in unpolluted Water. Due to sewage disposal, industrial effluents, Eutrophication, Unscientific Agricultural practices, fish culture and acidic nature of canal water leads to pollution of drinking water(Table : 2)

**TABLE 2 : SHOWING THE WATER PARAMETERS OF SEETHARAMPURAM CANAL FROM JANUARY TO APRIL 2016.**

S.NO	PARAMETER	JANUAR Y	FEBRUAR Y	MARC H	APRI L
1	$p^H$	8.0	7.4	7.4	7.5
2	DO	5.2	5.5	5.6	3.0
3	BOD	2.0	2.9	2.5	2.6
4	COD	12.0	23.0	15.0	20.5



The question of prohibiting of regulating aquaculture, prawn culture. And shrimp culture came up for consideration for the Apex Court in S. Jagannath Vs. Union of India (Air 1997 Sc 811)

The Court gave the following directions in this case :

1. We declare that the notification issued in G.O. Ms.No.120, dated 04-10-1999 is valid.
2. No pisci culture/aquaculture should be permitted to be undertaken with the Kolleru lake sanctuary, G.O.Ms, No.120,dated 4.10.1999 shuld be permitted.
3. State shall ensure for removal of all encroachments of Kolleru lake bed area(G.O.Ms.No.120)

The method of irrigation adopted in Godavari delta is by "flooding method" mainly of "strip border method". In this the irrigable land is leveled and divided into suitable size ablong plots by 0.30 mt. high field lands into a number of long and narrow strips. Water is allowed at the head or upper end of each strip and it flows along the strip in the form of a thin 5 to 7.5 cm stretch of water to the lower end of the strip.

The irrigation system is mainly from field to field initially. The drainage water from one plot is collected and discharged into filed drainage. The drainage system is not pucca as that of canal system. With the result the drainage water from upper field will flood over the adjacent field to join to nearest drainage course.

Under this process of filed to field irrigation, the drainage water of upper field will be input for lower field. This process of water utilization will not cause any effect so far as all the field block is under cultivation. If some land is under prawn / fish culture, the drainage water of prawn / fish tanks will be input for irrigation



land. The problem has been aggravated due to smaller plots of land holding by the ryots, in Godavari delta.

Due to successive use of same water for different tanks, apart from change of physical and chemical properties. The water will acquire “dielectric characteristics”. Ultimately the water gets polluted and will not be suitable for drinking purpose.

### CONCLUSION :

It is asocio – economic problem. No Government can ill afford to loose the tremendous foreign exchange earnings out of seafood exports. More over small and marginal formers are dependent on culture.

The only solution seems to be segregation of total irrigable land under delta system into two zones, one for raising irrigable crops and another for cultivating Prawn / fish tanks. The land surrounded by fisherman villages must be classified as zones for culture. Both central and state government and people in particular are responsible for the large scale pollution of canal water. It ia a violation of fundamental rights, guaranteed to the citizen. The supreme court has banned raising of culture in “Coastal Regulation zone”.

Public awareness is to be created among the people not to throw objectionable matter such as garbage, sewage waste, human and animal wastes etc. into the irrigation canals. It is a socioeconomic problem. Public education, training of researchers and health professionals is an essential part of out come of irrigation canal water pollution. In this regard every body should follow the hygienic conditions and maintain purity of water, reduce BOD and COD levels and maintain quality of drinking water.



**References:**

- 1) APHA, AWWA, WPCF (1989): Standard Methods for the examination of water and Waste Water, 17th Ed (Clescerina, L.S. Eds., Trussell, R.R., Greenberg, A.E.), APHA, Washington D.C. U.S.A.
- 2) Assadian, N.W., DiGiovanni, Enciso G.D., Iglesias, J., Lindemann, W., (2005): The transport of water borne solutes and bacteriophage in soil subirrigated with a wastewater blend *Agric. Ecosys Environ* 111: 279-291.
- 3) BIS (1991): Bureau of Indian Standards, Indian Standard Specification for Drinking water IS 10500: 2-4.
- 4) Chattopadhyay Srikumar and Rani, L.S. (2005): Water quality variation as linked to land-use pattern: A case study in Chhalakudy river basin, Kerala, *Current science*, volume 89, no12 Chemical factors in Sathiyar reservoir, *Hydrobiologia*, 70: 103-117.
- 5) Dhirendra, M.J., Alok Kumar, and Namita Agrawal, (2009): Studies on Physicochemical parameters to assess the Water Quality of river Ganga for drinking purpose in Haridwar district, *Rasayan J. Chem.* 2: 195-203.
- 6) Doyle, M.P. (1990): Food borne illness: Pathogenic E.coli, Y. enterocolitica and Y parahaemolyticus. *Lancet* 336: 1111-1115.
- 7) Ford, T.E. (1990): Microbiological Safety of Drinking water, United States and Global Perspectives, *Environ Health Perspect* 107:191.
- 8) Gaikwad, V.B. (2000): Water quality monitoring of Godavari river in and around Nashik, Ph.D. Thesis Submitted to University of Pune, India.
- 9) Qadir, A. et al., (2008) Spatio – temporal variations in water quality of Nullah Aik – tributary of the river Chenab, *Pakistan Environmental Monitoring and Assessment*, 140: 43 – 59.



**STUDIES ON FISH PRESERVATION METHODS OF MEGA AQUA FOOD PARK, TUNDURRU, WEST GODAVARI DT**

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**Introduction**

Union Minister of Food Processing industries Harsimrat kaur Badal on February 12, 2019 commissioned Godavari Mega Aqua Food Park at Tundurru Village in Blumavaram mandal, West Godavari District, Andhra Pradesh. The Park is promoted by Godavari Mega Aqua Food Park Pvt. Ltd. It will be the first Mega Aqua Food Park Operationalized exclusively for fish and marine Products processing in the state of Andhra Pradesh as we know that fish is an easily available source of protein. It is highly nutritious and easily digestible. In India, edible fishes are abundantly available from sea, rivers, lakes, ponds and marshes. Fish is also an item of export trade. Fish body contains proteins, fats, minerals, vitamins, amino acids, iodine, phosphorus and large amount of water. Thereafter dead fishes get spoiled by the process of decomposition and hence proper fish preservation techniques or methods are essential. Moreover, fishes are also provided with a variety of bacteria which immediately attack on the various body constituents of fish after death. In this light, preservation of fishes is an essential process. There are several different methods or techniques generally practiced in our country as well as abroad for fish preservation. Preservation techniques are needed to prevent fish spoilage and lengthen shelf life. They are designed to inhibit the activity of spoilage bacteria and the metabolic changes that result in the loss of fish quality. Spoilage bacteria are the specific bacteria that produce the unpleasant odors and flavors associated with spoiled fish. Fish normally host many bacteria that are not spoilage bacteria, and most of the bacteria present on spoiled fish played no role in the spoilage. To flourish, bacteria need the right temperature, sufficient water and oxygen, and surroundings that are not too acidic. We have to manage strong and peculiar method preservation. So that its frequency of spoiling can be greatly decreases. For the preservation of fish spoilage. There are many types of process in which some are very popular methods of preservation like, drying, canning, icing, etc. All this process is categorized under physical and chemical method of fish preservation and they are as following.

**Fish Preservation Methods**

**A. Chilling or refrigeration**

In this method, the basic idea is to preserve the fish at 0°C which prevents the spoilage for short period. At this temperature, the rate of decomposition of body tissue is drastically reduced and fish is preserved. For this purpose, ice is the best material used. Alternate layers of fish and ice are kept in closed vessels to maintain the temperature at 0°C. Sometimes for the preservation of large sized fishes, the ice pieces or cubes are also kept in the abdominal cavity of gutted fishes. This is cheaper and convenient method of fish preservation and widely used for fish transport from one place to another of short distance.

**B. Deep freezing**

This method of fish preservation is used for large periods of preservation. It is more effective but costly process. Before freezing, fishes are washed properly and kept at a temperature of -18°C for longer period. For this process, only the fresh fish in good condition are deep frozen. Prior to keep the fish in this process the heads of large fishes are removed and they are also gutted and washed. This process is without spoilage and fishes can be kept for a longer period.

**C. Freeze drying**

This process is lengthy as well as expensive and used for the presentation of only good quality of frozen at -20°C by keeping them in freezing chamber. As soon as freezing is over, the frozen fishes are kept in trays and are transferred to the cabin containing horizontal heating plates for drying in vacuum. The fishes are well dried due to hot plates and then they placed in air-conditioned chamber.

**D. Salting**

Salting is very old and common practice used in fish preservation in India and other parts of the world. Salting is nothing but the partial dehydration of fishes by osmosis with sodium chloride. Due to intense salting, microbes are killed and diseases is stopped. In this process before salting, the heads of the fishes are removed, gutted and washed and then salted as soon as possible. There are different methods of salting such as dry salting, cold salting, light or strong salting.

**a) Dry salting**

In this method, alternate layers of fish and salt are placed. This is called dry salting.

**b) Wet salting or brine**

In this process, the fishes are dipped in salty water called brine. The brine or salt water is used of two different concentrations. In light brine salt concentration is 16% and strong brine is used containing 25% salt. After this salt water treatment, the fishes are dipped in salt.



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- E. Cold salting**  
 ➤ Strong Salting process is performed at the normal room temperature. Salting is very common practice adopted by fishermen near sea shores. The small sized fishes are sun dried and preserved for longer period.
- F. Drying**  
 ➤ This is also a very old common practice of fish preservation adopted by tropical countries like India, Japan, China and others where sun rays are very powerful to dry the fishes easily. Sunlight is the cheapest and abundant source of heat energy used for drying purpose. By this method small sized fishes are dried. The fishes are kept for dehydration on a mat or anything for 3 to 5 days and during this period turning over the fishes is continued. After complete dehydration, the dry fishes can be stored. These dried fishes are also used for making fish fertilizer. The larger fishes are cut into pieces for easy drying. However, this method is not perfect for longer preservation.
- a) Sun curing**  
 It is a little bit advanced method over simple sun drying in which body of fish is opened from the ventral side and viscera and gills are removed. Then the fish is washed and salted in ratio of 1:3 to 1:8 (salt: fish) which is related with the size of fish.
- b) Mona curing**  
 It is similar to sun curing but difference is that no incision is made in the body of the fish to remove the intestine and gills. These organs are directly removed from mouth. Further such eviscerated fishes are cleaned, salted and dried as earlier.
- c) Wet curing**  
 It is also like sun curing with the only difference in the packing of salted fish as such. This method is used only for fatty fishes.
- G. Canning**  
 ➤ Canning is expensive of fish preservation and hence it is not commonly used. However, it is widely used in advanced countries like America, France, Japan and Spain. This is lengthy, complicated but very advanced process of preservation. In this process, the best quality fishes are selected and their heads and viscera are removed. Then these eviscerated fishes are treated with brine (salt water), washed, dried and cooked in olive oil. This process is used to remove excess of water for 2 to 5 minutes. Then the cooked fishes are packed in olive oil in tins and sealed and sent to markets.

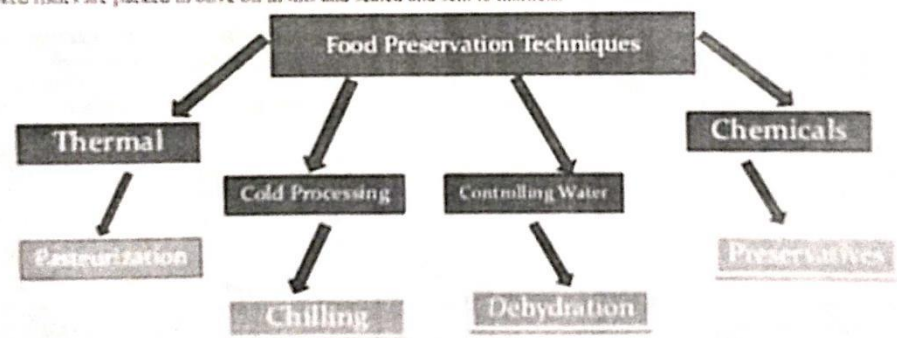


Fig: Fish- food Preservation Techniques

- Fish Products**
- Value addition is one of the most practical ways to increase the profitability in fish processing and sale in domestic as well as international markets. It is also becoming a market requirement as the wholesale traders, retail outlets and finally the consumers are on the lookout for fish products that require minimum preparation.
  - Some of the value-added fish products, fish pickles, fish flakes, wafers, fish noodles.
  - Fish sausage is the ground fish meat with various ingredients (additives) like salt, sugar, starch, spices, fat, chemicals, etc., packed in a synthetic casing, properly sealed, boiled and cooled product. In other words, fish sausage is a ready to eat professional food which is heat processed. (Table: Fish sausage ingredients)





## Fish sausage Ingredients

Ingredients	Percentage
1. Minced fish meat	70.0%
2. Salt	2.0%
3. Sugar	1.5%
4. Polyphosphate	2.0%
5. Spices	1.0%
Coriander	0.3%
Chili powder	0.3%
Pepper	0.2%
Garlic	0.1%
Ginger	0.1%
6. Mono Sodium Glutamate	0.2%
7. Preservatives	0.2%
8. 5% color solution	0.13%
2% of carmosine	
3% of ponceau	
9. Starch	9.0%
10. Cold water	10.0%
11. Fat/ Vegetable Oil	5.0%

## ECONOMIC IMPORTANCE OF FISH PRESERVATION

Fishes are one of the most important group of vertebrates serving as food for human. They possess a great economic, nutritional, medicinal, industrial, aesthetic and religious values as well as providing employment for millions of people in the world. They contribute to food security in many regions of the world, providing a valuable supplement for diversified and nutritious diets. Consumption of fish has several health, nutritional, environmental and social advantages.

- I. **Food Value:** Fish serves as an important food for human. Edible tissue of fish is appreciably greater than that in chicken, pig and sheep goat. For example, approximately 65% of the raw weight of finfish is eaten, compared with 50% of chicken and pigs, and 40% of sheep goat. Fish are supported by water but terrestrial animals and birds require comparatively strong bones as they spend their substantial energy into the growth of the bones, which cannot be consumed as food. The total estimated fish production of the world in 2012 was 158 million metric tons with a per caput consumption around 19.2kg.
- II. **Nutritive value:** Fish is highly nutritious. It provides tasty, low-calorie meal but is a good source of high-quality protein. Fish is an almost zero carbohydrate food, good for diabetes and other such patients. The protein content in fishes varies from 15-30% on wet weight basis and 60-80% on dry weight basis. The protein of food highly digestible and with well-balanced amino acids. Fish are low in fat and cholesterol. Fish is a good source of vitamins - A, B and D and also offers a good source of calcium, iodine, fluorine, magnesium and zinc. Fish are rich in poly-unsaturated fatty acids containing omega-3. Two poly-unsaturated fatty acids present in fish, eicosa pentaenoic acid (EPA) and docosa hexaenoic acid (DHA), collectively known as Omega-3, are essential fatty acids. They cannot be produced in human body, but are essential in the diet.
- III. **Medicinal value:** Fish is low fat, high in protein and an excellent source of omega-3 fatty acids. Regular consumption of fish can reduce the risk of various diseases and disorders. Some research findings indicate the following:
  - Asthma:** Children who eat fish are less likely to develop asthma.
  - Brain and eyes:** Fish rich in Omega-3 fatty acids can contribute to the health of brain tissue and the retina of eyes. The IQ level of children whose mother consumed about 340 g fish per week during pregnancy was found higher than non-fish eaters. Similarly, breastfed babies whose mother eat fish have better eyesight, perhaps due to the Omega-3 fatty acids transmitted in breast milk.
  - Cancer:** The Omega-3 Fatty acids in fish reduce the risk of many types of cancers by 30 to 50 percent, especially of the oral cavity, esophagus, colon, and breast, ovary and prostate.
  - Cardiovascular disease:** Eating fish every week reduces the risk of heart disease and stroke by reducing blood clots and inflammation, improving blood vessel elasticity, lowering blood pressure, lowering blood fats and boosting good cholesterol.



**Dementia:** Elderly people who eat fish or seafood at least once a week may have a lower risk of developing dementia, including Alzheimer's disease.

**Depression:** People who regularly eat fish have a lower incidence of depression. Depression is linked to low levels of Omega-3 fatty acids in the brain.

**Diabetes:** Fish may help people with diabetes to manage their blood sugar levels.

**Prematurity:** Eating fish during pregnancy may help reduce the risk of delivering a premature baby.

Further, it is observed that different fishes are used as Ayurvedic medicines which help in treatment of duodenal ulcers, skin disease, night blindness, weakness, loss of appetite, cough and cold, Bronchitis, Asthma, tuberculosis, etc.

**IV. Fish products**

- a. **Fish Meal:** The dried and ground preparation of unused or trash fish is called fish meal and is a highly nutritive product that makes an excellent feed for poultry, pig, cattle and fish. Fish meal contains about 60-70% crude protein, 2-15% oil and 10-20% minerals. The protein of fish meal is highly digestible and contains all amino acids.
  - b. **Fish oil:** Fish oil of two kinds, body oil and liver oil. The oil extract from the whole body of the fish is called fish body oil. For the extraction of body oil, the fishes are minced, steamed, and then pressed for oil recovery, then subject to filter for refining. It is very rich in iodine. The fish body oil is mostly used in manufacture of paints, varnishes, soaps, lubricants, candle, printing inks etc.
  - c. **Fish silage:** Fish silage is a liquid or semi liquid product made from whole or part of the fish that are liquefied by the action of enzymes in the fish in the presence of an added acid (hydrochloric or sulfuric acid). The enzymes down fish Proteins into smaller soluble units, and the acid helps to speed up their activity while preventing bacterial spoilage.
  - d. **Fish flour:** Fish flour is made up of dried and powder fish. It is a superior quality of fish meal which is used for human consumption. It is considered an ideal protein source to supplement diet. It can be mixed with wheat or maize flour and used for enriching the nutritive value of bread, biscuits, cakes etc.
  - e. **Fish manure and guano:** Low grade, inedible fish and offal from the fish canning factories, fish salting plants, fish filleting plants and other fish processing industries are utilized to prepare the fish manure. These reduce are dried, ground, mixed with ash and converted into manure.
  - f. **Fish glue:** The gelatinous adhesive material obtained from the connective tissues of skin and bones of certain fish, principally cod fish, is called fish glue. It is used in gummed tape, letterpress printing, plates, blue print paper and adhering the wood, leather, glass, etc.
  - g. **Isinglass:** Isinglass is a substance obtained from the dried swim bladders of fish. It is a high - grade collagen used mainly for the clarification of wine, beer and vinegar. It can also be cooked into a paste for specialized gluing purposes.
  - h. **Fish leather:** The coarse scaly skins of several fishes are used for manufacturing, polishing and smoothing materials in place of sand paper. The dried and processed skin is also used for preparing high quality shoes, moneybags, suitcases, belts, phone cases, etc.
  - i. **Fish fin:** The fins of the sharks and rays are used to make tasteful sauce and soups. It is a popular soup item of Chinese usually served at special occasions such as weddings and banquets, or as a luxury item in Chinese culture.
  - j. **Fish pearls:** The material obtained by scraping the silvery coating of the scales of Certain fishes is used for polishing the hollow glass beads. These beads are then filled with wax and marketed as artificial pearls which are used as jewelry.
- V. **Biological control:** Many species of carnivorous fishes' prey upon insects and their larvae in water. These fishes can be used to control harmful insects, mosquito larvae, etc. *Gambusia affinis* is a well-known fish for mosquito fish.
  - VI. **Sports and games:** Sport or recreation fishing is the fishing for pleasure or competition. Sport fishing can be done in a variety of ways. The most common form of sport fishing is done with a rod, line and hooks with baits, called angling. The most common sport fishes of Nepal are sahar, aala and rainbow trout.
  - VII. **Decorative value:** Many species of colored fish are kept in aquarium, oceanarium, ponds and lakes for decoration or ornamentation. The common ornamental fish species kept in an aquarium in Nepal are gold fish, gourami, robera fish, guppy, fighting fish, etc.
  - VIII. **Employment opportunity:** Fisheries and Aquaculture sector provide, either directly or indirectly, a great employment opportunity for millions of people around the world. In 2012, about 500 million people were directly engaged in the world, part time or full time, in production of fish either by fishing or in aquaculture.



References

1. M.N. Moorigini (1998). Fish Processing in India, New Delhi, ICAR
2. Charles L. Cutting (2002). Fish Processing and preservation.
3. Fisheries and Aquaculture (2008) Globalization and Fisheries: Proceedings of an OECD- FAO Workshop (<https://books.google.com/books?id=gQnPR413eN0C&pg=PA254&dp=22Fish+paste%22&hl=en&SA=X&ei=6VfKTw4K86jAAh8d21B2&ved=0CNgBEQgBMBw#v=onepage&q=22Fish%20paste%22&f=false>) Organization for Economic Co-operation and Development OECD Publishing, ISBN 978964037762.
4. Huss III (1988) Quality and quality changes in fresh (<http://www.fao.org/docrep/v7180e/v7180e00.htm>) FAO Fisheries Technical paper 348, Rome, ISBN 92-5-103507-5.
5. FAO Preservation Techniques: (<http://www.fao.org/fishery/topic/12322/en>) Fisheries and Aquaculture department, Rome. Updated 27 May 2005. Retrieved 14 March 2011.
6. FAO Handling of fish and fish products (<http://www.fao.org/fisher/topic/12321/en>) Fisheries and Aquaculture department, Rome. Updated 27 May 2005. Retrieved 22 July 2012.
7. Kauffeld M, Kawaji M and Egol PW (Eds.) (2005). Handbook on ice slurries fundamentals and engineering international institute of Refrigeration. ISBN 978-2-913149-42-7.
8. "Deepchill™ Variable - State Ice in a Poultry Processing Plant in Korea" (<http://www.sunwell.com/suntech13.htm>) Retrieved December 4, 2010.
9. Results of Liquid Ice Trails aboard Challenge II" (<https://web.archive.org/web/20160129173242/http://www.seafoodscotland.org/images/stories/downloads/pdf/libraryOfPublications/2challeng.pdf>) (PDF). April 27, 2003. Archived from the original (<http://www.seafoodscotland.org/images/stories/downloads/pdf/libraryOfPublications/2challeng.pdf>) (PDF) on January 29, 2016. Retrieved December 4, 2010.)

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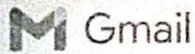
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