BEFORE THE NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH, NEW DELHI.

OA No. 1004/ 2024

IN THE MATTER OF:-

Prahlad Roy Goenka & Anr.

APPLICANTS

Versus

Union of India & Others

RESPONDENTS

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RESPONDENT No. 4

(Vivek Chandel)IAS
Director-cum-Warden of Fisheries,
Himachal Pradesh.

Director-cum-Warden of Fisheries,
Himachal Pradesh, Bilaspur

Through Advocate General, Himachal Pradesh

THROUGH COUNSEL

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NOTARY
Sudarshan Kumar Jagota
Sub-Division
Bilaspur
Regd. No. 431
Expiry Date: 13-07-2022
Govt. of Himachal Pradesh

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BEFORE THE NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH, NEW DELHI

OA No. 1004/ 2024

IN THE MATTER OF:-

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RESPONDENTS

Reply to the OA No. 1004/2024 on behalf of Respondent No. 4.

NOTARY Sudershan Kumar Jagota Sub Division Bilaspur Regd. No. 43 Expiry Date : 13-07-2028 Govt. of Himachal Pradesh

MAY IT PLEASE YOUR LORDSHIP:-

PRELIMINARY SUBMISSION:-

That the Department of Fisheries, Himachal Pradesh i.e. Respondent No. 4 seeks to clarify the facts regarding the population of Golden Mahseer, particularly in the Gobind Sagar Reservoir. To enhance Mahseer conservation and production, the department has established a Mahseer Fish Farm at Machhyal in District Mandi, Himachal Pradesh, aimed at producing high-quality Mahseer fish seed for stocking in the State's rivers, rivulets, lakes, and reservoirs.

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The Department of Fisheries is diligently implementing the Himachal Pradesh Fisheries Act, 1976, ensuring compliance with all its provisions through judicious management. As a result, the department anticipates surpassing Mahseer fish production figures from the past three years.

Furthermore, the department enforces a two months fishing close season from June 16th to August 15th every year to facilitate auto breeding of the fishes. It is humbly submitted that complete ban on fishing is not feasible because in reservoirs composite fish catch includes more than 50 fish species which is a major livelihood option for more than 6000 reservoir fishermen of the State. However, Mahseer is just a fractional part of this catch, but cannot be avoided due to open fishing in the reservoirs through gill net method. Similar is the case with riverine fisheries, where more than 6000 riverine fishermen earn their livelihood from fishing in open rivers and composite fish catch can't be avoided. Fishing in reservoirs and rivers is strictly regulated under the H.P. Fisheries Act, 1976, and the H.P. Fisheries Rules 2020 (Copy of H.P Fisheries Act 1976 and H.P Fisheries Rules 2020 enclosed as Annexure-R1), particularly regarding the prohibition of undersized gill nets and cast nets, to enhance fish production across the State.

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Himachal Pradesh, Bilaspur

Due to the department's continuous and rigorous efforts to increase fish production in the Gobind Sagar Reservoir, there has been a significant boost in the overall population of various fish species, including Mahseer. As a result, the department expects to exceed last year's (2023-24) Mahseer fish production from 10.54 MT to 11.50 MT of the current FY (2024-2025) (Copy of data of Mahseer fish production in Gobind Sagar Reservoir enclosed as Annexure –R2)

Reply on merits :-

I-II That the contents of these paras need no reply being formal in nature.

III(1-4) That the contents of these paras need no reply being formal in nature.

III(5-8) That the contents of the para do not pertain to Respondent No. 4, hence need no reply.

III(9) That the contents of this para are admitted to the extent that Golden Mahseer is the State Fish of Himachal Pradesh. The Department of Fisheries, Himachal Pradesh is making all possible efforts to propagate and conserve the population of Golden Mahseer in the State. For this purpose department has established a Mahseer Fish Farm at Machhyal in District Mandi with aim to increase good quality Mahseer fish

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seed production for stocking in State's reservoirs, rivers and rivulets. As a result of effective conservation measures like frequent/active patrolling by officials of the department, the department is able to detect on an average 862 illegal fishing cases and realize corresponding compensation of Rs.5,16,200/- per annum in the State (The figures includes progress of last two years and current FY 2024-25 till 15th January 2025). The Mahseer seed production at Mahseer Fish Farm Machhyal District Mandi is increasing which can be seen from the available data of last three years (including current year till 31st January 2025) as under:

S.No.	Financial Year	No. of Eggs produced	No. of Early fry produced
1.	2022-23	21000	15000
2.	2023-24	104600	55448
3.	2024-25	168050	115343

III(10) That the contents of this para are admitted to the extent that the Golden Mahseer Fish is found in major rivers, rivulets and reservoirs of the State. Department is making every possible effort for

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conservation of Mahseer Fish and also adopting the scientific phenomenon for seed stocking in all water bodies which are favorable for Mahseer Fish.

III(11) That the contents of this para are partially admitted to the extent that the production of Golden Mahseer has shown a declining trend in the State of Himachal Pradesh in past few years. However, department is continuously stocking good quality seeds of various fishes in different rivers, rivulets and reservoirs of the State. For the first time in 2024 the Department of Fisheries, Himachal Pradesh has stocked 20000 No. fish fingerlings of Golden Mahseer Fish in Pong reservoir, 13500 No. in Gobind Sagar reservoir, 2800 No. in Beas river and 410 No. in Kol Dam to strengthen Golden Mahseer population. Besides this department is effectively undertaking conservation measures like frequent/active patrolling across the State, due to which department has been able to detect 767 illegal fishing cases in financial year 2022-23, 901 illegal fishing cases in financial year 2023-24 and 920 illegal fishing cases

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in financial year 2024-25 (till 15th January), corresponding fine of Rs. 4,63,550 , Rs. 5,39,910 and Rs.5,45,140/- for the respective years has been imposed and deposited in State Treasury. Based upon the above measures, the department expects to exceed last year's (2023-24) Mahseer fish production from 10.54 MT to 11.50 MT of the current FY (2024-2025).

III(12) That the contents of the para do not pertain to Respondent No. 4, hence need no reply.

III(13) That the contents of this para are admitted to the extent that the ecological environment of major Himalayan rivers, rivulets, lakes and reservoirs are ecologically suitable for rehabilitation and breeding of Mahseer Fish.

III(14) The contents of this para are partially admitted as it is true that Golden Mahseer live near or at the top of the aquatic food chain and therefore conserves other flora and fauna of the aquatic ecosystem, however being a top carnivore in the ecosystem can be harmful for growing juveniles of other fish species.

III(15) That the contents of this para are admitted to the extent that the Department of

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Fisheries is quite vigilant for conservation of Mahseer Fish by means of Organizing Angling competitions and conducting various awareness camps to spread awareness among the masses aiming to popularize and increase the population of Mahseer. For conservation of Golden Mahseer, Department of Fisheries, Himachal Pradesh in 2024 has stocked 20000 No. fish fingerlings of Golden Mahseer Fish in Pong reservoir, 13500 No. in Gobind Sagar reservoir, 2800 No. in Beas river and 410 No. in Kol Dam to strengthen Golden Mahseer population. Photographs of the Angling Competition and seed stocking are hereby enclosed as Annexure- R3.

III(16-17) That the contents of these paras do not pertain to Respondent No. 4, hence need no reply.

III(18) The contents of Para III{(18) of (l)} are partly admitted in the context that introduction of non-native species may have negative effect on the Golden Mahseer population. However non-native species like Silver fish are the major source of livelihood for more than 3000 fishermen of

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the Gobind Sagar Reservoir, hence cannot be avoided. Present stocking density of such non-native species in Gobind Sagar Reservoir is based on recommendations given by ICAR-CIFRI, Barrackpore, Kolkata (Copy of Scientific study (Investigation on fisheries & Ecological Status, Threats & Remedial Measures For Enhancement of Fish Productivity of Gobind Sagar Reservoir, Himachal Pradesh) conducted by ICAR-CIFRI Barrackpore Kolkata, Annexure R4). Other contents of the para are admitted.

III(19) That the contents of the para do not pertain to Respondent No. 4, hence need no reply.

III(20) That the contents of this para are admitted to the extent that the Golden Mahseer has been listed as an endangered species by IUCN (International Union for Conservation of Nature and Natural Resources). However, Department of Fisheries, Himachal Pradesh is doing honest efforts to conserve this species through controlled seed production and its subsequent stocking in Mahseer friendly waters and through its conservation efforts

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as explained in para- III(9) above.

III(21-28) That the contents of these paras do not pertain to Respondent No. 4, hence need no reply.

III(29) That the contents of this para are not admitted as there is neither large scale poaching in the State nor any case of dynamite fishing reported in last three years due to department's rigorous/active patrolling throughout the State. Further, Section 6 of Himachal Pradesh Fisheries Act 1976, provides punishment of imprisonment which may extend up to 3 years, against dynamite fishing.

III(30) That the contents of the para do not pertain to Respondent No. 4, hence need no reply.

III(31) The contents of this para are partially admitted in respect of Pong Dam reservoir and Gobind Sagar reservoir on the basis of available data of previous years with respect to Mahseer Fish production is as under:

S.No	Financial Year	Gobind Sagar (MT)	Pong Dam (MT)
1	2021-22	14.83	15.75
2	2022-23	14.88	19.49
3	2023-24	10.54	30.39

We can observe an increasing trend of

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Production in both reservoirs except for Gobind Sagar in 2023-24. The same was due to massive devastation caused by monsoon in the year 2023 which badly impacted the production of Gobind Sagar reservoir. However, department is expecting to surpass the production figures of 2023-24 for Mahseer production in Gobind Sagar reservoir in the current financial year as well as in the upcoming years too.

III(32-44) That the contents of these paras do not pertain to Respondent No. 4, hence need no reply.

III(45) The contents of this para are admitted to the extent that Mahseer Fish Farm has been established at Machhyal, Joginder Nagar, District Mandi and after successfully raising Mahseer brood stock in captivity, now this farm has started contributing in Golden Mahseer breeding under captive conditions in Hatchery. For the first time in 2024, 20000 No. fingerlings of Golden Mahseer produced at this farm have been stocked in Pong Reservoir ,13500 No fingerlings in the Gobind Sagar Reservoir, 2800 No. in Beas river and 410 No. in Kol Dam.

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III(46) That the contents of this para are partially admitted to the extent that Department is increasing seed stocking activity, conservation activities, prohibiting of undersize Mahseer fish catch and efforts for restoration of natural habitat in different water bodies of the State. However, the construction of Barrages, Dams and Hydro Power Projects are not in control of the department as these are the Government policies which are controlled by the State/Centre Government in larger public interest. Additionally, it is submitted that a complete ban on fishing is not feasible because in reservoirs composite fish catch includes more than 50 fish species and Mahseer is just a fraction of it. Also fish catch is a major livelihood and traditional occupation of fishermen community in the State reservoirs, which includes livelihood of more than 6000 fishermen families.

III (47) That the contents of this para do not pertain to Respondent No. 4, hence need no reply.

IV That the contents of this para partially pertain to Respondent No. 4.to the extent that the Department strictly enforces

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Himachal Pradesh Fisheries Act 1976 including its section 3 as such.

V That the contents of this para need no reply being formal in nature.

VI (A-E) That the contents of this para mentioned under sub paras A to E are admitted to the extent that Department of Fisheries Himachal Pradesh abides by the directions of Hon'ble Supreme Court of India and NGT orders as well as all Articles of the Constitution of India, which includes Article 48A, Article 51 A and Article 51 A(g). However, the department is making honest efforts for conservation of the Golden Mahseer across all the water bodies of the State, the explanation for the same to avoid repetition can be referred from Preliminary submission, Paras III(9),III(11),III(29) and III(45).

VI(F-J) That the contents of this para mentioned under sub para F to J do not pertain to Respondent No. 4, hence need no reply

VI(K) That the contents of this para are denied to the extent that there is no large scale poaching in the State of Himachal Pradesh as Department of Fisheries, imposes two

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months fishing close season from 16th June to 15th August every year during monsoon season when fishing is completely banned in State general waters to encourage natural breeding of the fishes including Mahseer.

VI(L) That the contents of this para mentioned under sub para (L) do not pertain to Respondent No. 4, hence need no reply

VI(M) That the contents of this para mentioned under sub para (M) are admitted to the extent that Fish Pass has been constructed/ provided by the Larji Hydro Electric Project authorities. However, to make it fully effective Department is taking up the matter with the Larji HEP authorities.

VI(N) That the contents of this para mentioned under sub para (N) are admitted to the extent that department is concerned for development and conservation of Fisheries in water bodies of the State. However, the monitoring technology to track movement of various fish species, providing valuable data for adaptive improvement rather than adopting "fit and forget" approach requires a lot of scientific and research knowledge. Hence this work pertains to the scientists of

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reputed Fisheries institutes like ICAR-CIFRI of the country.

VII That the contents of this para need no reply being formal in nature.

VIII It is, therefore, prayed that keeping in view the facts and circumstances explained here-in-above the present petition devoid of any merit and the same may kindly be dismissed in the interest of justice.

Place:- Bilaspur **Respondent No. 4**

Dated:- 2nd March 2025

(Vivek Chandel)IAS
Director-cum-Warden of Fisheries,
Himachal Pradesh

THROUG COUNSEL

For ADV. SHIMPY SHARMA
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Sukhwinder Kumar Jaswal
Sub Division
Bilaspur
Regd. No. 43.
Expiry Date : 13-07-2027
Govt. of Himachal Pradesh

BEFORE THE NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH, NEW DELHI

OA No. 1004/ 2024

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AFFIDAVIT

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I, Vivek Chandel (IAS) S/O Sh. Man Singh Chandel, aged 47 years, holding the post of Director-cum-Warden of Fisheries, Himachal Pradesh, Bilaspur do hereby solemnly affirm and declare as under:

I) That the reply to the CWP No. 1004/2024 petition has been prepared at my instance and I have gone through the contents of paras 1 to 47 as well as paras of preliminary submission which are true and correct to the best of my knowledge and belief on the basis of information as derived from the official record. No part of it is false and nothing material has been concealed therefrom.

Identified by S.K. Jagota Adv

II) I, the above deponent further State on oath that this affidavit of mine is true and correct. No part of it is false and nothing material has been concealed therefrom.

ATTESTED

Verified on 2nd day of March, 2025 at Bilaspur.

...firmed that the above/overleaf was declared before me on oath affirmation on 2nd March day of 2025 at Bilaspur in the Distt. of .... by Sh. Vivek Chandel who is identified by Sh. Self who is presently known to me. The contents of the affidavit are duly read and explained to the deponent who admitted the contents to be true

Sudarshan Kumar Jagota
Advocate
Notary Public
Sub Division Bilaspur

Deponent

Director-cum-Warden of Fisheries,
Himachal Pradesh, Bilaspur

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Annexure R-F

(Updated copy)

HIMACHAL PRADESH

FISHERIES

ACT-1976

Shimla-171002, the 28th April, 1976

No. 6-24/70-LR-The Himachal Pradesh Fisheries Bill, 1976 (Bill No. 11 of 1975) after having received the assent of the Governor, Himachal Pradesh, on the 26th April, 1976, under article 200 of the Constitution of India, is hereby published in the Rajpatra, Himachal Pradesh as Act No. 16 of 1976)

Sd/
M.C PADAM
Under Secretary (Judicial)

Dy. Director of Fisheries (Hq)
Directorate of Fisheries HP
Bilaspur 174001

Act No.-16 of 1976

HIMACHAL PRADESH FISHERIES ACT, 1976.

AN

ACT

To provide for certain matters relating to fisheries in Himachal Pradesh.

Be it enacted by the Legislative Assembly of Himachal Pradesh in the Twenty Seven Years of the Republic of India as follows:

1. SHORT TITLE, EXTENT AND COMMENCEMENT	i. This Act may be called the Himachal Pradesh Fisheries Act, 1976. ii. It extends to the whole of Himachal Pradesh. iii. It shall come into force at once.
2. DEFINITIONS	In this Act, unless there is anything repugnant in the subject or context:- a. 'fish' includes shell fish and fish in all stages of its life history including aquatic plants of fisheries; b. 'fishing craft' means any boat whether manually operated or powered, used for fishing or transport of fish; c. 'fishing gear' means any net line, rod and line, fishing tackle and other appliances used for catching fish; d. 'fishing offense' means an offense punishable under this Act or under any rule made there under ; e. 'fishery officer' means any person whom the Himachal Pradesh Government or any other officer empowered by the Himachal Pradesh Government in this behalf, may from time to time, appoint by name, or as holding an office, to carry out all or any of the purposes of this Act or to do anything required by this Act or any rule made there under : Provided that no police officer below the rank of Sub-Inspector shall be so empowered; f. 'fixed engine' means any net, cage, trap or other contrivance for taking fish, fixed in the soil or made stationary in any other way ; g. 'private waters' means waters which are the exclusive property of any person or in which any person has for the time being an exclusive right of fishery, whether as owner, lessee or in any other capacity and includes tanks, ponds, artificial lakes etc. excavated at the expense of the owner which have no communication in the rainy season with natural waters such as rivers, streams, canals and jhils : Explanation -- water shall not cease to be private water within the meaning of this definition by reason only that other persons may have by custom a right of fishery therein; h. 'State Government' means the Government of Himachal Pradesh;

Dy. Director of Fisheries (Hq)
Directorate of Fisheries HP
Bilaspur 174001

	i. 'religious waters' means waters belonging to a religious body or institution and which have never been fished before on account of any restrictions on religious grounds, j. 'religious body' means the trustees or any other persons who are incharge of a religious institution or in whom the ownership of the religious institution vest for the time being; and k. 'religious institutions' means a temple, a mosque, or a church, any other shrine dedicated to any God or Goddess, and such other institutions as the State Government may by notification in the Official Gazette declare in that behalf.
3. POWER TO MAKE RULES FOR PROHIBITION AND LICENSING OF FISHING IN SELECTED WATERS	1. The State Government may make rules for the purposes mentioned hereinafter in this section and shall under such rules declare the waters, not being private waters, to which all or any of them shall apply. 2. The State Government may, by notification in the Official Gazette, apply such rules or any of them to any private waters with the consent in writing of the owner thereof and of all persons having for the time being any exclusive right of fishery therein, or if the State Government is satisfied that the consent is unreasonably withheld without such consent. Provided that no rules under this section shall apply to the religious waters. 3. Such rules may – a. Prohibit or regulate all or any of the following matters : i. the erection and use of fixed engines; ii. the construction, temporary or permanent, of weirs, dams and bunds; and killing of fish by diversion of natural waters, and iii. the dimension and kinds of fishing gears to be used and the mode of using them; b. prohibit fishing except under license and regulate the granting of such licenses, the fees payable therefore and the conditions to be inserted therein ; c. prohibit the destruction or attempt to destroy fish by gun spear, bow and arrow or like instrument or pollution of waters by trade effluents ; d. prescribe seasons in which the killing or catching or sale of any fish of any prescribed species shall be prohibited ; e. prescribe a minimum size or weight below which no fish or any prescribed species shall be caught, killed or sold ; f. prohibit fishing in any specified water for specified period ; g. regulate the export of fish outside any area or areas and price at which fish may be brought or sold in any specified markets of all or any specified species; h. require the owner, mortgagee with possession or lessee of any tank or jhil for the stocking of such tanks or jhils

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with any class or classes of fish;

i. prescribe the formation of associations or societies and the collection of funds for the uplift of fishermen and promotion of fishing industry;
j. regulate the marketing of fish and also purchase and use of fish for preservation or for the manufacture of any fish products;
k. regulate the possession of fishing craft and gear within such specified limits as may appear to be necessary; and
l. regulate the transport of all fish or of certain species of fish or fish products within specified limits as may appear to be necessary.

Such rules may, among other matters:-

a. prescribe the routes by which alone fish or fish products may be imported into and exported from the State of Himachal Pradesh.
b. Prohibit the import, export or transport, within specified limits, of fish without a pass from a fisheries officer or a person duly authorised to issue the same or otherwise than in accordance with the conditions of each pass,
c. prescribe the form of such passes and provide for their issue, production and return, and
d. provide for the examination of fish in transit within specified limits.

4. In making any rule under this section the State Government may provide for :-

a. seizure, removal and forfeiture of any apparatus erected or used for fishing in contravention of the rules,
b. forfeiture of any fish taken by means of any such apparatus, and
c. confiscation of any consignment of fish held or transported in contravention of the rules.

5. The power to make rules under this section shall be subject to the condition of the rules being made after previous publication.
6. Every rule under this Act shall be laid, as soon as may be after it is made, before the Legislative assembly while it is in session for a total period of not less than fourteen days which may be comprised in one session or in two or more successive sessions, and if, before the expiry of the session in which it is so laid or the sessions immediately following the Assembly makes any modification in rule or decides that the rule should not be made, the rule shall thereafter have effect only in such modified form or be of no effect, as the case may be so however, that any such modification or annulment shall be without prejudice to the validity of anything previously done under that rule.

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4. POWER TO PROHIBIT SALE OF FISH	The State Government may, by notification in the Official Gazette, prohibit in such area or areas as may be specified in that behalf the offering or exposing for sale or barter of any fish killed in contravention of nay rule made under sub-section (3) of section 3 of this Act.
5. PENALTIES	The breach of any rule made under section 3 or for any prohibition notified under section 4 shall be punishable:- 1. on first conviction with imprisonment of either description for a term which may extend to three months, or with fine which may extend to five hundred rupees, or with both; and 2. on every subsequent conviction with imprisonment of either description for a term which may extend to six months, or with fine which may extend to one thousand rupees, or with both.
6. PUNISHMENT FOR DESTRUCTION OF FISH BY EXPLOSIVES	1. If any person uses any dynamite or other explosive substances in any water with intent thereby to catch or destroy any fish, that may be therein, he shall be punishable with imprisonment for a term which may extend to * "three years or with fine which may extend to five thousand" rupees or with both. 2. Whoever, having already been convicted of an offense under sub-section (1) is again convicted thereunder, shall, on every subsequent conviction, be punishable with imprisonment for a term which may extend to three years and with fine which may extend to * "five thousand" rupees. 3. * Omitted
7. PUNISHMENT FOR DESTRUCTION OF FISH BY POISONING WATER	If any person puts any poison, * "bleaching powder", lime or noxious material into any water with intent thereby to catch or destroy any fish, he shall be punishable with imprisonment for a term which may extend to *"three years or with fine which may extend to five thousand" rupees, or with both. * 7-A Punishment for the possession of dynamite and other explosive substance to be used for killing the fish. If a person is found to be in possession of a dynamite or any other explosive substance for the purpose of killing the fish near or in the vicinity or on the bank of a river, rivulet, khad, pond, lake, reservoir which are habitated by the fishes, shall, unless he explains satisfactrily that his possession or control over such a dynamite or the explosive substance was for a lawful object, be punishable with imprisonment for a terms which may extend to two years, or with fine which may extend to three thousand rupees, or with both. *7-B Punishment for killing or catching fish during prohibited season. Notwithstanding anything to the contrary contained in section 5 of this Act, if a person kills or catches fish with a net during the season, in

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Bilaspur 174001

	which killing or catching of fish is prohibited under any rule framed under clause (d) of sub-section (3) of section 3 shall be punishable with imprisonment for a term which may extend to two years or with fine which may extend to three thousand rupees or with both.
2 of 1974	*7-C Offenses to be cognizable and non-bailable. Notwithstanding anything contained in the code of Criminal Procedure, 1973, all offenses under section 6, 7, 7 A &7B of this Act shall be cognizable and non-bailable offenses.
8. ARREST WITHOUT WARRANT FOR OFFENSE UNDER THIS ACT 2 of 1974	1. Any fisheries officer, police officer not below the rank of the Sub-Inspector, or any other person specially empowered by the State Government in this behalf, may arrest without any warrant any person committing or attempting to commit, in his view a fishing offense: a. if the name and address of the person are not known to him, and b. if the person declines to give his name and address, or if there is reason to doubt the accuracy of the name and address, if given. 2. A person arrested under this section may be detained until his name and address have been correctly ascertained:- Provided that no person so arrested shall be detained longer than it may be necessary for bringing him before a Magistrate, except under the order of a Magistrate for his detention. 3. Every fishery officer shall have the same powers of search and investigation relating to a fishing offense as a police officer of the rank of the Sub-Inspector has under the Code of Criminal Procedure, 1973.
9. COGNIZANCE OF OFFENSES	No court shall take cognizance of any offense under this Act, except the complaint of a fishery officer or of a police officer not bellow the rank of the Sub-Inspector or any other person or class of person authorised by the State Government in this behalf.
10. POWER TO COMPOUND CERTAIN OFFENSES	1. The State Government may, by notification in the Official Gazette, empower a fishery officer by name or by virtue of office:- a. to accept from any person concerning whom evidence exists, which if unrebutted, would prove that he has committed any fishing offense as described in the first column of the schedule, a sum of money by way of compensation for the offense with regard to which such evidence exists and on the payment of such sum to such officer, such person, if in custody, shall be released and no further proceedings shall be taken against him;

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	b. to release any property that has been sized as liable to confiscation without further payment or on payment of the value thereof as estimated by such officer and on the payment of such value such property shall be released and no further proceedings shall be taken in respect thereof. 2. A sum of money accepted as compensation under clause (a) of sub-section (1) shall in no case exceed the amount acceptable as compensation in the second column of the schedule for the particular offense descried in the first column thereof.
11. PUBLIC SERVANTS INDEMNIFIED FOR ACTS DONE UNDER THIS ACT. 45 OF 1860	1. All persons empowered to exercise powers and perform duties under this Act or rules made thereunder shall be deemed to be public servants within the meaning of section 21 of Indian Penal Code, 1860. 2. No suit or other legal proceedings shall lie in respect of the exercise of any powers or discretion conferred by this Act, or against any public servant or person duly appointed or authorised under this Act, in respect of anything in good faith done or purporting to be done under the provisions thereof or the rules made thereunder.
12. REPEAL AND SAVINGS 2 of 1914: 31 of 1996:	The Punjab Fisheries Act 1914 as in force in the areas comprised in Himachal Pradesh immediately before the 1st November, 1966 & as in force in the areas added to Himachal Pradesh under section 5 of the Punjab Re-organization Act, 1966, is hereby repealed: Provided that: i. any thing done or action taken or proceeding commenced or continued under the repealed Act shall be deemed to have been done, taken commenced as continued under the corresponding provisions of this Act; ii. any appointment, order, regulation or notification made, issued or given under the provisions of the repealed Act, shall in so far as it is not inconsistent with the provisions of this Act, be deemed to have been made, issued or given under the provisions of this Act, unless and until superseded by any appointment, order, regulation or notification made, issued or given under this Act.

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* "The Schedule"
(See Section 10)

MAXIMUM AMOUNT ACCEPTABLE AS COMPENSATION FOR CERTAIN FISHING OFFENSES UNDER SECTION 10

Sl. No.	Description	Maximum acceptable compensation. (Rs.)
1.	Fishing with a new net having a smaller mesh than that prescribed under the rules made under the Act.	Rupees five hundred
2.	Fishing without a license	Rupees three hundred
3.	Killing or catching or selling or attempt to kill, catch or sell fish of a size or weight less than the standard prescribed under this Act.	Rupees three hundred
4.	Killing or catching or selling or attempt to kill, catch or sell any fish of a prohibited species during a close season.	Rupees three hundred
5.	Fishing or attempting to fish with any gear or method other than permitted under the rule.	Rupees three hundred
6.	Using at any one time more than two or either any of the gears permitted under the rules.	Rupees three hundred
7.	Licence holders employing or engaging non-licensees to help them with their nets, while fishing.	Rupees three hundred
8.	Fishing or attempting to fish in prohibited water.	Rupees three hundred
9.	Offering or exposing for sale or barter any fish, the sale of which is prohibited in any specified area by a notification issued under section 4 of the Act.	Rupees three hundred
10.	Exporting or attempting to export fish in contravention of any rule made under sub-section (3) of section 3 of the Act	Rupees one thousand
11.	Selling or attempting to sell fish for price above specified market value.	Rupees four hundred
12.	Possessing fishing craft and tackles unauthorisingly in contravention of clause (k) of sub-section (3) of section 3 of the Act.	Rupees four hundred
13.	Transporting or attempting to transport fish or fish products within specified limits in contravention of clause (1) of subsection (3) of section 3 of the Act.	Rupees four hundred

Note: * Means 1st amendment in H.P. Fisheries Act vide (Raj Kumar Mahajan) Secretary (Law) Government of H.P. Notification No. L. L. R. (D) (6) 13/89-Legislakhen, dated 6th February, 1990.

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(Authoritative English Text of this Department Notification No. Fish- A (3)-2/2015-III dated 19/05/2020 as required under Clause (3) of article 348 of the Constitution of India)

GOVERNMENT OF HIMACHAL PRADESH
DEPARTMENT OF FISHERIES

No. Fish-A(3)-2/2015-III **Dated Shimla-2,** **19th May, 2020**

NOTIFICATION

Whereas, the draft Himachal Pradesh Fisheries Rules, 2019, were published in the Rajpatra (e-Gazette), Himachal Pradesh on 23rd August, 2019, for inviting objection(s) and suggestion(s) from the general public through the Director-cum-Warden of Fisheries, Himachal Pradesh, Bilaspur-174001 within 30 days, vide this Department Notification No. Fish-A (3)-2/2015-II, dated 23rd July, 2019, as required under section 3 of the Himachal Pradesh, Fisheries Act, 1976 (Act No. 16 of 1976).

And whereas, no objection (s)/suggestion(s) has been received in this behalf during the stipulated period;

Now, therefore, in exercise of the powers conferred by section 3 of the Himachal Pradesh Fisheries Act, 1976 (Act No. 16 of 1976), the Governor, Himachal Pradesh is pleased to make the following rules, 2020, namely:-

1. **Short title and commencement** (i) These rules may be called the Himachal Pradesh Fisheries Rules 2020.

   (ii) They shall come into force from the date of publication in the Rajpatra/e-Gazette of Himachal Pradesh.

2. **Definition.-** In these rules, unless the context otherwise requires ,-

   (a) 'Act' means the Himachal Pradesh Fisheries Act, 1976(No. 16 of 1976);

   (b) 'Beat' means the area demarcated for fishing under these rules;

   (c) 'Director' means the Director-cum-Warden of Fisheries, Himachal Pradesh or any one who may be authorized by the State Government in this behalf;

   (d) 'General Waters' shall be those stretches of rivers or streams which are not 'trout waters' and which have been defined under rule 3(A);

   (e) 'landing centre' means the place fixed by the Director or any other officer authorized by him where all fish caught shall be collected;

   (f) 'license' means the license granted under these rules:

   (g) 'person' shall also include a Co-operative Society of fishermen:

   (h) 'Schedule' means the Schedule appended to these rules;

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(i) 'Trout Waters' shall means those stretches of rivers or streams where trout fish is being developed as defined under rule 3 (B);

(j) 'Year' shall mean financial year; and

(k) 'State' means the State of Himachal Pradesh.

3. **Declaration of water not being private water to which all or any of the rules shall apply.**- The following waters are hereby declared not being private waters to which all or any of the rules as according to their respective provisions shall apply,-

(A) **General waters** :

(i) River Jamuna and its tributaries including Markanda and Roon stream excluding Trout Waters.

(ii) River Satluj and its tributaries excluding Trout Waters.

(iii) River Ravi and its tributaries excluding Trout Waters.

(iv) River Beas and its tributaries excluding Trout Waters.

(v) River Chenab and its tributaries excluding Trout Waters.

(vi) All lakes/ ponds owned by the Government.

(vii) Balancing reservoir at Sundernagar and the canal feeding balancing reservoir.

(B) **Trout waters:**

(i) River Pabbar from village Mahla to village Hatkoti in Shimla District in Jamuna river stream.

(ii) River Beas and its tributaries from its source to its confluence with Sarvari streams in Kullu District including Sarvari stream.

(iii) Parvati and Gadsa streams and their tributaries in Kullu District.

(iv) Sainj and its tributaries in Kullu District.

(v) Tirthan streams and its tributaries above its confluence with river Beas in Kullu and Mandi District.

(vi) River Uhl and its tributaries in Mandi and Kangra District including balancing reservoir and feeder channels at Barot.

(vii) Entire Bhandal Nallah and its tributaries up streams Chakoli bridge in Chamba District.

(viii) River Baspa, Bhaba streams and Chisso stream in Satluj river stream in Kinnaur District.

(ix) Neugal stream and its tributaries up streams Mainjha bridge and 10 kms stretch of Baner Khad up stream suspension bridge at Tikker Doli in Kangra District.

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(x) Kurpan stream and its tributaries in Satluj river system in Kullu District.

(C) Reservoirs:

(i) Gobind Sagar Reservoir:

Impoundment formed by Bhakra Dam up to a level of 1680 R.L. in Bilaspur, Una Districts of Himachal Pradesh and it shall be devided into eight beats as below.-

BEAT NO. I	From the inception of the reservoir in Kunkhar Khad to village Raipur on the right bank and village Sharat on the left bank.
BEAT NO. II	From village Ralpur on the right bank and village Sharat on the left bank to village Bhakra on the left bank and village Bramni on the right bank.
BEAT NO.III	From village Bhakra on the left bank and village Bramni on the right bank to village Nakrana on the left bank and village Charanaru on the right bank.
BEAT NO. IV	From village Nakrana on the left bank and village Charanaru on the right bank to village Osal on the left bank and village Nansar on the right bank excluding the spread of reservoir in Seer khad beyond village Seri on the right bank and village Badoh on the left bank.
BEAT NO. V	From inception of reservoir in Seer khad to village Seri on the left bank and village Badoh on the right bank.
BEAT NO. VI	From village Osal on the left bank and village Nansar on the right bank to Nala-Ka-Naun on the left bank and village Kasnaur on the right bank including spread of reservoir in Gambhar and Gambhrola Khad.
BEAT NO. VII	From Nala-Ka-Naun on the left bank and village Kasnaur on the right bank to village Kunger-Hatti on the right bank including spread of reservoir in the Ali khad
BEAT NO. VIII	From village Kunger-Hatti on the left bank and village Bari Daulan on the right bank to inception of reservoir in river Satluj including spread of reservoir in Alsad Khad

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(ii) **Pong Reservoir:**

Impoundment formed by Pong Dam up to a level of R.L. 1410 in Kangra District of Himachal Pradesh and it shall be divided into nine Beats as below,-

BEAT NO. I	From the inception of the Dam at Ghamroor and village Chalwara on the right bank to the village Rail on the left bank and village Harsar on right bank.
BEAT NO. II	From village Bari Kianpur on the left bank and village Chalwara on the right bank to the village Rail on the left bank and village Harsar on right bank.
BEAT NO.III	From village Rail on the left bank and village Harsar on right bank to village Ogarhala on the left bank and village Jarot on the right bank.
BEAT NO. IV	From village Ogarhala on the left bank and village Jarot on the right bank to village Rorikori on the left bank and village Nandpur bangoli on the right bank.
BEAT NO. V	From village Rorikori on the left bank and village Nandpur Bangoli on the right bank to village Janmbal on the left bank and village Kohli-Balta and Khairain on the right bank.
BEAT NO. VI	From village Janmbal on the left bank and village Kohli-Balta and Khairain on the right bank to village Bassi on the left bank and village Bari on the right bank.
BEAT NO. VII	From village Bassi on the left bank and village Bari on the right bank to Dehra bridge on both banks.
BEAT NO. VIII	From Dehra bridge on both banks to Chamba Pattan on both banks.
BEAT NO. IX	**Sathana Balancing Reservoir:** Impoundment formed as a result of Shah Nahar Barrage across the river Beas in Kangra District below Pong Dam starting from village Muhal Bhanath to village Muhal Beli on the left side and from village Muhal Van Balhun to village Muhal Brar on the right side.

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(iii) Pandoh Reservoir:

Impoundment formed by Pandoh Dam on River Beas up to level of R.L. 2940 in Mandi district.

(iv) Chamera Reservoir:

Impoundment formed by Chamera Dam up to a level of 763.16 m in Chamba district of Himachal Pradesh and it shall be divided in to three beats as under,-

BEAT NO. I	From village Rajpur (Shalimar) on the right bank of river Ravi and village Udaipur Khas on the left bank to village Manot on the right bank and village Dharmari on the left bank.
BEAT NO. II	From village Dudun (Gharat Nalla) on the right bank of river Siul to village Kandla on the left bank and village Dhapyara Bargral on the right bank to village Ukal (Palai) on the left bank.
BEAT NO. III	From village DhapyaraBargral on the right bank of river Suel to village Ukal (Palai) on the left bank and village Manot on the right bank of river Ravi to village Dharmari on the left bank of river Ravi.

(v) Ranjeet Sagar Reservoir:

Impoundment formed by Ranjeet Sagar Dam (Thein Dam) in the area falling in Chamba District of Himachal Pradesh and it shall be divided into only one beat as under,-

BEAT	From the revenue Village Chonka to Khairi, Lahri, Sandhara, Siharu, Chuhan and Bihnu.

(vi) Kol Dam Reservoir:

Impoundment formed by Kol Dam upto a level of 646 M in the area falling in District of Bilaspur, Shimla, Solan and Mandi of Himachal Pradesh and it shall be divided into following three beats,-

BEAT NO. I	From Village Chamyan on the left bank of reservoir and village Kyan on the right bank of reservoir to village Padyar on left bank and village Ahan on right bank.
BEAT NO. II	From Village Padyar on the left bank of reservoir and village Ahan on right bank to village Annu on left bank and village Karangal on right

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bank.

BEAT NO. III — From Village Annu on left bank of reservoir and village Karangal on right bank to village Makarchha on left bank and village shakra on right bank.

4. **Fishing methods and mode of use.**- Notwithstanding anything contained in these rules and subject to provision of rules 5 and 6 fishing methods permitted for fishing in water declared not to be private water shall be as per column 3 of the Schedule:

Provided that fishing by Chips and Barpatta shall be allowed only on the basis of local customs and customary rights accrued to bonafide fishermen who hold a general fishing license.

5. **Grant of licenses for fishing, fee payable thereof.-**

(1) No person shall fish in water declared not being private waters except under a license.

(2) The license for fishing shall be issued by the Director or any officer authorized by him/her in this behalf subject to these rules and the license so issued shall only be valid subject to fulfillment of these rules and the conditions prescribed in these rules.

(3) The license shall be issued on the Form No. FSH -1 annexed to these rules.

(4) The license shall be issued only on receipt of payment of fee as per column 5 of the Schedule. "Amount of royalty fee shall be payable in advance as per the procedure laid down by the Director".

(5) In case license granted under these rules is lost or destroyed, the duplicate license shall be issued on payment of Rs. 10/-

6. **Conditions for issuance of license.-** The license for fishing shall be issued under following conditions namely :-

(a) The license shall be valid only for the class of water, fishing method and period for which it has been issued;

(b) the license is not transferable;

(c) no person including licensee shall be allowed to fish in river and streams with in 100 Mtrs from any bridge across that, provided that this sub-rule shall not apply to those who holds license for fishing rod and line or hand line or long line;

(d) licensee shall be bound to show his license to any person empowered under section 8 of the Act to arrest without warrant for offences under the rule of Act;

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(e) the competent authority for issuing the license may cancel the license so issued for breach of any provision of these rules or the Act; and

(f) it will be a condition of Gill net license that licensee shall fish for a minimum period of 25 days in a month. Failing to do so without cogent reasons, the license shall be liable to be cancelled. This shall also be sufficient reason to deny such licensee a license for the ensuing year.

7. **Prohibiting fishing by gun spear, bow arrow or like instruments or pollution of water by trade effluent .-** Destruction or attempt to destroy fish by gun, spear, bow and arrow or like instruments or pollution of water by trade effluent "or by use of phai, jhatka or any other method not defined in the Schedule" shall be prohibited.

8. **Prohibiting fishing etc. in prescribed season and specified waters :-**

(1) No person shall be allowed to fish during the period prescribed in column 7 of the Schedule in respect of water prescribed under column 2 of the Schedule.

(2) No person shall be allowed to fish in any stretch of river/ streams prescribed under column 8 of the Schedule in respect of water prescribed under column 2 of the Schedule.

9. **Minimum size or weight of fish allowed to be killed .-** (1) No licensee shall catch or kill or sell any of the following fish which is less than the size shown against each species, separately:-

(a)	Mahseer (*Tor putitora*)	50 cms.
(b)	Trout (*Salmotruttafario or Oncorhynchus*mykiss)	40 cms.
(c)	Common Carp (*Cyprinuscarpio*)	30 cms.
(d)	Theila (*Catlacatla*)	45 cms.
(e)	Rohu (*Labeorohita*)	40 cms.
(f)	Mori (*Cirrhinamrigala*)	30 cms.
(g)	Silver carp (*Hypophthalmicthysmolitrix*)	45 cms.
(h)	Grass carp (*Ctenopharyngodonidellus*)	45 cms.
(i)	Gugli or Saloh (*Schizothoraxplagiostomus.*)	40 cms.
(j)	Singhara (*Mystusseenghala*)	30 cms.

(2) The fish caught below the size prescribed in sub-rule (1) shall be released back in the water by the licensee.

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10. Marketing of fish, its transport/ export of fish out side any area.- (1) All fish caught by any person who has got a license for fishing with gillnet in the water specified as reservoirs under rule 3 (c) of these rules shall be handed over by the licensee to the fishermen Co-operative Society of which he/she is a member and shall be brought to the landing center by that fishermen co-operative society for weightment by representative of State Government and charging fee shall be charged as per rule 5 read with column 5 of the Schedule before its marketing inside or outside the State.

(2) The sale of fish, so weighed under sub- rule (1) shall be done within and outside the State in consultation with the Director of Fisheries, Himachal Pradesh by the Fisheries Co-operative Societies/ Federation and where no such Federation exists, by the primary fishermen co-operative societies.

(3) If so required by the Director, the person marketing fish outside the State under this rule shall be bound to sell to the extent of the "25%" of daily catch of fish for sale in the State at rates fixed by the State Government.

(4)(a) No person shall transport fresh fish or processed fish from the landing center or any other fish production centre to any market for sale except under the pass to be issued by the Director or any person authorized by him/her in this behalf. The route of transport has to be adhered as per pass. The fish being so exported may be examined any time in transit by Director or any person authorized by him/her.

(b) The pass under rule shall be issued on the Form No. FSH -3 annexed to these rules.

(c) No person shall import fish into the State for marketing without a valid pass issued by the Director or any other person authorized by him/her in this behalf.

(5)(a) The Director shall lay down suitable procedure from time to time with a view to carry out the provision of this rule;

(b) The Director shall have powers to fix the rates at which the fish sold departmentally by the Fisheries Department, shall be sold at various sale centres so defined by him/her in this behalf ;

(c) The Director or any officer authorized by him/her shall have powers to finalize/ fix the price of fish, at which sale of fish shall be done within the State.

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11 Seizure, removal of apparatus, forfeiture of fish and confiscation of consignment.-

(1) All Fisheries Officers shall have powers to seize and remove any apparatus, erected/ used in contravention of these rules and put the same to auction or store or return to the owner.

(2) All Fisheries Officers shall have powers to forfeit the fish caught in contravention of these rules and to dispose of it by auction or sale or restore it to the owner on the merit of the case.

(3) All Fisheries Officers shall have powers to confiscate any consignment of fish held or transported in contravention of these rules and to dispose of it by auction or sale or restore it to the owner on the merit of the case.

12. Possession of fishing craft and gears with in specified limits.- No person shall possess fishing crafts or gears with in an area of 3 kms. from periphery of any water declared not being private water unless he/she has got a valid license for fishing with that and all Fisheries Officers shall have power to seize the apparatus and proceed under rule 11.

13. Miscellaneous .- (1) The Director or any officer authorized by him/her shall have powers to fish in any water by any method except those prohibited under the Act, on experimental basis for purpose of research and exploration of fisheries resources.

(2) The Director or any officer authorized by him/her shall have powers to finalize the sale rate of fish of fishermen Co-operative Society so weighed under sub- rule(1) of rule 10.

(3) The adjustment fees on %age of sale in respect of reservoirs under Rule 3 (c) shall be done on fee adjustment bill in Form No. FSH -2 annexed to these Rules.

(4) The Director shall prescribe the form to be used for any purpose if not otherwise provided for under these Rules.

14. Repeal and savings.- (1) The Himachal Pradesh fisheries rules, 1979 notified vide notification No. Fish.A(3)-1/77 dated 15th November, 1979 and published in the Rajpatra, Himachal Pradesh are hereby repealed.

(2) The repeal of the aforesaid rules, shall not affect .-

(a) anything done or action taken, proceeding commenced or continued under aforesaid rules ,-

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(b) any appointment, order, regulation or notification made, issued or given under the provisions of the aforesaid rules shall in so far it is not inconsistent with the provision of these rules be deemed to have been made, issued or given under the provisions of these rules unless and until superseded by any appointment, order or regulation made, issued or given under these rules.

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FORM FSH-I (See rule 5 and Schedule)	FORM FSH-I (See rule 5 and Schedule)
Form No..... License No..... Permission is hereby granted to the person holding this license under the Himachal Pradesh Fisheries Rules. 2020 to fish in water..... with fishing method..... For the period of..... with effect from..... under the Schedule to the rules..... Name and address of the person .... Fee paid or adjusted through fee adjustment BILL Rs..... (Rupees..... .....) Date of payment.....	Form No..... License No..... Permission is hereby granted to the person holding this license under the Himachal Pradesh Fisheries Rules. 2020 to fish in water..... with fishing method..... For the period of..... with effect from..... under the Schedule to the rules..... Name and address of the person .... Fee paid or adjusted through fee adjustment BILL Rs..... (Rupees..... .....) Date of payment.....
Director or any Officer authorised.	**Director or any Officer authorised.**

Conditions under which the license is issued

1. The license holder shall not catch or kill or sell any fish if the following species are less than the length shown against each.

a)	Mahseer (*Tor putitora*)	= 50 cms.
b)	Trout (*Salmo trutta fario or Oncorhynchus mykiss*)	= 40 cms.
c)	Common Carp (*Cyprinus carpio*)	= 30 cms.
d)	Theila (*Catla catla*)	= 45 cms
e)	Rohu (*Labeo rohita*)	= 40 cms.
f)	Mori (*Cirrhina mrigala*)	= 30 cms.
g)	Silvercarp (*Hypophthalmichthys molitrix*)	= 45 cms
h)	Grass carp (*Ctenopharyngodon idellus*)	= 45 cms.
i)	Gugli or Saloh (*Schizpthorax plagiostomus*)	= 40 cms.
j)	Singhara (*Mystus seenghala*)	= 30 cms.

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Fish caught below the size shown above shall be released back by the licensee.

2. The destruction or attempting to destroy fish by gun, spear, bow and arrow and like instruments or pollution of waters by trade effluent or by use of phai, jhatka or any other methods gear defined in the rules is prohibited.
3. The license holder shall not engage or employ any person to help him/her with his/her fishing gear unless the person so employed is also a license holder.
4. No fishing gear except rod and line shall be used by the license holder in river and streams with in 100 M from any bridge.
5. Every license holder shall be bound to show the license to any person empowered under section 8 of the Himachal Pradesh Fisheries Act, 1976 (Act No.16 of 1976).
6. The license is not transferable.
7. The license holder is bound to report to the Deputy Commissioner or any Fisheries Officer or Police Officer, of any breach of rules that comes to his notice.
8. Fishing is not permitted in any water closed to fishing by any rule notified under section 3(1) of the Himachal Pradesh Fisheries Act, 1976 and described as closed to fishing shown in the Schedule.
9. No trout shall be caught by any person during the period from 1st November to last day of February each year. Not more than four trout shall be caught in a day by the license holder.
10. The holder of a trout fishing license shall fill in the following proforma and return to the Director-cum-Warden of Fisheries on expiry of the license.

Date	River/stream/ pool or place	Detail of catch		Remarks
		No of Trout caught	Wt. of Trout caught	

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FSH-2

(SEE RULE 13(3))

GOVERNMENT OF HIMACHAL PRADESH

"FISHERIES DEPARTMENT"

FEE ADJUSTMENT BILL

Book No..... Bill No.....

Name of the Fish Landing Centre.....

Date..... Name of Fish Co-Operative Society .....

.....

Details of fish caught

Fish Variety					Total
Weight					
Rate of fee					
Fee amount					
Balance of fee					
Fee deposited today					
Total					

Challan No.....dated.....vide which royalty is deposited into try.

Total Amount of fee in balance.

Today's fee adjustment.

Balance fee after day's adjustment.

Signature of the Contractor or his/her representative	Signature of president of society or his /her representative.	Signature of employees who weighed the fish	Signature of Incharge of Centre with Designation.

Agency appointed.

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FSH-3

(SEE RULE 10(4)(b)

GOVERNMENT OF HIMACHAL PRADESH

"FISHERIES DEPARTMENT"

PASS

Book No.....Pass No.....

With reference to Fee Adjustment Bill No. .....

Date.....Shri.....

Resident of .....

is hereby permitted to transfer .....

to.....(Weight of fish) .....

from.....to.....via.....The details of fish are given below:-

Fish Variety	Total No	Total weight
i)		
ii)		
iii)		
iv)		
Total No. of Fishes.....	**Total Weight**	

Signature of the In-charge Fish Landing Center with Designation.

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Schedule

CLASSIFICATION OF LICENSES (SEE RULES 3,4,5(2)(4),6, and 8)

Sr. No	Kind of water (see rule 3)	Permitted fishing method (see rule 4)	License valid for (Rule 6 & 8)		License fee: (See rule 5)	Close-season: (See rule 8 (1)	Closed area for fishing (See rule 8 (2)
			Period	Jurisdiction			
1.	2.	3.	4	5	6	7	8
1.	GENERAL WATER as per rule- 3 (a) (i) to (vii)	(i) Rod and Line and Handline	Daily or weekly or monthly or yearly basis	Daily licence is stream wise and weekly or monthly or yearly licence is for entire State	Rs. 100/- daily or Rs. 600/- weekly or Rs. 2400/- monthly or Rs. 11,000/- yearly.	16th June to 15th August each year both days inclusive.	(a) KANGRA DISTRICT i) From the inception of river Machhiali in Palampur Tehsil or to it's confluence with HulkuNalla. ii) one hundred metres above and two hundred metres below bridge on Punnkhad in Palampur Tehsil on PathankotMandi Road. iii) From the back of SandharAal of Khaulikhad in Kangra Tehsil to Narti Machhial (Tikka mal) and up streams of Machhial and
		(ii) Cast Net	Yearly	District	Rs.200/-	16th June to 15th August each year both days inclusive.	
		(iii) Chips	Yearly 1st Sep. to 30th Nov.	Specified area of KangraDistt.	Rs. 2000/-	16th June to 15th August each year both days inclusive.	

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		(iv) Barpata	Yearly 1st Sep. to 30th Nov.	Specified area of KangraDistt.	Rs. 2000/-	16th June to 15th August each year both days inclusive.	Cho which meet the road. iv) From SaptailAal to MamtaMachhial in Jugalkhad in Kangra District. v) 150 mtrs both banks of river Beas (50 mtrs above and 100 mtrs downwards) near Cremation ground to Kali NathMandir situated at Kalashwar. vi) Ralian Di Aal and its surrounding area in Khasra No. 111/1(17 Kanal 11 marla portion) in TikkaPaddar village Jadrangal in Kangra Tehsil. vii) 50 mtrs above and 100 mtrs below the suspension bridge near Kangra Mandi Railway station on Kangra Tanda Road. (viii) From Chobu Aal to Bhedu Aal near Bhedu

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							Mahadev Mandir in Neugal Khad situated in Khasra No. 963 measuring 02-86-27 hectare Mohal Maruhoon Mauza Mundi, Tehsil Dheera, District Kangra, Himachal Pradesh. (b) UNA DISTRICT (i) From the Panjghratla bridge near Bhanaur village upto Raghwa valley above Gharats in Una District. (c) KULLU DISTRICT (i) Mohul Khad in general waters of Kullu district. (ii) Sirir Khad in Trout Waters of Kullu District. (d) MANDI DISTRICT (i) River Beas from Sikh Gurdwara paddal upto its confluence with Suketi nallah. (ii) Suketi streams from Suketi bridge in Mandi

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							Town upto its confluence with river Beas. (iii) Rana khad from village Monoh up to village Bhararu. (iv) Rewalsar lake. (e) SIRMOUR DISTRICT (i) Renuka lake
2.	TROUT WATERS as per rule 3 (B) (i) to (x)	Artificial baits (both spoon and fly)	Daily or weekly or monthly or yearly basis	Daily licence is stream wise and weekly or monthly or yearly licence is for entire State	Rs. 300/- daily or Rs. 1800/- weekly or Rs. 7200/- monthly or Rs. 33000/- yearly	1st November to last of the February of each year.	
3.	GOBIND SAGAR RESERVOIR as per rule 3 (C) (i)	(i)Gill net of size 80 mtrs long and 5 to 8 mtrs depth with minimum mesh of 5 cms from (knot to knot)	1st April or date of issue to 31st March	Beat wise	Rs. 100/- plus 15% of sale proceeds of fish by the Fish Cooperative Society at landing centre.	16th June to 15th August each year both days inclusive.	1.500 Kms upstream of the dam Body.

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		(ii) Rod and Line	Daily or weekly or monthly or yearly basis	Daily licence is beat wise and weekly or monthly or yearly licence is for entire reservoir	Rs. 100/- daily Rs. 600/- weekly or Rs. 2400/- monthly or Rs. 11,000/- yearly.	16th June to 15th August each year both days inclusive.	
4.	PONG RESERVOIR as per rule 3 (C) (ii)	(i) Gill net of size 80 mtrs long and 5 to 8 mtrs depth with minimum mesh of 5 cms from (knot to knot)	1st April or date of issue to 31st March	Beat wise	Rs. 100/- plus 15% of sale proceeds of fish by the Fish Cooperative Society at landing centre	16th June to 15th August each year both days inclusive.	1.500 Kms upstream of the dam Body.
		(ii) Rod and Line	Daily or weekly or monthly or yearly basis	Daily licence is beat wise and weekly or monthly or yearly licence is for entire reservoir	Rs. 100/- daily Rs. 600/- weekly or Rs. 2400/- monthly or Rs. 11,000/- yearly.	16th June to 15th August each year both days inclusive.	
5.	PANDOH	Rod and Line,	Daily or	Daily or	Rs. 100/- daily	1st November to	

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	RESERVOIR as per rule 3 (C) (iii)	artificial baits (both spoon and fly)	weekly or monthly or yearly basis	weekly or monthly or yearly licence is for entire reservoir	Rs. 600/- weekly or Rs. 2400/- monthly or Rs. 11,000/- yearly	last of the February of each year.	
6.	CHAMERA RESERVOIR as per rule 3 (C) (iv)	(i) Gill Net of size 80 mtrs long and 5 to 8 mtrs deep with minimum mesh size of 5 cms from knot to knot.	1st April or date of issue to 31st March	Beat wise	Rs. 100/- plus 15% of sale proceeds of fish by the fish Cooperative Society at landing centre.	16th June to 15th August each year both days inclusive.	
		ii) Rod and Line	Daily or weekly or monthly or yearly basis	Daily licence is beat wise and weekly or monthly or yearly licence is for entire reservoir .	Rs. 100/- daily Rs. 600/- weekly or Rs. 2400/- monthly or Rs. 11,000/- yearly.	16th June to 15th August each year both days inclusive.	
7	RANJIT SAGAR RESERVOIR as per rule	(i) Gill Net of size 80 mtrs long and 5 to 8 mtrs	1st April or date of issue to 31st March	Beat wise	Rs 100/- plus 15% of sale proceeds of fish by the fish	16th June to 15th August each year both days inclusive.	

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	3 (C) (v)	deep with minimum mesh size of 5 cms from knot to knot.			Cooperative society at landing centre.		
		(ii) Rod and line	Daily or weekly or monthly or yearly basis	Daily licence is beat wise and weekly or monthly or yearly licence is for entire Reservoir area falling in Himachal Pradesh.	Rs. 100/- daily Rs. 600/- weekly or Rs. 2400/- monthly or Rs. 11,000/- yearly.	16th June to 15th August each year both days inclusive.	
8	KOL DAM RESERVOI R as per rule 3 (C) (vi)	(i) Gill net of size 80 mtrs long and 5 to 8 mtrs depth with minimum mesh of 5cms from (knot to knot)	1st April or date of issue to 31st March	Beat wise	Rs. 100/- plus 15% of sale proceeds of fish by the Fish Cooperative societies at the landing centres.	16th June to 15th August each year both days inclusive.	
		(ii) Rod and line	Daily or	Daily licence is	Rs. 100/- daily	16th June to 15th	

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		or Hand line	weekly or monthly or yearly basis	beat wise and weekly or monthly or yearly licence is for entire reservoir	Rs. 600/- weekly or Rs. 2400/- monthly or Rs. 11,000/- yearly.	August each year both days inclusive.	

Note: Fishing license fee shall be implemented as per revision issued by Govt. Notification from time to time.

By order.

(Sanjay Gupta)
Addl. Chief Secretary (Fisheries) to the
Government of Himachal Pradesh
May, 2020.

Endst. No. Fish-A (3)-2/2015-III, Dated : Shimla-2,
Copy is forwarded to the following :-

1. The Director-cum-Warden of Fisheries, H.P., Bilaspur- 174001.
2. The Addl. LR-cum-Addl. Secretary (Law) to the Govt. of H.P., Shimla-2.
3. Deputy Director of Fisheries (Hq.), Directorate of Fisheries, Bilaspur- 174001.
4. Deputy Director of Fisheries, Trout Farm Patlikuhal, Distt. Kullu, H.P.
5. All the Assistant Director of Fisheries, Himachal Pradesh.
6. Controller, Printing & Stationery, Himachal Pradesh, Shimla for publication in the Rajpatra.

(Urmila Gupta)
Deputy Secretary (Fisheries) to the
Government of Himachal Pradesh

Dy. Director of Fisheries (Hq)
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Bilaspur 174001

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Annexure R-2

मासिक मत्स्य-4 प्रतिवेदन गोविन्दसागर जलाशय माह 03/2024 (दिनांक 16.02.24 से 31.03.24) तक मत्स्य मण्डल, बिलासपुर, हिमाचल प्रदेश ।

प्रपत्र-1

क्र0	सहकारी सभा का नाम	गिल जाल	प्रतिलिपि	दैनिक बंशी डोरी	कुल योग	मत्स्य सभाओं की सं0	सदस्य सं0	परिचय पत्र वालों की संख्या	पकडी गई मछली की मात्रा				विक्री की गई मछली का मूल्य	
									इस माह		योग			
									सं0	भार कि0ग्रा0	सं0	भार कि0ग्रा0	इस माह	योग
1	संरक्षण	**0**	0	0	0	0	0	**0**	0	0	0	0	0	0
2	बिलासपुर	**351**	0	15	366	7	612	**351**	59	95.000	4336	7821.000	**11875.00**	824902.50
3	जकातखाना	**662**	0	9	558	9	977	**662**	1402	1707.500	34610	43918.000	213437.50	**4728027.50**
4	नकराणा	**496**	0	0	496	10	981	**496**	1249	3725.000	16363	**48167.000**	471818.50	5203048.50
5	भाखडा	**728**	0	375	1103	8	1386	**728**	1114	2888.000	23317	42584.000	519798.00	6026798.00
6	माव्दली	**402**	0	152	554	2	247	**201**	1258	2077.900	14064	20807.700	**385919.00**	3195471.00
7	लठियाणी	**158**	0	50	208	2	124	**79**	459	2124.500	18582	27925.900	420651.00	4764355.00
	योग:-	**2797**	**0**	**601**	**3398**	**38**	**4327**	**2517**	**5541**	**12617.900**	**111272**	**191223.600**	**2023499.00**	**24742602.50**

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पकडी गई मछली की किस्म

प्रपत्र–2

क0	आवतरण केन्द्र का नाम	कतला				रोहू				मिरगल			
		इस माह		योग		इस माह		योग		इस माह		योग	
		संख्या	भार	सं0	भार	संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार
1	संरक्षण	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2	बिलासपुर	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
3	जकातखाना	0	0.000	4	88.500	8	14.500	94	128.000	0	0.000	31	27.000
4	नकराणा	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
5	भाखडा	11	69.500	63	393.500	0	0.000	17	32.500	95	60.500	459	461.500
6	मान्दली	18	56.500	176	562.700	1	6.000	50	84.900	4	4.900	483	436.900
7	लठियाणी	40	49.500	329	1060.300	22	42.000	306	529.000	20	43.600	1907	2826.100
	योगः–	**69**	**175.500**	**572**	**2105.000**	**31**	**62.500**	**467**	**774.400**	**119**	**109.000**	**2880**	**3751.500**

Dy. Director of Fisheries (Hq)
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पकड़ी गई मछली की किस्म

प्रपत्र–3

क0	आवतरण केन्द्र का नाम	कुलवंश				मिरर कार्प				महाशेर			
		इस माह		योग		इस माह		योग		इस माह		योग	
		संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार
1.	संरक्षण	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2.	बिलासपुर	0	0.000	0	0.000	0	0.000	2046	2375.500	0	0.000	490	1001.500
3.	जकातखाना	0	0.000	0	0.000	995	1127.500	23127	23686.500	61	106.500	1125	1811.500
4.	नकराणा	0	0.000	0	0.000	415	905.000	9760	16764.000	209	434.500	990	2440.000
5.	भाखडा	1	1.500	149	188.500	161	404.500	5310	8983.000	93	217.000	669	1632.500
6.	माव्दली	3	3.000	58	67.600	173	287.400	3590	6334.100	248	467.200	734	1278.900
7.	लठियाणी	25	50.700	1159	1254.800	50	89.100	4379	5810.400	50	100.500	1344	2376.400
	योगः–	**29**	**55.200**	**1366**	**1510.900**	**1794**	**2813.500**	**48212**	**63953.500**	**661**	**1325.700**	**5352**	**10540.800**

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पकडी गई मछली की किस्म

प्रपत्र–4

क0	आवतरण केन्द्र का नाम	गिड वाटा				सिल्वर कार्प				सिंघाडा			
		इस माह		योग		इस माह		योग		इस माह		योग	
		संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार
1	संरक्षण	0	0	0	0	0	0	0	0	0	0	0	0.000
2	बिलासपुर	0	0	0	0	59	95.000	1800	4444.000	0	0	0	0.000
3	जकातखाना	0	0.000	228	107.500	64	115.000	6666	14134.000	274	344.000	3327	3873.000
4	नकराणा	0	0.000	0	0.000	293	1623.500	2721	22129.000	332	762.000	2892	6834.000
5	भाखडा	0	0	0	0	430	1123.000	4128	15377.500	262	314.000	12436	14580.000
6	मान्दली	0	0	0	0	149	454.100	1130	2905.000	661	766.800	7831	8937.100
7	लठियाणी	0	0	0	0	150	1186.000	4580	8089.600	102	563.100	4578	5979.300
	योगः–	**0**	**0.000**	**228**	**107.500**	**1145**	**4596.600**	**21025**	**67079.100**	**1631**	**2749.900**	**31064**	**40203.400**

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पकडी गई मछली की किस्म

प्रपत्र–5

क्र0	आवतरण केन्द्र का नाम	खास कार्य				बिगहैड				विकी की गई मछली का शुल्क	
		इस माह		योग		इस माह		योग		इस माह	योग
		संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार		
1.	संरक्षण	0	0	0	0.000	0.00	0.00	0	0	0.00	0.00
2.	बिलासपुर	0	0.000	0	0.000	0.00	0.00	0	0	1782.00	123746.00
3.	जकातखाना	0	0.000	8	62.000	0.00	0.00	0	0	32017.00	709213.00
4.	नकराणा	0	0.000	0	0.000	0.00	0.00	0	0	70773.00	780464.00
5.	आखडा	5	59.000	8	83.000	56.00	639.00	78	852	77970.00	904020.00
6.	मान्दली	2	32.000	12	200.500	0.00	0.00	0	0	57887.00	479322.00
7.	लटियाणी	0	0.000	0	0.000	0.00	0.00	0	0	63098.00	714654.00
	योग:–	**7**	**91.000**	**28**	**345.500**	**56.00**	**639.00**	**78**	**852**	**303527.00**	**3711419.00**

Dy. Director of Fisheries (Hq)
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प्रपत्र–6

क्र.0	आयतरण केन्द्र का नाम	प्राप्त शुल्क की राशि		लम्बित शुल्क की राशि		अवैध मत्स्य आखेट पकडे		अभिसंधान किए		लम्बित रहे	
		इस माह	योग	इस माह	योग	इस माह	योग	इस माह	योग	इस माह	योग
1.	संरक्षण	0	0	0	0	2	81	25	81	0	0
2.	बिलासपुर	16514.00	126746.00	0.00	0.00	0	17	0	17	0	0
3.	जकातखाना	144384.00	709213.00	0.00	0.00	3	35	12	35	0	0
4.	नकराणा	185379.00	780464.00	0.00	0.00	6	42	18	42	0	0
5.	भाखडा	153357.00	904022.00	0.00	0.00	0	48	7	48	0	0
6.	मान्दली	64396.00	479322.00	0.00	0.00	9	35	9	35	0	0
7.	लठियाणी	273443.00	714654.00	0.00	0.00	10	26	21	26	0	0
	योगः–	**838773.00**	**3714421.00**	**0.00**	**0.00**	**30**	**284**	**92**	**284**	**0**	**0**

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प्रपत्र-7

क्र०	अवतरण केन्द्र का नाम	अनुज्ञप्ति शुल्क		अवैध मत्स्य आखेट मुआवजा		समहरित मछली नीलामी		अधिशुल्क जमा		अन्य प्राप्तियां		कुल योग	
		इस माह	योग	इस माह	योग	इस माह	योग	इस माह	योग	इस माह	योग	इस माह	योग
1	संरक्षण	0	0.00	11900.00	61150.00	0.00	2500.00	0.00	0.00	0.00	0.00	11900.00	63650.00
2	बिलासपुर	0	1500.00	0.00	9700.00	0.00	1500.00	16614.00	123746.00	0.00	0.00	16614.00	136446.00
3	जकातखाना	0.00	900.00	3600.00	19900.00	0.00	200.00	144984.00	709213.00	0.00	0.00	148584.00	730213.00
4	नकराणा	0.00	0.00	8400.00	23300.00	0.00	8600.00	185379.00	780464.00	0.00	0.00	193779.00	812364.00
5	भाखड़ा	1200.00	37500.00	3500.00	26100.00	0.00	12100.00	153957.00	904022.00	0.00	150.00	158657.00	979872.00
6	मान्दली	400.00	15200.00	4500.00	18300.00	0.00	1008.00	64395.00	479322.00	0.00	0.00	69296.00	513830.00
7	लठियाणी	0.00	5000.00	6000.00	8000.00	0.00	1750.00	273443.00	714654.00	0.00	0.00	279443.00	729404.00
8	स०लि०क०	1000.00	279700.00	0.00	0.00	0.00	0.00	0.00	0.00	120.00	50340.00	1120.00	330040.00
	योगः-	2600.00	339800.00	57900.00	166450.00	0.00	27658.00	838773.00	3711421.00	120.00	50490.00	879393.00	4295819.00

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Directorate of Fisheries HP
Bilaspur 174001

राज्य से बाहर व विभागीय फार्मों से संचहित अंगुलिकाओं का विवरण गोविन्दसागर जलाशय (अवधि 16.02.2024 से 31.03.2024 तक)।

क0	आवतरण केन्द्र व सोसाईटी का नाम	विभागीय केजों से (लाखों में)			विभागीय फार्मों से (लाखों)					अन्य राज्य से आयातीत (लाखों में)							संग्रहित मछली बीज
		मिरर कार्प	सिल्वर कार्प	योग	मिरर कार्प	अमूर कार्प	मेजर कार्प	हंगेरियन स्टेन	योग	कतला	सिल्वर कार्प	घास कार्प	मेजर कार्प	मिरर कार्प	पंगेशियस	योग	फूल योग
1	बिलासपुर	0	1.50115	1.50115	0	0	0	0	0.00000	9.05	18.02	0	4.59	3.17	0	34.83	36.33115
2	ललियाणी	0	0	0	0	0	0	0	0.00000	0.96	1.35864	0	0	0.85	0	3.16864	3.16864
4	नकराणा/ जडडू	0	0	0	0.0	0	0	0	0.00000	0	0	0	0	0	0	0	0.00000
5	जगातखाना	0	0	0	0	0	0	0	0.00000	0	0	0	0	0	0	0	0.00000
6	भाखड़ा	0	0	0	0.0	0	0	0.0	0.00000	0	4.27000	0.85	0.9225	1.14	0	7.1825	7.18250
7	नादली /दोयड	0	0	0	0	0	0	0	0.00000	0.0	6.36000	0.6800	4.6600	3.85	0	15.55	15.55000
8	पिंजरों (Cages) में मछली बीज संग्रहण	0	0	0	0.000	0	0	0	0.00000	0	0	0	0	0	0	0.00	0.00000
	योग :-	0	1.50115	1.50115	0.000	0	0	0.0	0.00000	10.01000	30.00864	1.53000	10.17	9.01	0	60.73	62.23229

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मासिक मत्स्य-4 प्रतिवेदन गोविन्दसागर जलाशय माह 02/2025 (दिनांक 16.01.25 से 15.02.25) तक मत्स्य मण्डल, बिलासपुर,हिमाचल प्रदेश।

प्रपत्र-1

क्र०	सहकारी सभा का नाम	गिल जाल	प्रतिलिपि	दैनिक बंशी डोरी	कुल योग	मत्स्य सभाओं की सं०	सदस्य सं०	परिचय पत्र वालों की संख्या	पकडी गई मछली की मात्रा				विक्री की गई मछली का मूल्य	
									इस माह		योग			
									सं०	भार कि०ग्रा०	सं०	भार कि०ग्रा०	इस माह	योग
1	संरक्षण	0	0	0	0	0	0	0	0	0	0	0	0	0
2	बिलासपुर	347	0	8	355	8	621	347	142	289.000	6752	13201.500	37570.00	1514280.00
3	जकातखाना	758	0	1	0	9	977	758	3252	3205.500	53283	58380.000	416715.00	6685695.00
4	नकराणा	481	0	2	483	11	996	481	1923	7391.000	27469	106888.200	951778.00	11731325.50
5	भाखडा	675	0	443	1118	7	1314	675	1586	3918.500	35312	75941.000	709248.50	10379817.00
6	माव्दली	465	0	182	647	3	375	256	1087	1317.500	28068	41424.200	250910.00	6447461.00
7	लठियाणी	162	0	110	272	2	117	81	1104	2381.300	14608	29169.800	471497.00	4804132.00
	योगः-	**2888**	**0**	**746**	**3634**	**40**	**4400**	**2598**	**9094**	**18502.800**	**165492**	**325004.700**	**2837718.50**	**41562710.50**

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पकडी गई मछली की किस्म

प्रपत्र–2

क्र0	आवतरण केन्द्र का नाम	कतला				रोहू				मिरगल			
		इस माह		योग		इस माह		योग		इस माह		योग	
		संख्या	भार	सं0	भार	संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार
1	संरक्षण	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2	बिलासपुर	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
3	जकातखाना	0	0.000	9	182.500	53	55.000	407	457.000	0	0.000	87	99.500
4	नकराणा	0	0.000	53	196.000	0	0.000	1	4.000	0	0.000	0	0.000
5	भाखडा	3	9.000	77	335.500	0	0.000	20	36.500	3	4.000	126	180.500
6	मान्दली	1	2.000	151	779.900	0	0.000	97	163.200	17	17.000	534	480.100
7	लठियाणी	32	105.800	414	1454.700	41	88.100	599	1269.500	71	157.700	1527	2882.400
	योगः–	**36**	**116.800**	**704**	**2948.600**	**94**	**143.100**	**1124**	**1930.200**	**91**	**178.700**	**2274**	**3642.500**

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पकड़ी गई मछली की किस्म

क0	आवतरण केन्द्र का नाम	कुलवंश				मिरर कार्प				प्रपत्र–3 महाशेर			
		इस माह		योग		इस माह		योग		इस माह		योग	
		संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार
1.	संरक्षण	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2.	बिलासपुर	0	0.000	0	0.000	0	0.000	2426	3757.500	0	0.000	469	948.000
3.	जकातखाना	0	0.000	0	0.000	1248	944.500	32289	24136.500	20	37.500	537	1116.000
4.	नकराणा	0	0.000	1	4.000	348	816.500	5878	14375.200	119	325.000	2148	5449.500
5.	भाखडा	0	0.000	67	82.500	61	139.500	4126	6546.000	23	39.500	370	772.500
6.	मान्दली	0	0.000	12	15.500	59	87.300	3805	5464.200	1	4.000	445	702.000
7.	लठियाणी	59	84.900	558	815.000	137	346.900	2131	4386.000	65	130.800	847	1738.600
	योगः–	**59**	**84.900**	**638**	**917.000**	**1853**	**2334.700**	**50655**	**58665.400**	**228**	**536.800**	**4816**	**10726.600**

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पकडी गई मछली की किस्म

प्रपत्र–4

क0	आवतरण केन्द्र का नाम	गिड वाटा				सिल्वर कार्प				सिंघाडा			
		इस माह		योग		इस माह		योग		इस माह		योग	
		संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार
1	संरक्षण	0	0	0	0	0	0	0	0	0	0	0	0.000
2	बिलासपुर	0	0	0	0	142	289	3857	8496.000	0	0	0	0.000
3	जकातखाना	435	216.000	1765	803.000	1215	1704.500	13725	25812.000	278	240.000	4369	4636.500
4	नकराणा	0	0.000	0	0.000	1263	4693.500	16203	69661.000	125	363.500	2526	6775.500
5	भाखडा	0	0	0	0	1197	3308.000	22428	56891.000	288	294.000	7838	8042.000
6	मान्दली	0	0	0	0	255	551.100	9963	20495.000	754	656.100	13060	13309.300
7	लठियाणी	0	0	0	0	490	1025.500	5360	10776.800	209	441.600	3172	5846.800
	योगः–	**435**	**216.000**	**1765**	**803.000**	**4562**	**11571.600**	**71536**	**192131.800**	**1654**	**1995.200**	**30965**	**38610.100**

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पकडी गई मछली की किस्म

प्रपत्र–5

क्र०	आवतरण केन्द्र का नाम	ग्रास कार्प				बिगहैड				बिक्री की गई मछली का शुल्क	
		इस माह		योग		इस माह		योग		इस माह	योग
		संख्या	भार	संख्या	भार	संख्या	भार	संख्या	भार		
1.	संरक्षण	0	0	0	0.000	0.00	0.00	0	0	0.00	0.00
2.	बिलासपुर	0	0.000	0	0.000	0.00	0.00	0	0	5637.00	227157.00
3.	जकातखाना	3	8.00	31	126.500	0.00	0.00	64	1010.5	62508.00	1002868.00
4.	नकराणा	0	0.000	0	0.000	68.00	1192.50	659	10423	142767.00	1759708.00
5.	भाखडा	1	5.000	18	170.500	10.00	119.50	242	2884	106389.00	1556977.00
6.	मान्दली	0	0.000	1	15.000	0.00	0.00	0	0	37636.00	967119.00
7.	लठियाणी	0	0.000	0	0.000	0.00	0.00	0	0	70724.00	720620.00
	योगः–	**4**	**13.000**	**50**	**312.000**	**78.00**	**1312.00**	**965**	**14317.5**	**425661.00**	**6234449.00**

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प्रपत्र–6

क0	आवतरण केन्द्र का नाम	प्राप्त शुल्क की राशि		लम्बित शुल्क की राशि		अवैध मत्स्य आखेट पकडे		अभिसंधान किए		लम्बित रहे	
		इस माह	योग	इस माह	योग	इस माह	योग	इस माह	योग	इस माह	योग
1.	संरक्षण	0	0	0	0	7	59	0	45	7	14
2.	बिलासपुर	9859.00	212463.00	14694.00	14694.00	0	13	0	13	0	0
3.	जकातखाना	107829.00	948305.00	28509.00	54563.00	7	27	14	27	0	0
4.	नकराणा	225963.00	1650033.00	109675.00	109675.00	0	34	0	32	0	2
5.	भाखडा	117750.00	1259729.00	106389.00	297248.00	2	39	0	25	2	14
6.	माव्दली	32185.00	954198.00	12921.00	12921.00	4	28	4	28	0	0
7.	लठियाणी	70924.00	651861.00	68759.00	68759.00	5	12	0	2	5	10
	योगः–	**564510.00**	**5676589.00**	**340947.00**	**557860.00**	**25**	**212**	**18**	**172**	**14**	**40**

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प्रपत्र-7

क्र०	अवतरण केन्द्र का नाम	अनुज्ञापति शुल्क		ट्रवैध मत्स्य आखेट मुआवजा		समहरित मछली नीलामी		अधिशुल्क जला		अन्य प्राप्तियां		कुल योग	
		इस माह	योग	इस माह	योग	इस माह	योग	इस माह	योग	इस माह	योग	इस माह	योग
1	संरक्षण	0	0.00	0.00	33600.00	0.00	16200.00	0.00	0.00	0.00	0.00	0.00	49800.00
2	बिलासपुर	0	800.00	0.00	6800.00	0.00	500.00	9859.00	212463.00	0.00	0.00	9859.00	220563.00
3	जकातखाना	100.00	100.00	5300.00	13600.00	500.00	1000.00	107829.00	948305.00	0.00	0.00	113729.00	963005.00
4	नकराणा	0.00	200.00	0.00	20000.00	400.00	12000.00	225963.00	1650033.00	0.00	0.00	226363.00	1682233.00
5	भाखडा	700.00	44300.00	0.00	14100.00	0.00	2670.00	117750.00	1259729.00	0.00	0.00	118450.00	1320799.00
6	मान्दली	100.00	18200.00	2000.00	14000.00	0.00	500.00	32185.00	954198.00	0.00	0.00	34285.00	986898.00
7	लठियाणी	0.00	11000.00	0.00	1500.00	0.00	0.00	70924.00	651861.00	0.00	500.00	70924.00	664861.00
8	स०नि०म०	200.00	288800.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	51960.00	240.00	340760.00
	योग:-	**1 00.00**	**363400.00**	**7300.00**	**103600.00**	**900.00**	32870.00	**564510.00**	**5676589.00**	**40.00**	**52460.00**	**573850.00**	**6228919.00**

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राज्य से बाहर व विभागीय फार्मों से संग्रहित अंगुलिकाओं का वितरण गोविन्दसागर जलाशय (अवधि 16.01.2025 से 15.02.2025 तक)।

क्र०	आवतरण केन्द्र व सोसाईटी का नाम	विभागीय केजों से (लाखों में)			विभागीय फार्मों से (लाखों)					अन्य राज्य से आयातित (लाखों में)							संग्रहित मछली बीज
		मिरर कार्प	सिल्वर कार्प	योग	मिरर कार्प	अन्नूर कार्प	मेजर कार्प	हंगेरियन स्टेन	योग	कतला	सिल्वर कार्प	घास कार्प	रोहू	मिरर कार्प	मरिगल	योग	कुल योग
1	बिलासपुर	0	0	0	0	0	0	0	0.00000	0	6.954	0	0	0	0	6.954	6.95400
2	लठियाणी	0	0	0	0	0	0	0	0.00000	0	0	0	0	0	0	0	0.00000
4	नकराणा/ जडडू	0	0	0	0.0	0	0	0	0.00000	5.103	4.51176	0	0	0	0.9916	10.60636	10.60636
5	जगातखाना	0	0	0	0	0	0	0	0.00000	0	0	0	0	0	0	0	0.00000
6	भारवड़ा	0	0	0	0.0	0	0	0.0	0.00000	3.0072	7.56075	0	0	0	0.82476	11.39271	11.39271
7	मादली /दोवड	0	0	0	2.93	5.5	0	0	8.43000	1.9	9.18895	0.6028	6.6718	0	1.51632	19.87	28.30150
8	पिंजरों (Cages) में मछली बीज संग्रहण	0	0	0	0.000	0	0	0	0.00000	0	0	0	0	0	0	0.00	0.00000
	योग :-	0	0	0	2.930	5.5	0	0.0	8.43000	10.00182	28.21546	0.60277	6.67	0	3.33268	48.82	57.25457

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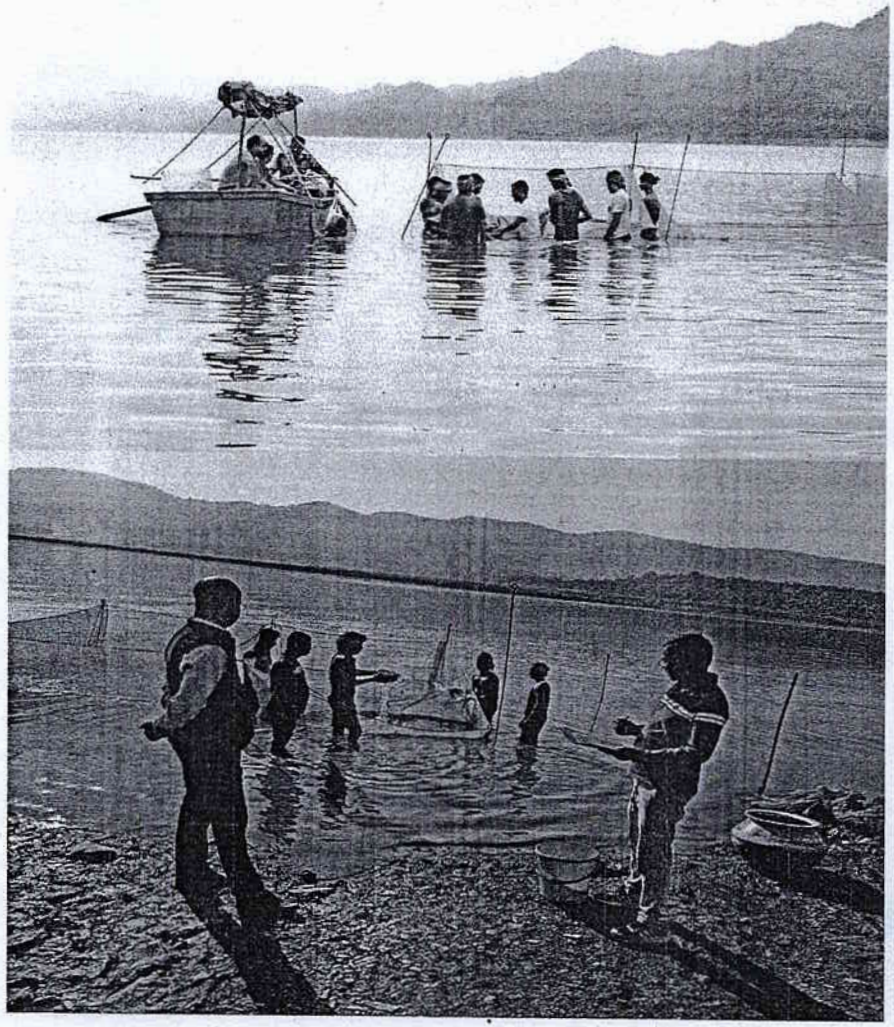
Annexure R-3



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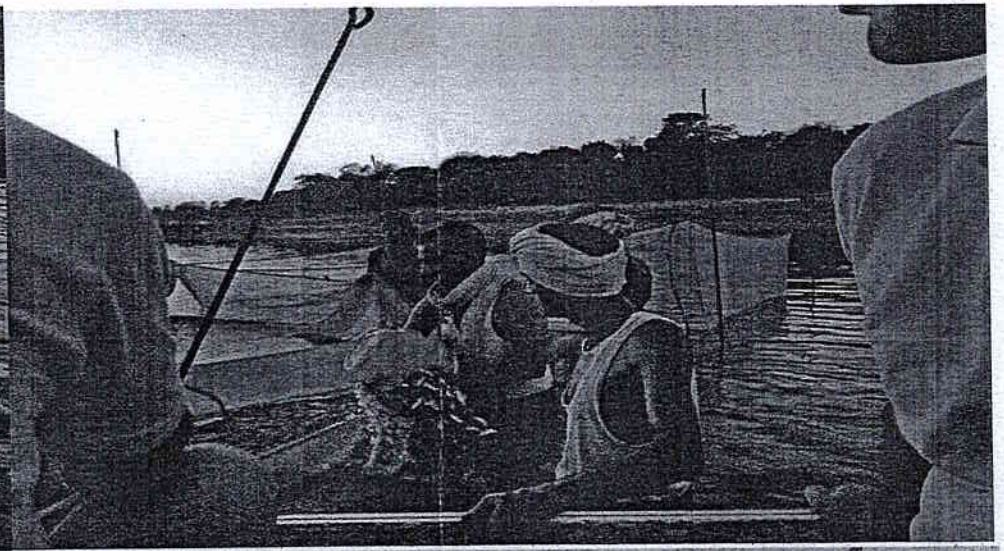

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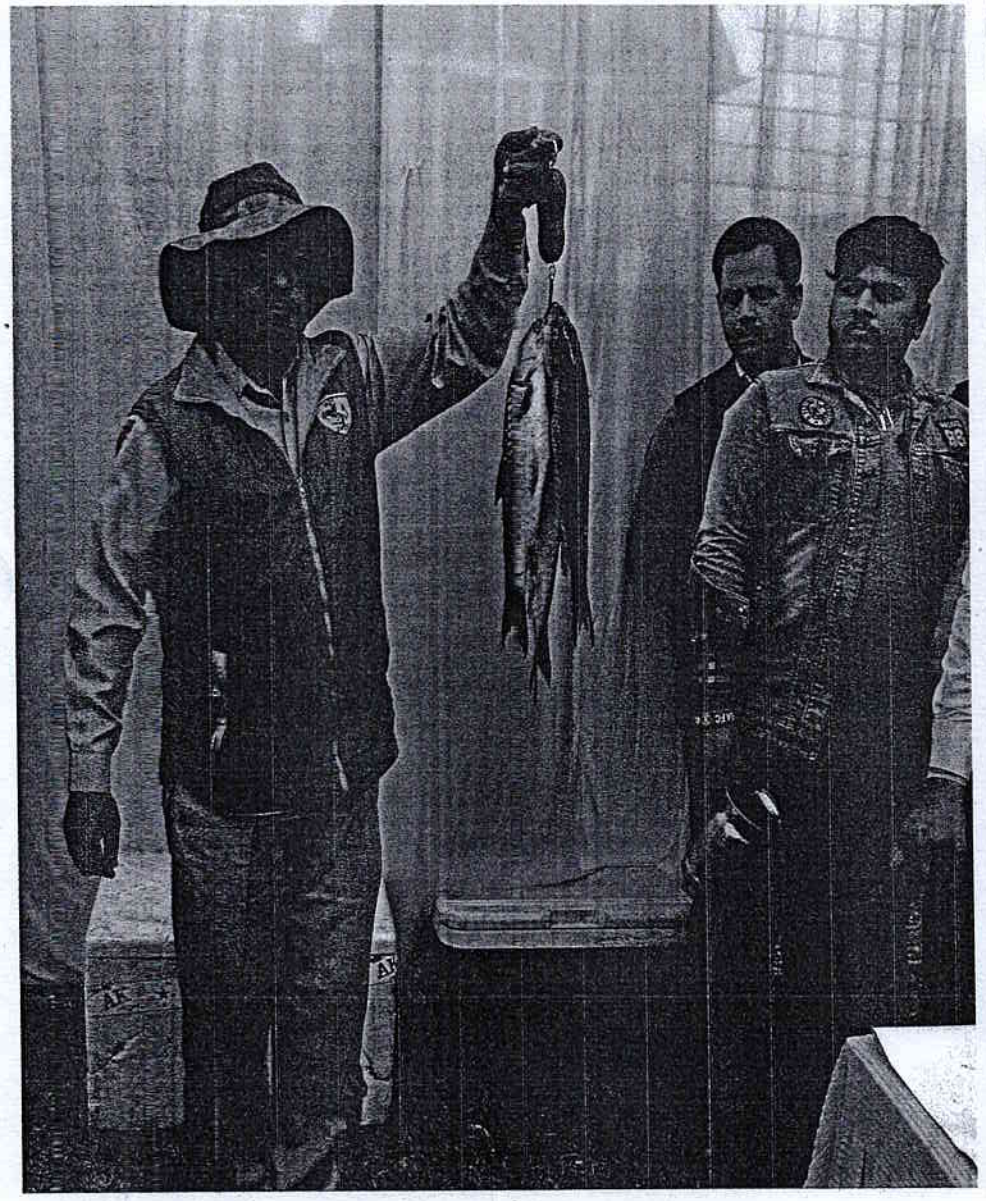

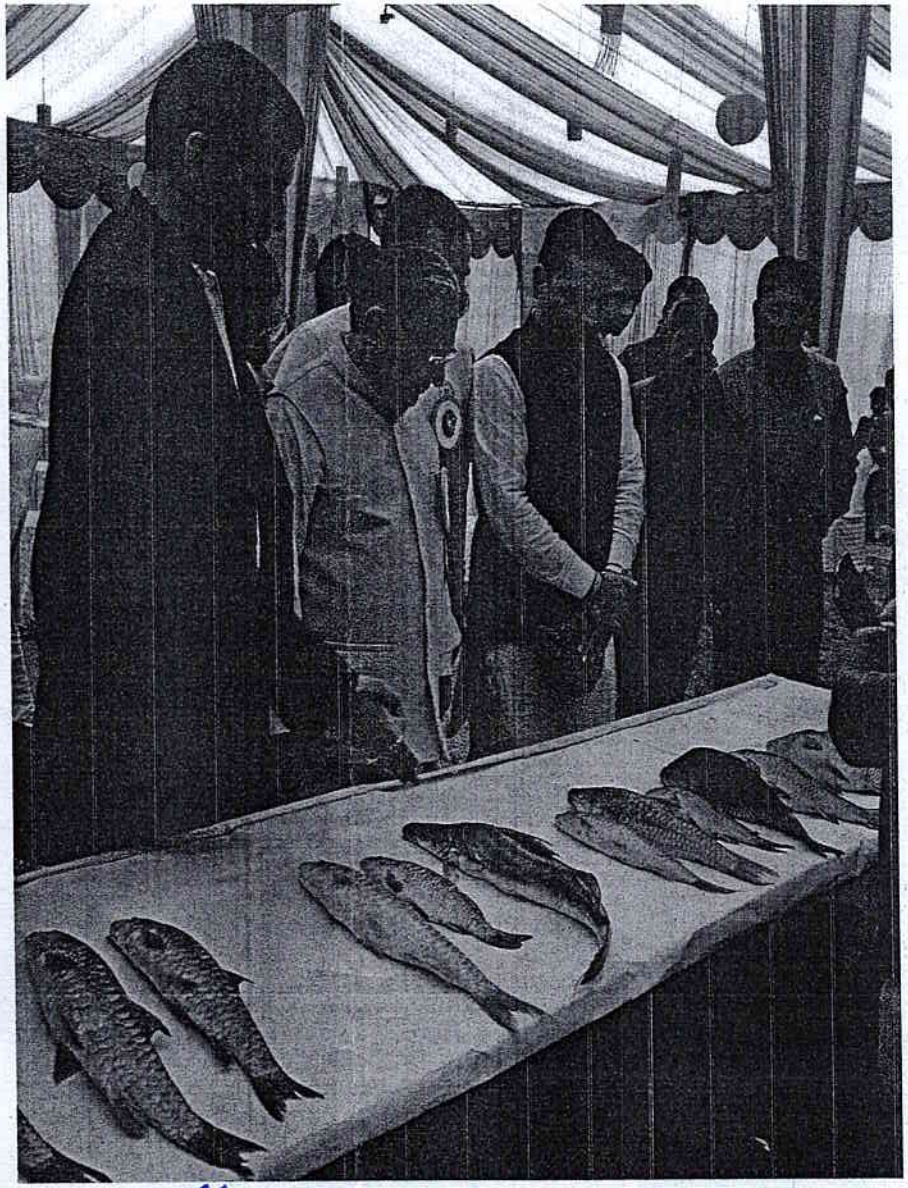

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Annexure R-4

FINAL REPORT

INVESTIGATION ON FISHERIES & ECOLOGICAL STATUS, THREATS & REMEDIAL MEASURES FOR ENHANCEMENT OF FISH PRODUCTIVITY OF GOBINDSAGAR RESERVOIR, HIMACHAL PRADESH

Submitted to:

Department of Fisheries
Govt. of Himachal Pradesh

Dy. Director of Fisheries (Hq)
Directorate of Fisheries HP
Bilaspur 174001

भा.कृ.अनु.प.-केन्द्रीय अंतर्स्थलीय मात्स्यिकी अनुसंधान संस्थान
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ICAR-Central Inland Fisheries Research Institute
Barrackpore, Kolkata - 700120, West Bengal
www.cifri.res.in
(ISO 9001:2008 certified Institution)

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FINAL REPORT

Project Title

Investigation on Fisheries and Ecological Status, Threats and Remedial Measures for Enhancement of Fish Productivity of Gobindsagar Reservoir, Himachal Pradesh

Submitted to:

Department of Fisheries, Govt. of Himachal Pradesh

Submitted by:

ICAR-Central Inland Fisheries Research Institute

(Indian Council of Agricultural Research)

Barrackpore-700120, Kolkata, West Bengal, India

भाकृअनुप
ICAR

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Bilaspur 174001

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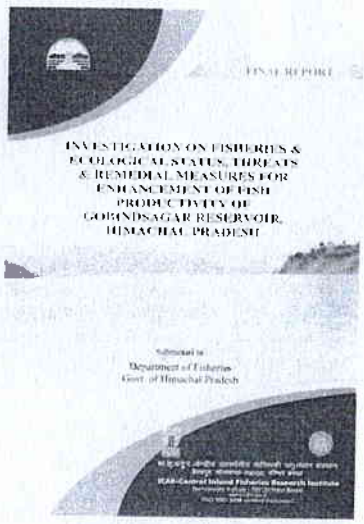

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PROJECT TEAM

Overall Coordinator

Dr. Basanta Kumar Das (Director, ICAR – CIFRI)

Principal Investigator

Dr. Uttam Kumar Sarkar (HoD, RWF Division, ICAR – CIFRI)

Co-Principal Investigators

Dr. Archan Kanti Das (Principal Scientist, ICAR – CIFRI)

Dr. Lianthuamluaia (Scientist, ICAR – CIFRI)

Mr. Mishal P., Scientist (ICAR – CIFRI)

Technical Support

Mr. Subhendu Mandal (Senior Technical Assistant, ICAR– CIFRI)

Young Professional

Mr. Ratul Chakraborty (YP – II, ICAR – CIFRI)

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1. Executive Summary

The present study was carried out to assess the fisheries and ecological status of Gobindsagar reservoir to develop sustainable management strategy for the rejuvenation of fish production in the reservoir. The water and sediment quality parameters indicated that the reservoir is medium productive. The highly fluctuating water spread area in the recent years is one of the most probable reasons for the declining of fish production. The water fluctuations can have a large impact on the fish breeding grounds/ habitats which influence the natural recruitment of the auto-breeding populations and also the natural food availability. The fish production was positively influenced by the water spread area as shown by regression analysis and sufficient water is needed for sustainable fish production. The species richness was 17 based on the experimental fishing and 21 based on the stakeholders' perception which indicated that the species richness has drastically reduced as compared to previous records. Habitat disturbance due to the wide fluctuation of the water spread area and climate change impact could be the possible reasons for the loss of fish diversity in the reservoir. The fish catch analysis for the last decade (2010-20) indicated that the exotic fish *Hypophthalmichthys molitrix* and *Cyprinus carpio* led the percentage fish catch followed by *Labeo catla*. The time series data also indicated that *Hypophthalmichthys molitrix* was the most dominant fish. However, the catch of *H. molitrix* decreased drastically after 2013 onwards and kept on decreasing. Canonical corresponding analysis (CCA) indicated that nutrient parameters nitrate-N and phosphate-P were the most influencing parameters for silver carp, the most dominant fish catch in the reservoir. Alkalinity, conductivity, dissolved oxygen (DO) were the most important parameters influencing the abundance of common carp and minor carp. Transparency and pH were the most important parameters influencing the productivity of mahseer, rohu, mrigal, catla, grass carp, calbasu and seenghala. The study clearly indicated that stocking has an impact on the fish production but other interventions like identification of and protecting the breeding ground can enhance the fish production in a sustainable manner. The estimated potential fish yield was in the range of 136-153 kg/ha/yr (Average 145 kg/ha/yr) on the basis of the algal biomass model. The fish yield ranged from 23-149 kg/ha/yr with an average of 72kg/ha/yr during the last decade indicated that the actual fish yield in the reservoir is quite lower than the estimated potential fish yield. The Schaefer's model estimated the MSY for the reservoir to be 101.42 kg/ha/yr and the fishing effort to attain the maximum sustainable fishing effort (fMSY) to be 2953 gill nets license per year. The Fox model estimated the MSY for the reservoir to be 97.04 kg/ha/yr and the fishing effort to attain the maximum sustainable fishing effort (fMSY) to be 3141 gill nets license per year. In order to re-establish the production in the reservoir in a sustainable manner, the major recommendations of the present study are: i) stocking of large sized IMC and common carp fish seed of >100 mm regularly and consistently @300 fingerlings/ha, ii) stocking of silver carp vigorously @300 fingerlings/ha (>100mm) for 5 years to develop the auto breeding population, iii) monitoring of the water spread area, maintaining the fishing effort of 2953 to 3141 gill nets license per year and iv) identification of the potential breeding grounds and protecting those habitats. The study identified the critical issues and demonstrated explicitly the need for implementing suggested management strategies for sustainable development.

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2. Introduction

Reservoir fisheries contribute immensely for fishery reserve of the State of Himachal Pradesh with important reservoirs like Gobindsagar, Pong (Maharana Pratap Sagar), Chamera, Ranjeet Sagar and Kol dam and mean water spread of 43,785 ha. Gobindsagar is an important reservoir built in River Sutlej under the Bhakra-Nangal project which was launched at the dawn of independence. The reservoir formed in 1963 holds great significance for many reasons, as it signifies the beginning of an era of large developmental projects in India and the project was considered as an icon of the young nation's pride, aptly described by Jawaharlal Nehru as one of the temples of modern India (Sugunan, 1995). It is one of the world's highest gravity dams with 226 meters and average water spread area is 10,000 hectares. It is a multipurpose river valley project primarily constructed for the generation of electricity, irrigation and flood control.

Gobindsagar reservoir, by virtue of its location at high latitude, transcending the limits of the tropics and cold-water influx from the Beas system, simulates some sub-temperature environment. The reservoir has brought about great socio-economic change in the region by serving as an important fishery resource for the state. Fisheries of this reservoir started providing employment and animal protein to a great number of people and the reservoir turned out to be a good revenue source for the government through fisheries. The creation of Gobindsagar has changed the ecology of river Sutlej where originally species such as *Labeo dero*, Mahseers (*Tor* spp) and Snow trouts (*Schizothorax* spp.) etc. were caught mainly by angling and use of cast nets, before the creation of Gobindsagar reservoir in 1959 (Sugunan, 1995). Once the reservoir was constructed, Indian major carps and common carp were being regularly stocked in this reservoir. Silver carp (*Hypophthalmichthys molitrix*) was accidently introduced into this reservoir due to flash floods at Deoli Fish Farm in 1971, which got proliferated and established in the reservoir due to auto-stocking, providing a unique opportunity for the fishery biologists to study the behavior of the exotic silver carp in an Indian reservoir. The reservoir was studied by All India Coordinated Research Project on Reservoir Fisheries from 1971 to 1985 (Sugunan, 1995). Negi (2007) reported the ichthyofaunal diversity of Gobindsagar reservoir as 51 species with a total catch of 1174.33 tons and 1202.88 tons during 2001-02 and 2002-03, respectively. Currently, the major species of commercial importance in the reservoir include *Labeo catla, Labeo rohita, Sperata seenghala, Bangana dero, Labeo calbasu, Tor putitora, Cirrhinus mrigala, Cyprinus carpio, Hypophthalmichthys molitrix, Ctenopharyngodon idella* etc. (Lal and Dua, 2018).

ICAR-CIFRI has systematically carried out some studies in Gobindsagar reservoir which had provided several recommendations for fisheries enhancement in the reservoir mainly focusing on stocking policy, species selection and other management guidelines (ICAR-CIFRI, 2015). Under the changing ecological scenario, the Directorate of Fisheries, Himachal Pradesh has conveyed the concern of declining fish productivity in the reservoir and has asked ICAR-CIFRI to undertake a scientific investigation on the issue to come out with solutions for the same to sustain fisheries in this reservoir.

The fish catch data provided by Department of Fisheries (DoF), Himachal Pradesh indicated that there is 68.4% decline in fish production over five years (2013-14 to 2017-18) and the species-wise data indicated rapid decline of silver carp production and subsequent increase in production and share of common carp, mahseers etc. Researchers have pointed out the decreasing fish production due to drastic reduction in volume of water and heavy siltation as results of construction of Kol dam and Karcham Wantoo power projects in River Sutlej. Hence, a year-long detailed study was proposed and implemented to investigate the current fisheries status, explore the factors determining fish productivity and to come out with suitable measures and recommendations for enhancement of fisheries productivity for Gobindsagar Reservoir.

Objectives

- To study the status of fisheries productivity in Gobindsagar reservoir and the biotic and abiotic factors determining the productivity of reservoir
- To recommend measures for productivity enhancement and sustainable fisheries management of Gobindsagar reservoir

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3. Sampling & methodology

Gobindsagar reservoir, a large category reservoir located in Sutlej river in Himachal Pradesh state, India. Sampling was carried out in 3 sampling stations in each zone covering lotic, intermediate, and lentic sector of the reservoir following stratified random sampling methodology within each zone. Systematic samplings were done seasonally covering pre-monsoon, monsoon and post-monsoon during 2021-22. The sampling was also carried out in the Kol dam/reservoir located above the Gobindsagar reservoir in the same river Sutlej.

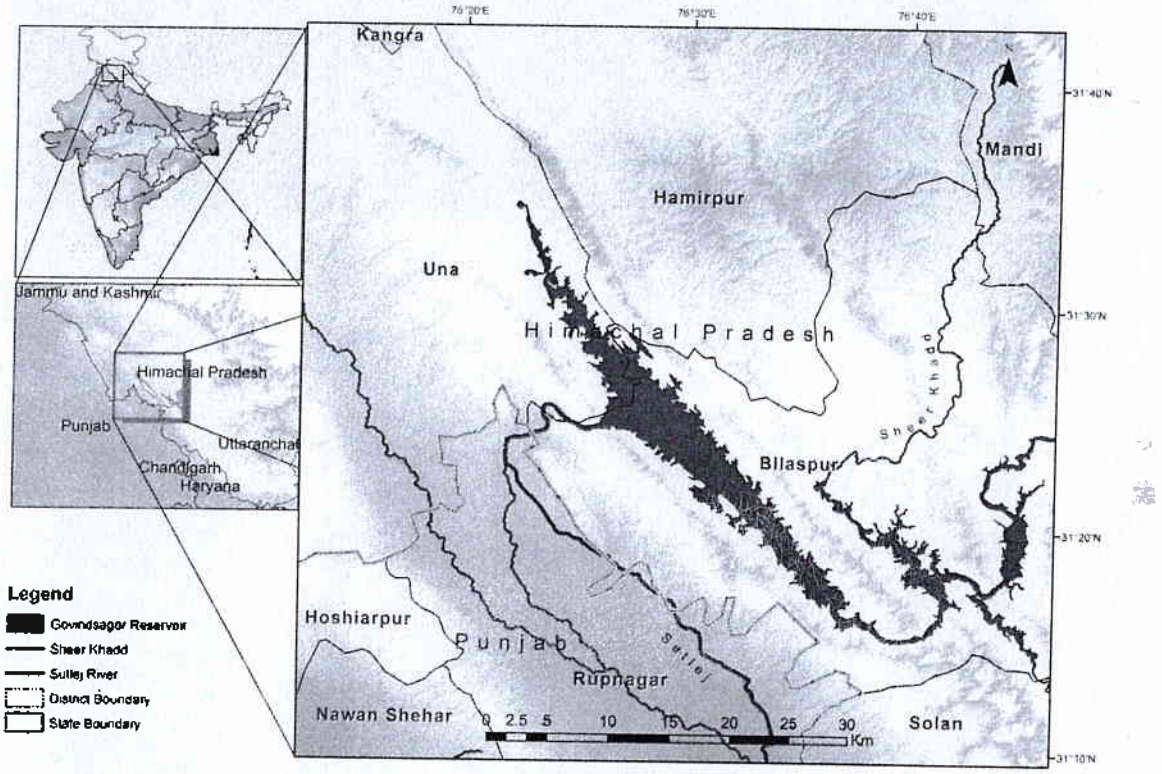

Fig. Location of the study area Gobindsagar reservoir, H.P.

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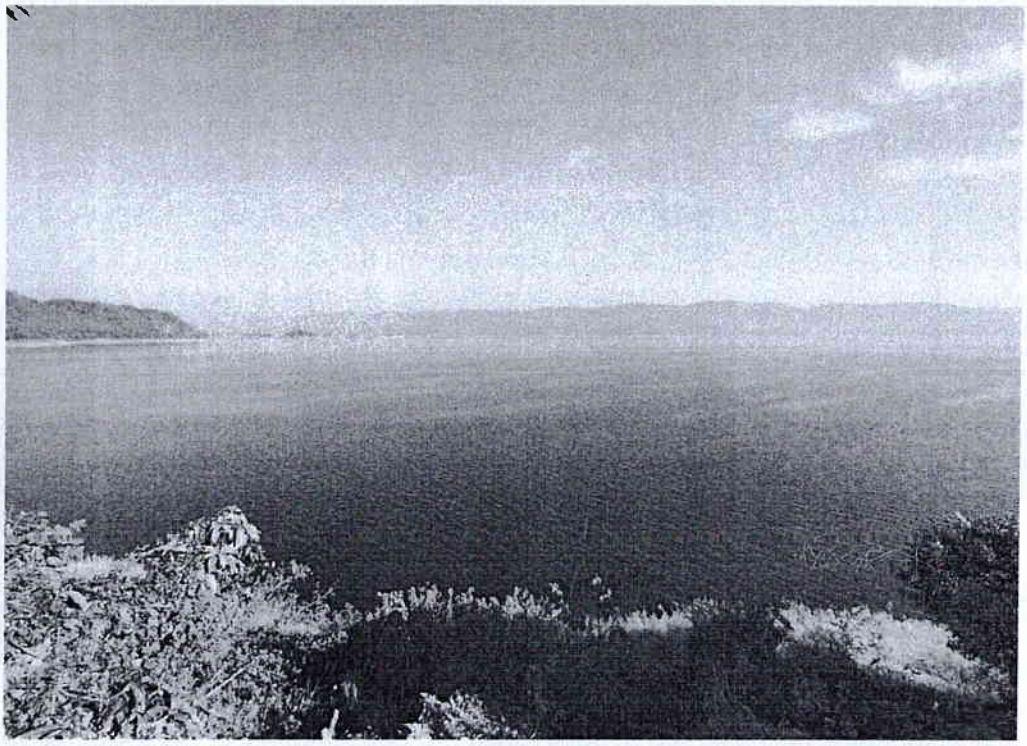

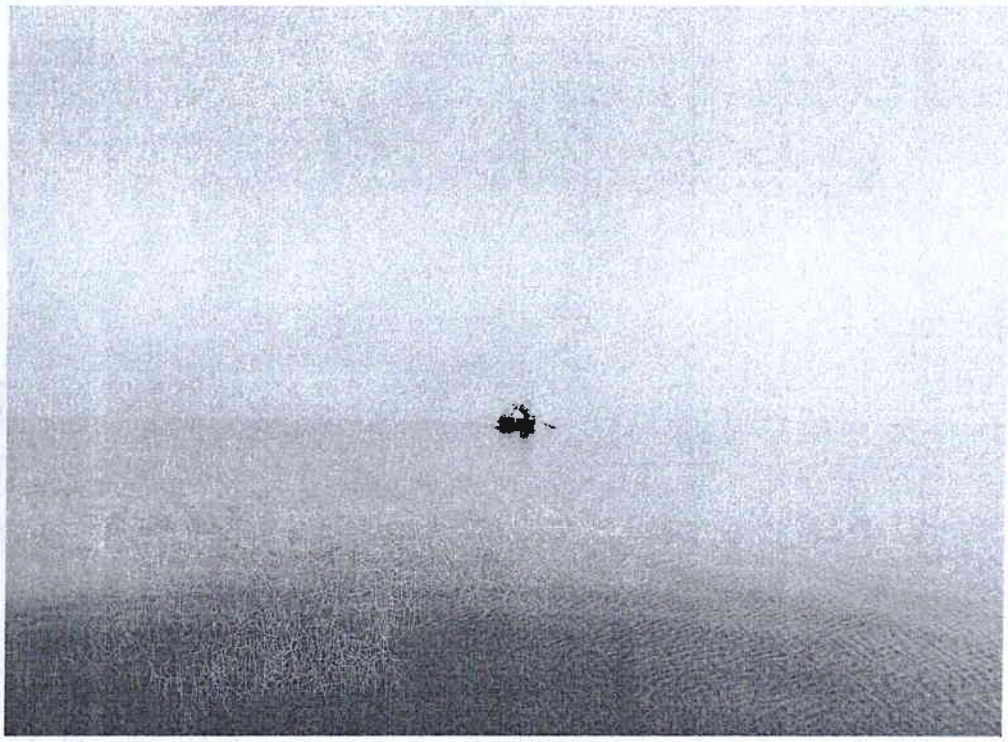

A view of the Gobindsagar reservoir, Himachal Pradesh

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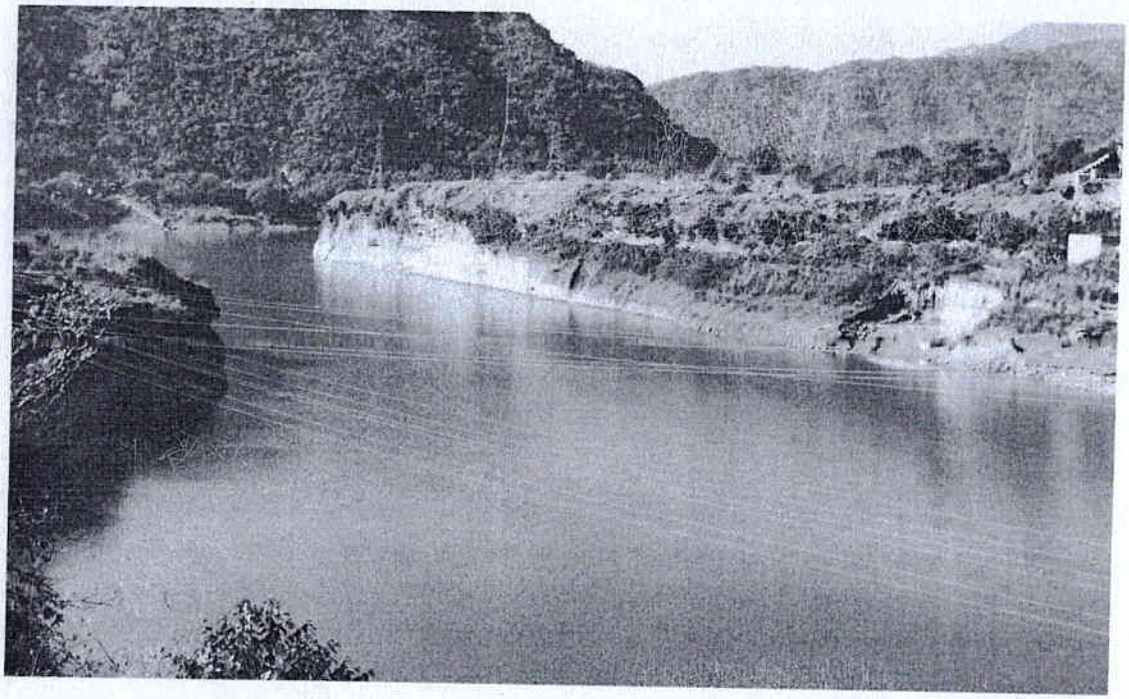

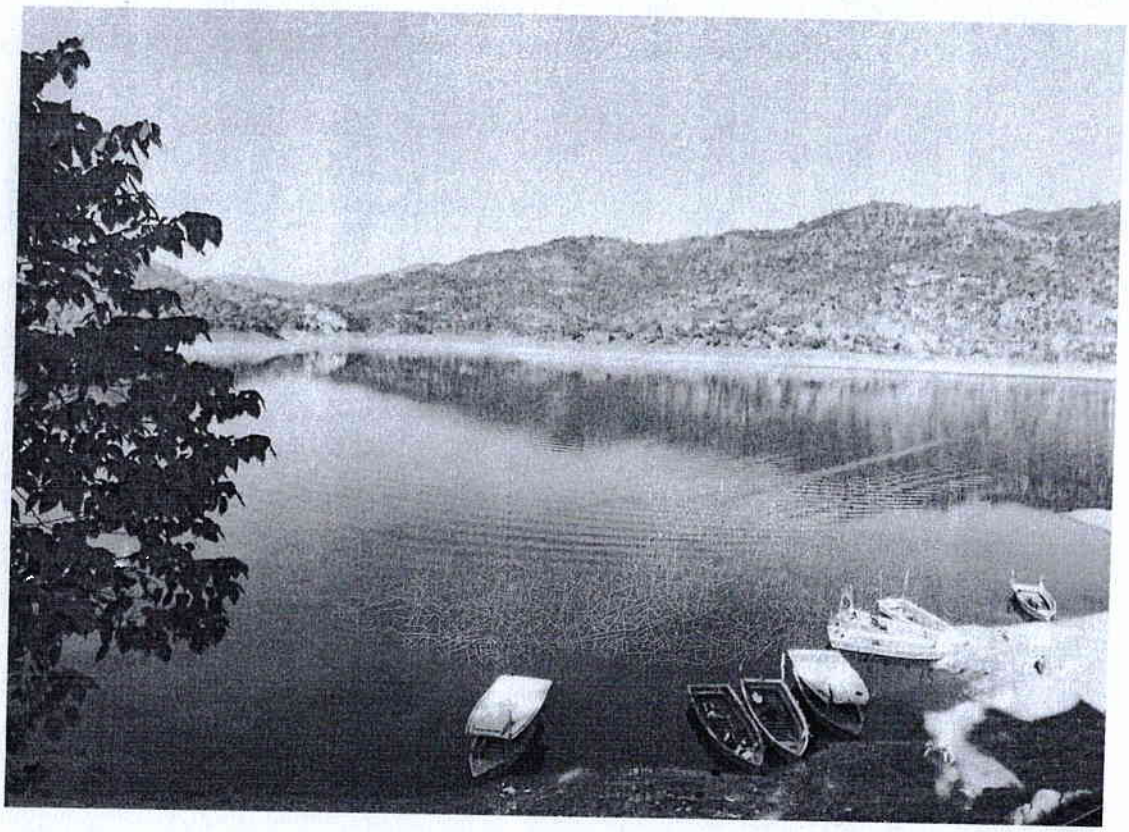

View of the Gobindsagar reservoir

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Fish diversity, catch composition etc.

- Experimental fishing was conducted using multi- mesh size fishing gears from different sampling sites covering lotic, intermediate, and lentic zone of the reservoir to assess the fish diversity of the reservoir
- Information was also collected from the local fishers and fish landing centres to assess the catch composition and fishing effort for the commercial fish catch.
- Historical data on seed stocking, fish production, and fishing effort was collected from the State Fisheries Department, Himachal Pradesh.
- Identification of fish species was made using keys mentioned by Jayaram (2010), Talwar & Jhingran (1991), Fish base etc.
- Fish assemblage pattern vis-a-vis environmental factors was assessed to identify the important factor for fish assemblage pattern using Canonical Correspondence Analysis (CCA).

Plankton and benthic communities

- Phytoplankton and zooplankton were sampled using standard plankton net in different sampling sites covering lotic, intermediate, and lentic zone of the reservoir.
- Qualitative and quantitative assessments of the plankton were done following Standard Methods, (APHA, 2012).
- Benthic macro-invertebrates were sampled using benthic grab in different seasons from different sampling sites following standard methods.

Assessment of environmental parameters including water quality and soil parameter and other meteorological data:

- The environmental parameters like water and sediment parameters were sampled from the different zones of the reservoir.
- Water quality parameters like temperature, depth, transparency, pH, specific conductivity, total alkalinity, total hardness, dissolved oxygen (DO), dissolved nutrients like nitrate-nitrogen, phosphate-phosphorus, silicate-Si were analysed using Standard Methods (APHA, 2012).
- Estimation of primary productivity of water was done using light and dark bottle Oxygen method.
- The time series data of water spread area was collected and analysed

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Assessment of productivity and fish yield potential, MSY, fMSY and stocking density

- The fish yield potential was assessed using primary productivity
- The maximum sustainable yield (MSY) and optimum fishing effort was assessed using the surplus production model

  The Schaefer surplus production model:

  $(Y_t / f_t) = a + b f_t$

  Under this model the catch per unit effort will be maximum when

  $$f_t = \frac{-a}{b}$$

  The maximum sustainable yield (MSY) for the model is

  $$MSY = \frac{-a^2}{4b}$$

  and the corresponding effort is

  $$f_{MSY} = \frac{-a}{2b}$$

  the coefficient a and b can be calculated by linear regression of catch per unit effort (Y_t / f_t) (CPUE) on effort f_t
- Stocking density was calculated based on the following:

  Stocking density (No./ha)= Potential yield (kg/ha)/Growth rate of fish (kg/year) + loss%

Trophic status

- The trophic status of the reservoir was assessed using Trophic State Index –TSI (Carlson, 1977)

$$\text{TSI (SD)} = 10\left(6 - \frac{\ln \text{SD}}{\ln 2}\right)$$

$$\text{TSI (Chl)} = 10\left(6 - \frac{2.04 - 0.68 \ln \text{chl}}{\ln 2}\right)$$

$$\text{TSI (TP)} = 10\left(6 - \frac{\ln \frac{48}{\text{TP}}}{\ln 2}\right)$$

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Impact of fingerling stocking

- The impact of stocking was assessed by the pattern of increment of fish yield based on stocking density maintained in the reservoir. The Regression analysis was employed to assess the response of fish production to different stocking densities (Sarkar et al. 2020, Lianthuamluaia et al 2021 and Puthiyottil et al. 2021).

Table 1. Geographical co-ordinates of sampling stations and land use pattern of Gobindsagar reservoir

Sampling station	Sampling Zones	GPS coordinates	Description of zones
1	Lotic	31°20'33.3"N 76°45'11.8"E	Riverine habitat, shallower, catchments are hilly represented by forest, agriculture land, barren land and human settlement area, pollution.
2		31°18'02.8"N 76°41'29.5"E	
3		31°19'08.5"N 76°40'00.3"E	
4	Intermediate/ Transitional	31°18'21.0"N 76°35'19.9"E	Transition phase between the river and the lake, depth is medium, catchment is hilly represented by forests, agricultural land, barren land and human settlement area.
5		31°19'48.79"N 76°34'10.03"E	
6		31°21'15.85"N 76°32'45.97"E	
7	Lentic (Dam)	31°24'32.10"N 76°29'15.59"E	Lacustrine nature where the dam is constructed, deeper, wider water spread area, site of cage culture, catchments are hilly represented by forest, agriculture land, barren land and human settlement area.
8		31°25'17.64"N 76°27'13.12"E	
9		31°27'10.42"N 76°26'54.69"E	

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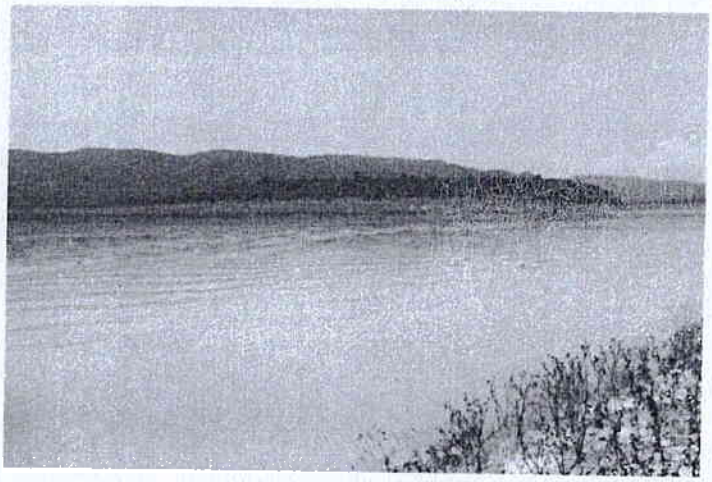
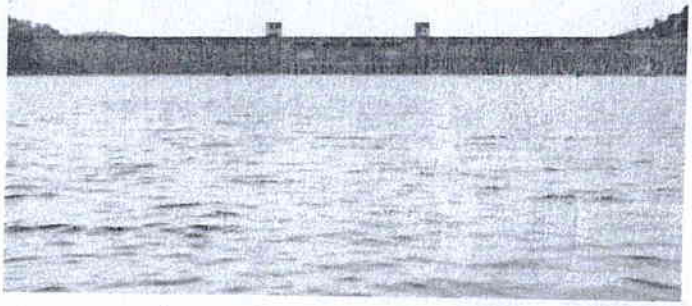


Lotic zone

Intermediate zone



Lentic zone

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Table 2. Basic morphological detail of Gobindsagar reservoir, Bilaspur, H.P.

Parameters	Particulars
Location	Bilaspur, Himachal Pradesh, India
Name of the river	Sutlej
Height (m)	226.0 m (741.47 ft)
Elevation at top of dam	560.0 m (1837.27 ft)
GPS Location	31°25' N , 76°25' E
Catchment area (km^2)	56,980
Water spread area at FRL (ha)	16,867
Water spread area at DSL (ha)	5,063
Average Water spread area (ha)	10,000
Mean Depth (m)	55.0
Total Length (km)	168.0
Widest Stretch (km)	6.0
Shoreline development index	12.26
Volume development index	4.04
Annual water level fluctuation (m)	450 – 507
Max. water level fluctuation (m)	70.0
Gross storage capacity(mill. m^3)	9868
Live storage capacity(mill. m^3)	7771

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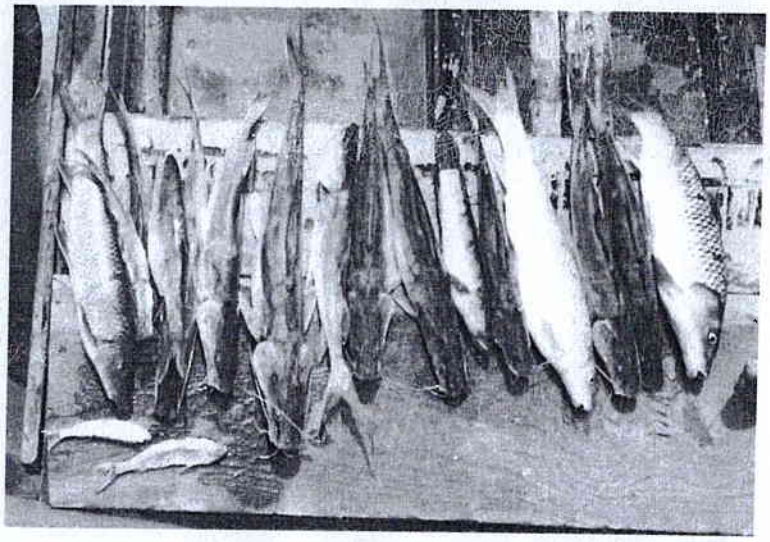
4. Fish diversity

The present study recorded 17 species under 5 orders and 7 family based on the observation of commercial fish catch and the experimental fishing in the reservoir. The fish diversity was also assessed based on the stakeholder perception. Based on the perception of the local fishers, 21 fish species were available in the reservoir. The feeding guilds indicated that more than 70% of the species observed in the reservoir were planktivores which clearly indicated that plankton play a very important role for the successful management of the reservoir. The species richness 17 based on the experimental fishing and 21 based on the perception of the fishers during the present study clearly indicated that the species richness has drastically reduced from the previous records. Habitat disturbance due to the wide fluctuation in water spread area and climate change could be the possible reasons for the loss of fish diversity in the reservoir.

The fish diversity variations in different zones of the reservoir was assessed based on the rarefaction curve using Hill diversity numbers. The species richness was higher in the lotic zone (15 species) as compared to lentic zone (12 species) and transitional zone (12 species) of the reservoir. The higher species richness was also clearly indicated by the Hill diversity number 0 in the rarefaction curve. The higher species richness in the lotic zone might be due to the riverine nature of the habitat which can support diverse fish species. The Evenness Index, Simpson Index and Shannon Index were almost similar in all the zones of the reservoir which was also indicated by the Hill diversity number 1 and 2 in rarefaction curve. The findings clearly indicated as far as the dominancy and evenness of the fish species distribution is concerned, the reservoir zones did not have significant difference.



Fish diversity in Gobindsagar reservoir

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Table 3. Fish diversity based on experimental fishing and commercial catch

Order	Family	Species	Feeding Guild	IUCN	Abundance (%)
Cypriniformes	Cyprinidae	*Labeo catla*	Planktivores/ Herbivores	LC	9.28
		Labeo rohita	Planktivores / Herbivores	LC	2.11
		Cirrhinus mrigala	Planktivores / Herbivores	LC	0.42
		Cirrhinus reba	Planktivores / Omnivores	LC	0.84
		Labeo calbasu	Planktivores / Omnivores	LC	0.84
		Cyprinus carpio	Planktivores / Omnivores	VU	15.61
		Tor putitora	Planktivores / Omnivores	EN	5.49
		Labeo dero	Planktivores / Omnivores	LC	11.39
		Labeo dyocheilus	Planktivores / Omnivores	LC	2.11
		Salmostoma phulo	Planktivores / Omnivores	LC	5.49
		Hypophthalmichthys molitrix	Planktivores / Herbivores	NT	25.74
		Ctenopharyngodon idella	Herbivorous	NE	1.69
Siluriformes	Bagridae	*Sperata seenghala*	Carnivorous	LC	10.13
Perciformes	Ambassidae	*Chanda nama*	Carnivorous	LC	1.27
		Parambassis ranga	Carnivorous	NE	1.27
Synbranchiformes	Mastacembelidae	*Mastacembelus armatus*	Carnivorous	LC	3.80
Anabantiformes	Channidae	*Channa punctata*	Carnivorous	LC	2.11

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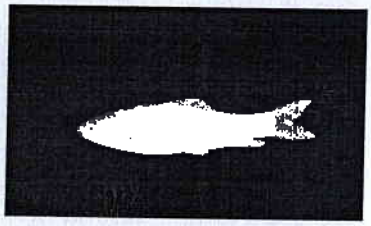
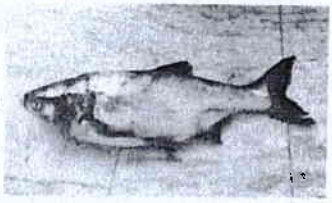
Labeo catla

Labeo rohita

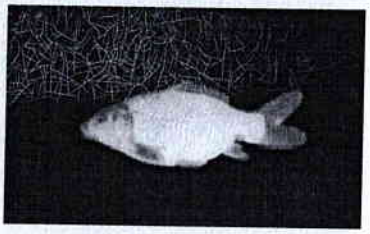


Cirrhinus mrigala

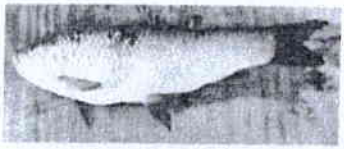


Hypophthalmichthys molitrix

Ctenophayrngodon idella

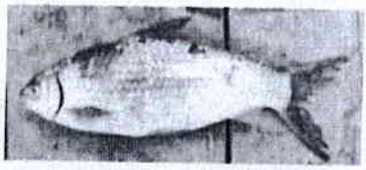


Cyprinus carpio

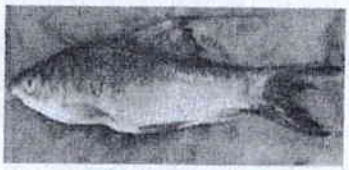


Labeo dero

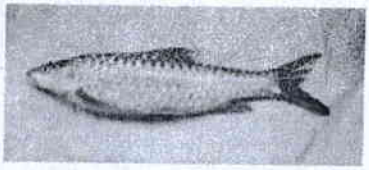
Labeo dyocheilus



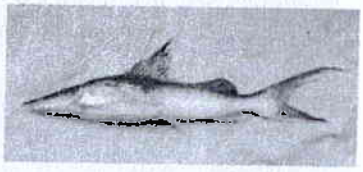
Cirrhinus reba



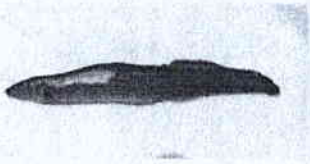
Labeo calbasu



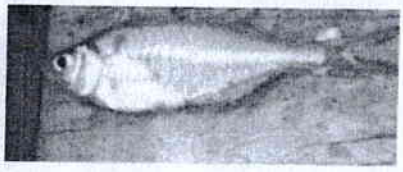
Tor putitora



Sperata seenghala

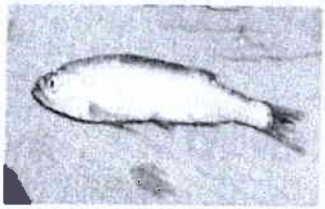


Mastacembelus armatus

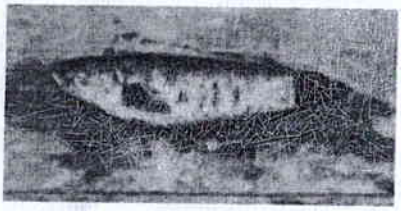


Chanda nama

Parambassis ranga



Salmophasia phulo



Channa punctata

Fig. Fish diversity of Gobindsagar reservoir, H.P.

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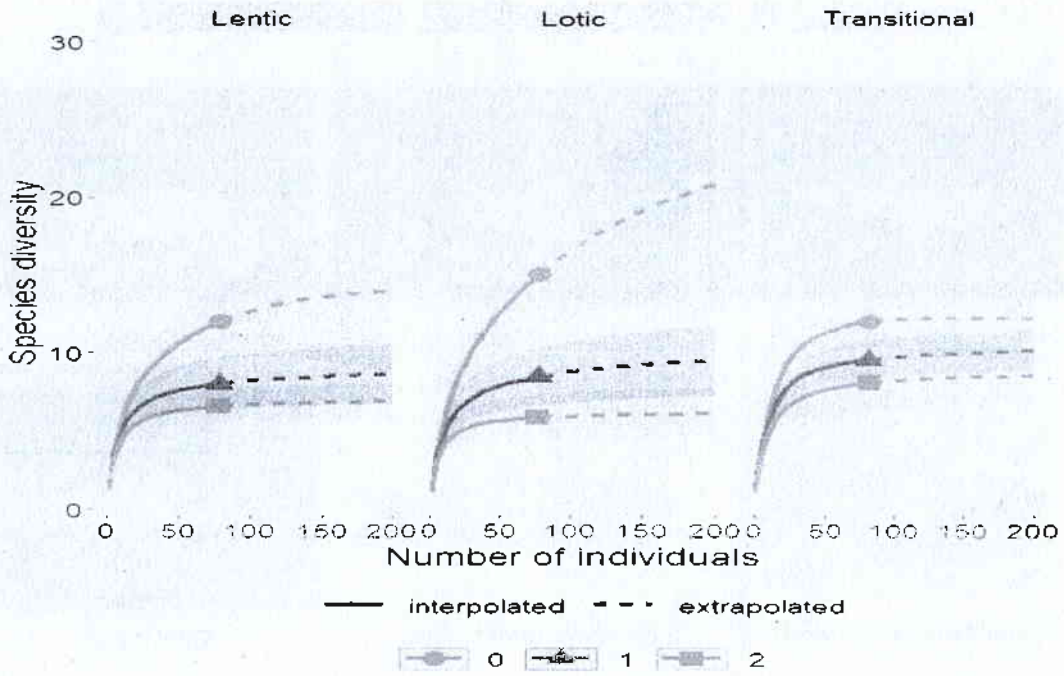

Fig. Rarefaction curve showing the fish diversity pattern in different zones of Gobindsagar reservoir

Experimental fishing in lotic zone of Gobindsagar reservoir

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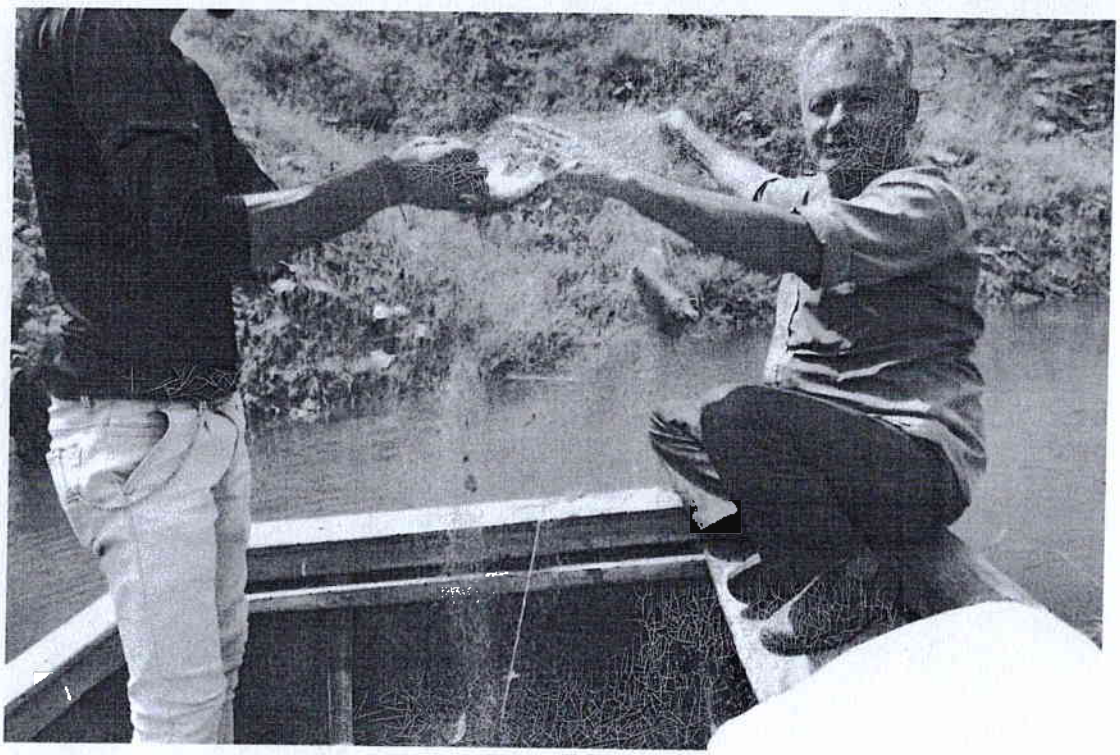

Experimental fishing in transitional zone of Gobindsagar reservoir

Experimental fishing in lentic zones of Gobindsagar reservoir

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5. Pattern of Fish production

Spatial and temporal variation of fish catch

The fish catch analysis during the last decade (2010-20) indicated that the exotic fish *Hypophthalmichthys molitrix* led the percentage fish catch followed by *Cyprinus carpio* and *Labeo catla*. The time series data also indicated that *Hypophthalmichthys molitrix* was the most dominant fish species. However, the catch of *Hypophthalmichthys molitrix* decreased drastically after 2013 and kept on decreasing. The spatial variation of fish production during the last decade indicated that the highest fish production was obtained in lentic zone followed by intermediate and lotic zone. The higher fish production in the lentic zone of the reservoir might be due to the accumulation of nutrients year round in the lentic zone which provide abundant natural fish food organisms for the commercial fish especially silver carp

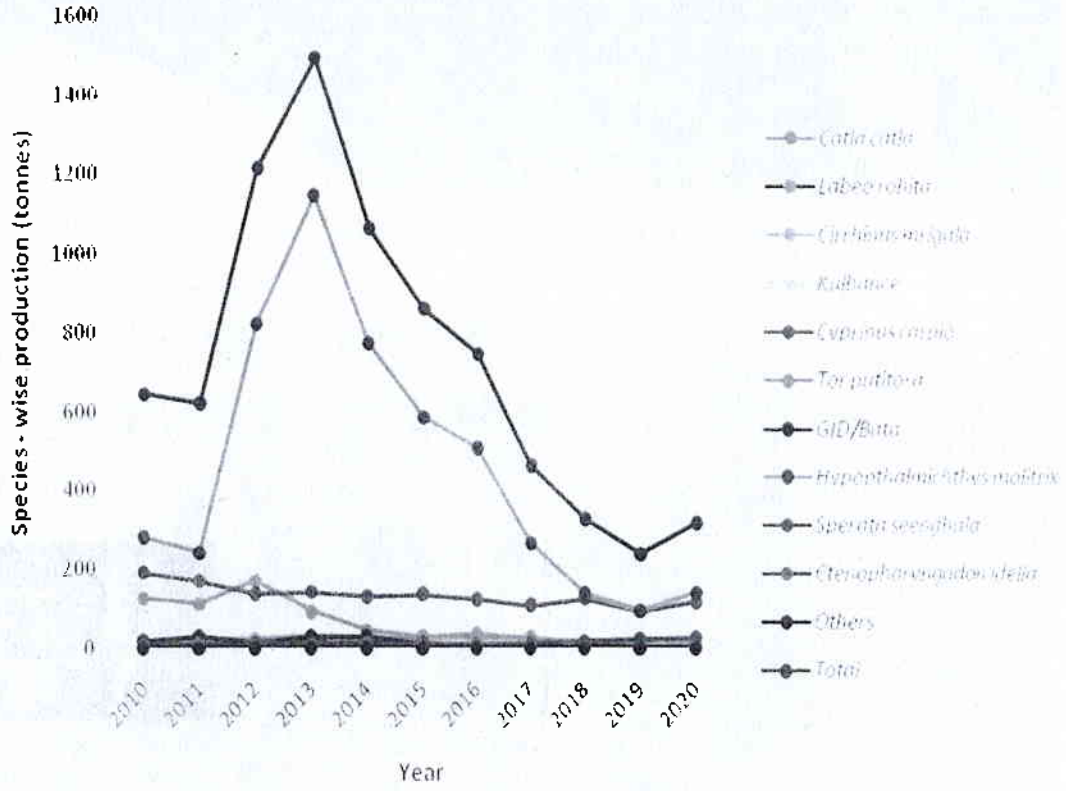

Fig. Fish production trend in Gobindsagar reservoir during 2010-20

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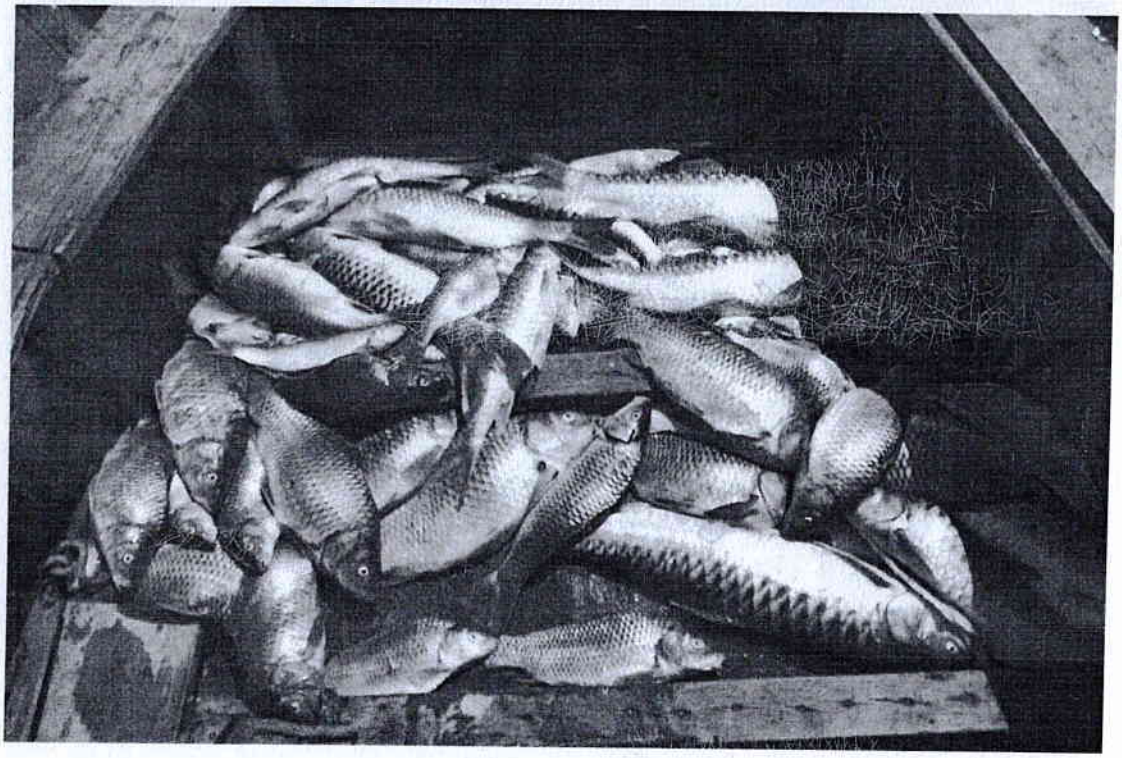

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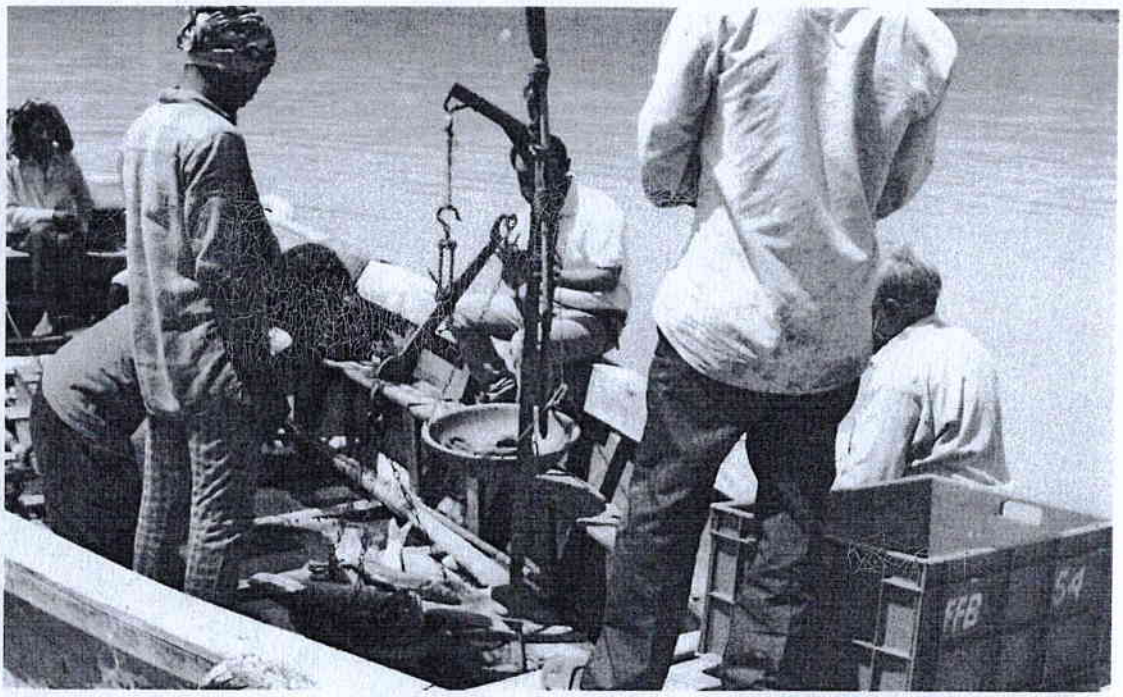

Commercial fish catch in different landing centres

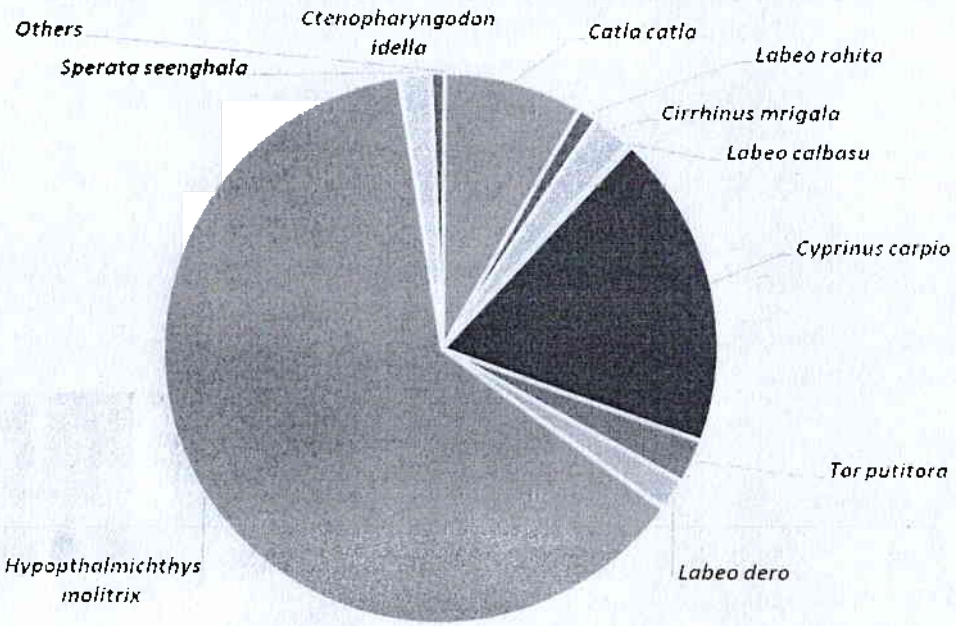

Fig. Fish catch composition during 2010–20 in Gobindsagar reservoir

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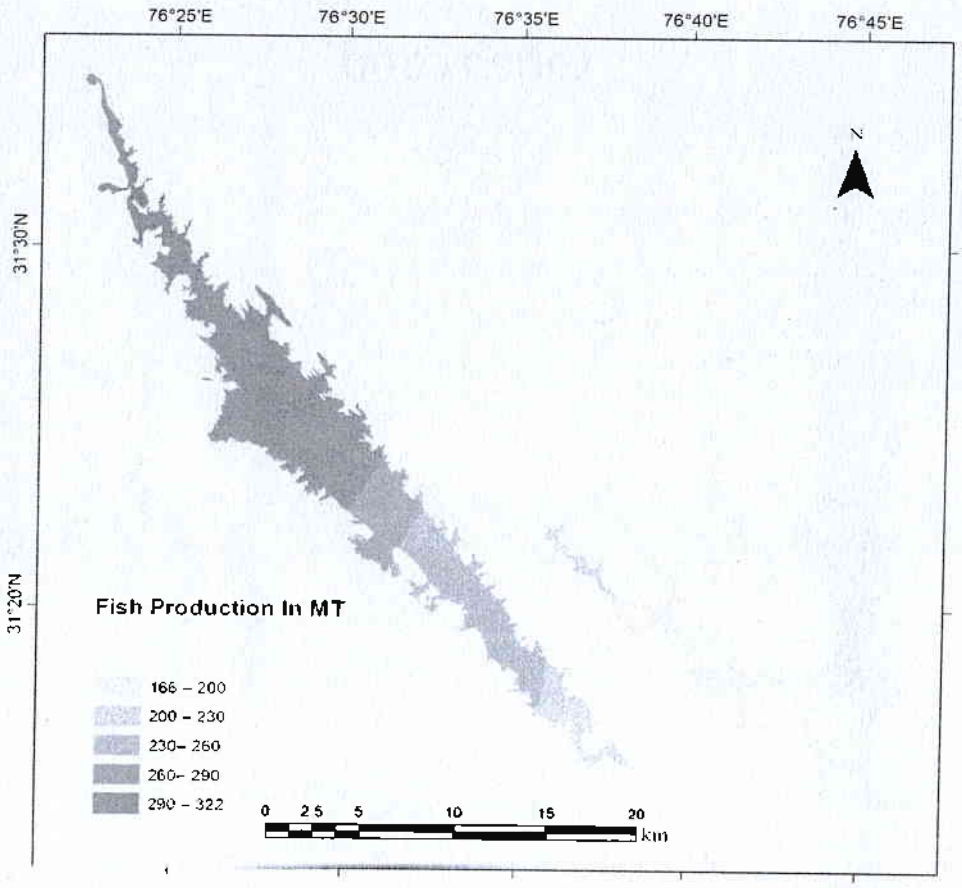

Fig. Map showing the spatial variation of annual fish production in Gobindsagar reservoir during 2010-20

Labeo catla

Year-wise average production of *Labeo catla* was 58.94 tonnes with the maximum production of 170.84 tonnes during 2012–13. Year-wise production trend revealed the increasing trend of fish production from 2005-06 to 2012-13. Subsequently after 2012-13, the production started to dwindle and came down to a meagre 4.87 tonnes in 2019 – 20.

The average fish production data of the last four years (2018-19 to 2021-22) indicated that the pre – monsoon witnessed a wide fluctuation in the production ranging from 0.049 to 3.49 tonnes with highest in the lentic zone and the minimum in the lotic zone of the reservoir. In monsoon season, fish production ranged from 0.30 – 2.35 tonnes with maximum at the lentic site and minimum at the transitional site of the reservoir. Variation in production of *Labeo catla* in the post – monsoon season ranged from 0.004 to 0.45 tonnes with highest at the lentic

site and the lowest at the lotic site. The seasonal variation indicated that the fish production was the highest in the pre- monsoon season.

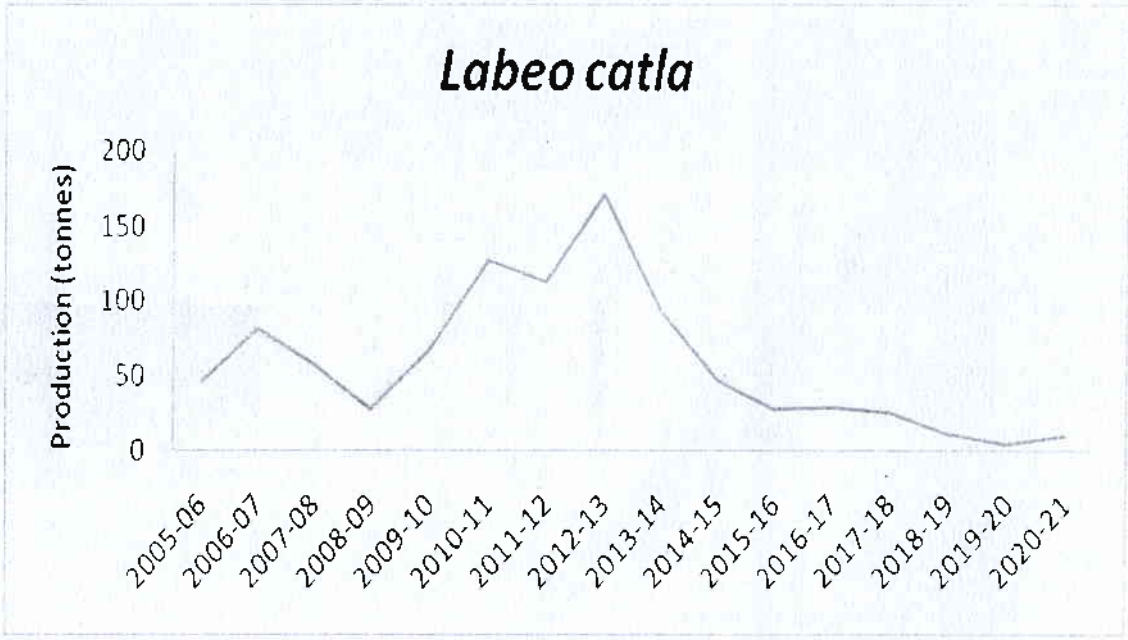

Fig. Year – wise production of *Labeo catla* from 2005 – 06 to 2020 – 21

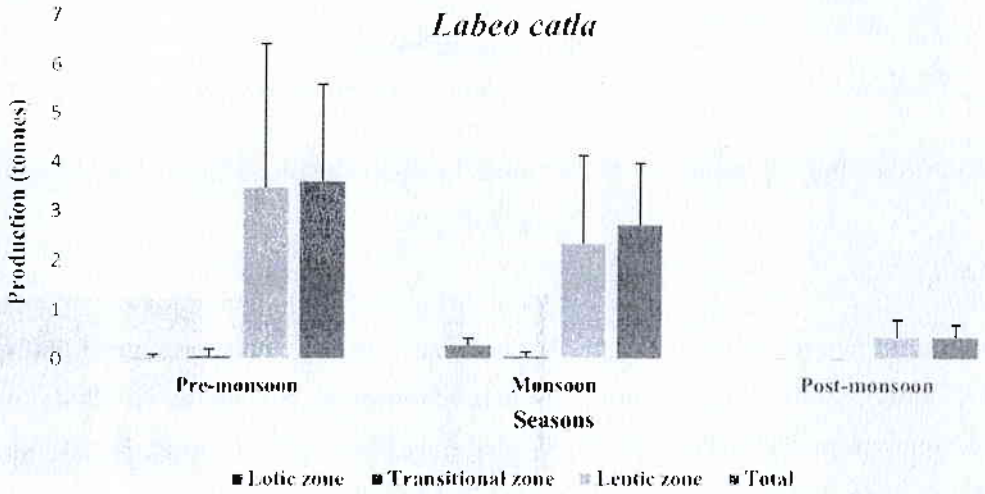

Fig. Average spatio-temporal variation of *Labeo catla* production during 2018-19 to 2021-22

Labeo rohita

The average fish production of *L. rohita* was 8.58 tonnes per year, with a maximum of 18.53 tonnes and a minimum of 0.55 tonnes during 2005-06 to 2020-21. Zone wise fish production

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data of for the last four years (2018-19 to 2021-22) indicated that the pre – monsoon season witnessed a high variation in the production of *L. rohita* ranging from 0.008 to 0.236 tonnes with highest in the lentic zone and minimum in the lotic sector of the reservoir. The monsoon season also showed high variation in the production ranging from 0.008 – 0.427 tonnes with maximum at the lentic site and minimum at the lotic. The variation in production of *L. rohita* in the post – monsoon season represented within 0.001 – 0.255 tonnes with the highest at the lentic site and the lowest at the transitional site. The seasonal variations indicated that the fish production was at the highest in the monsoon season.

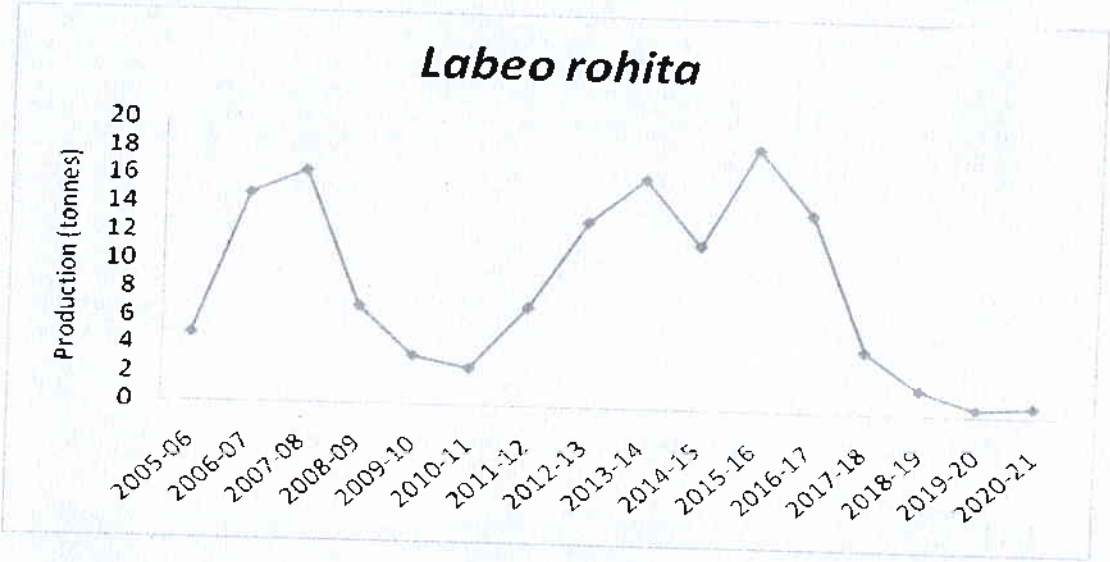

Fig. Year – wise production of *Labeo rohita* from 2005 – 06 to 2020 – 21

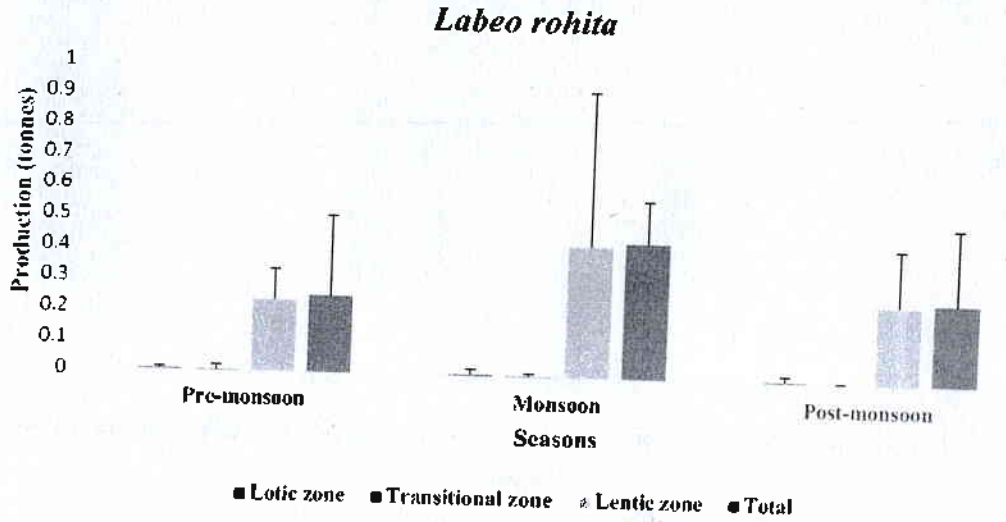

Fig. Average spatio- temporal variation of *Labeo rohita* production during 2018-19 to 2021-22

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Cirrhinus mrigala

Cirrhinus mrigala production was at an average of 12.5 tonnes per year during 2005-06 to 2020-21 with a maximum of 31.78 tonnes and a minimum of 1.19 tonnes. The production was increasing and reached its peak in 2013-14 but the production kept on decreasing since that year. The production data of the last four years (2018-19 to 2021-22) indicated that the fish catch was negligible in both the lotic and transitional zone of the reservoir irrespective of the seasons. The seasonal variation of fish production indicated that the production of *C. mrigala* was lower in the pre -monsoon season.

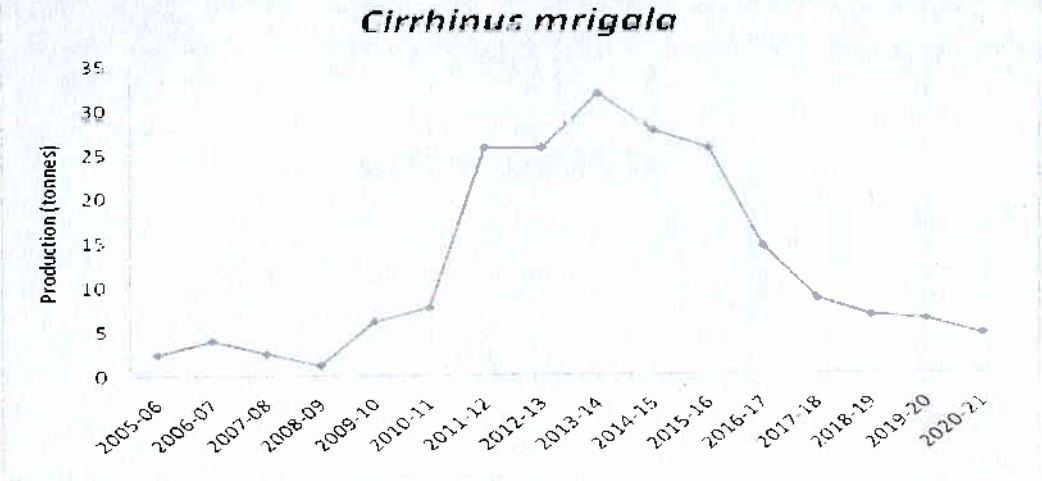

Fig. Year – wise production of *Cirrhinus mrigala* in the last decade (2010 – 20)

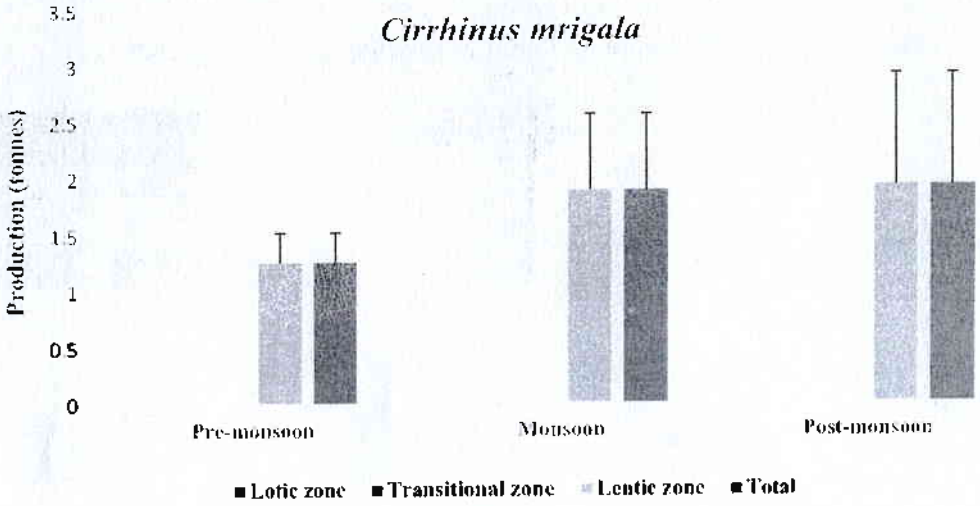

Fig. Average spatio- temporal variations of *Cirrhinus mrigala* production during 2018-19 to 2021-22

Labeo calbasu

Year-wise average production of *L. calbasu* was 1.38 tonnes with maximum production of 3.29 tonnes and minimum production of 0.16 tonnes during the 2005-06 to 2020-21. Year-wise production trend revealed the increasing trend with the maximum production during 2018-19. The production data of the last four years (2018-19 to 2021-22) indicated that the production of *L. calbasu* was almost nil in lotic and transitional zone in all the seasons.

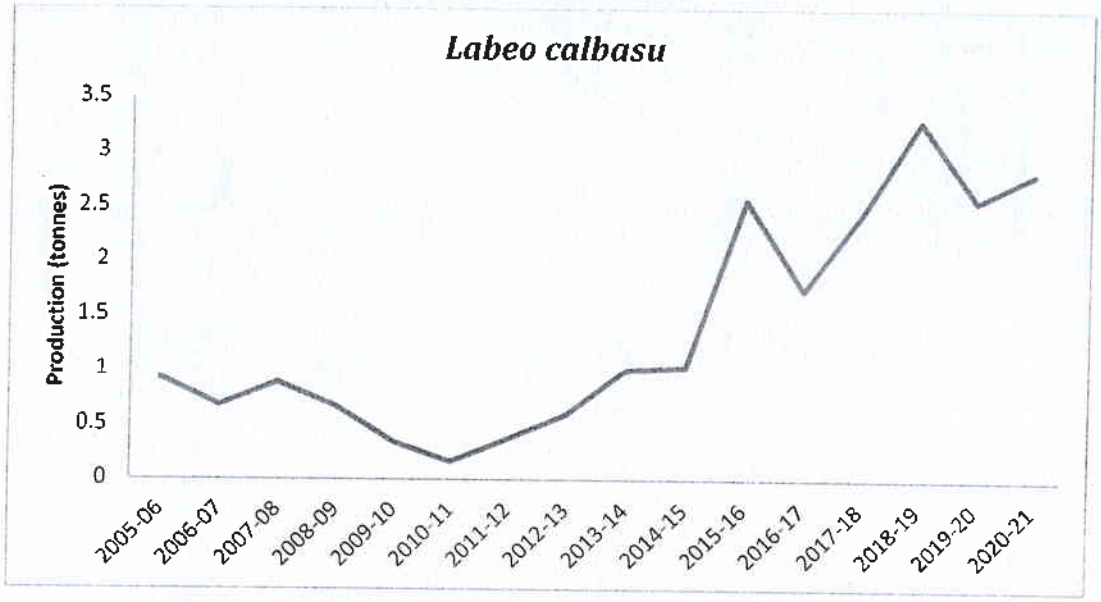

Fig. Year – wise production of *Labeo calbasu* from 2005 – 06 to 2020 - 21

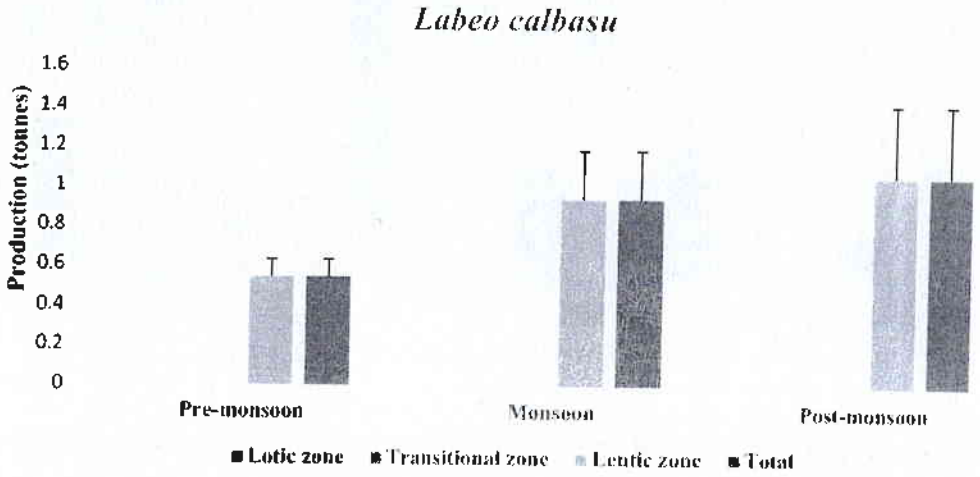

Fig. Average spatio- temporal variation of *Labeo calbasu* production during 2018-19 to 2021-

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Cyprinus carpio

Year-wise average production of *Cyprinus carpio* was 149.28 tonnes with maximum production of 219.691 tonnes and minimum production of 92.9 tonnes. Year-wise production trend of *C. carpio* indicated the decreasing trend since 2007-08 onwards. The fish production pattern during 2018-19 to 2021-22 indicated that production of *C. carpio* was higher in the lentic zone as compared to the other zones of the reservoir. The seasonal variation indicated that the production was higher in the monsoon season.

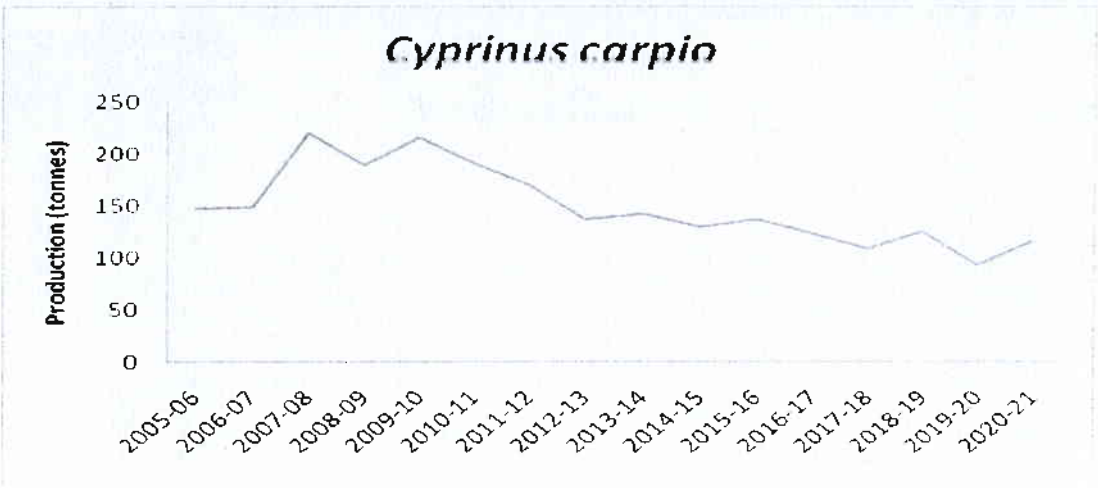

Fig. Year – wise production of *Cyprinus carpio* from 2005 – 06 to 2020 - 21

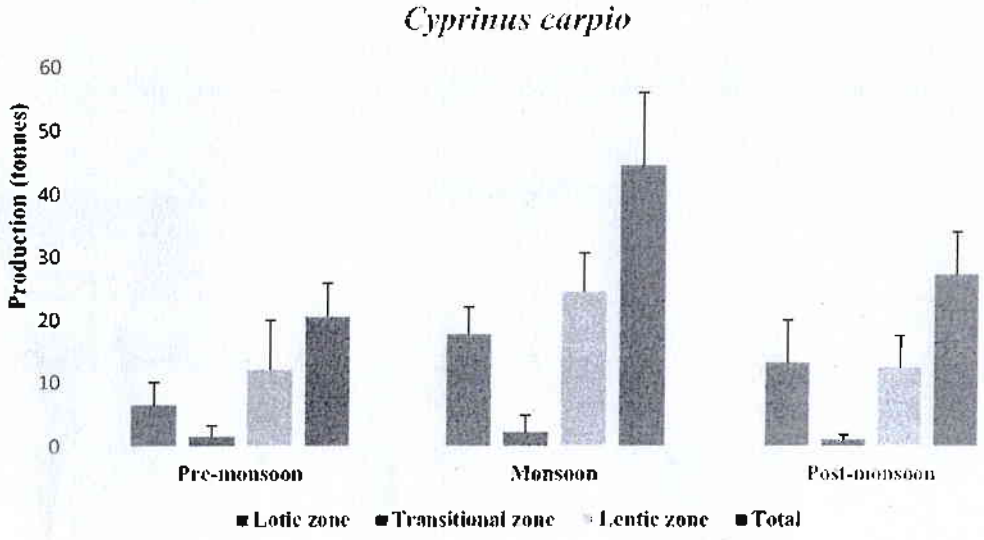

Fig. Average spatio- temporal variation of *Cyprinus carpio* production during 2018-19 to 2021-22

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Tor putitora

Golden mahseer *Tor putitora*, commonly known as mahseer is an iconic and important species of the Gobindsagar reservoir. Annual average production of *T. putitora* was 21.3 tonnes with the maximum production of 37.06 tonnes (2016-17) and minimum production of 10.291 tonnes (2019-20). The production data of the last four years (2018-19 to 2021-22) indicated the wide fluctuations of *T. putitora* production among the zones in each season. The spatial variation in fish production of this species indicated that the overall production was higher at the lentic zone irrespective of the seasons. The temporal variations indicated that the fish production was higher in monsoon seasons but lower in post- monsoon season.

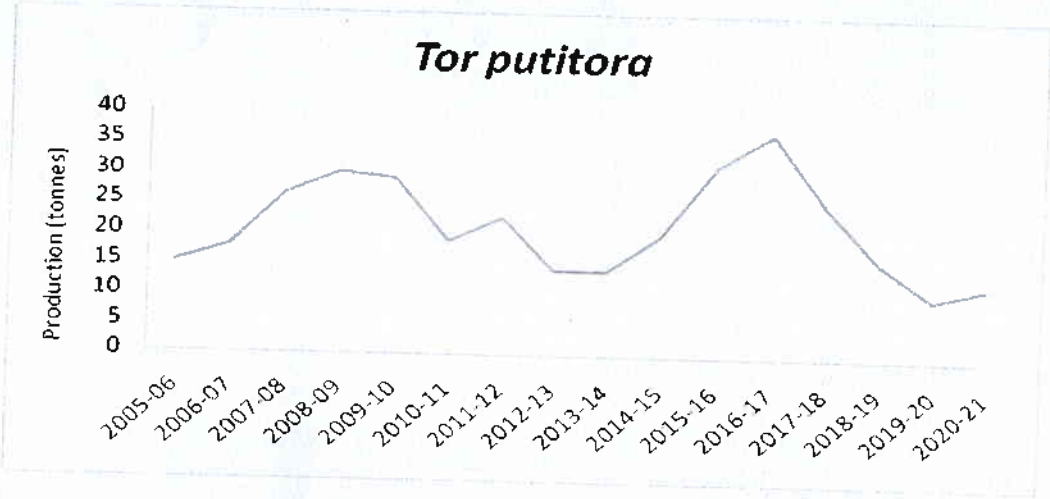

Fig. Year - wise production of *Tor putitora* from 2005 – 06 to 2020 - 21

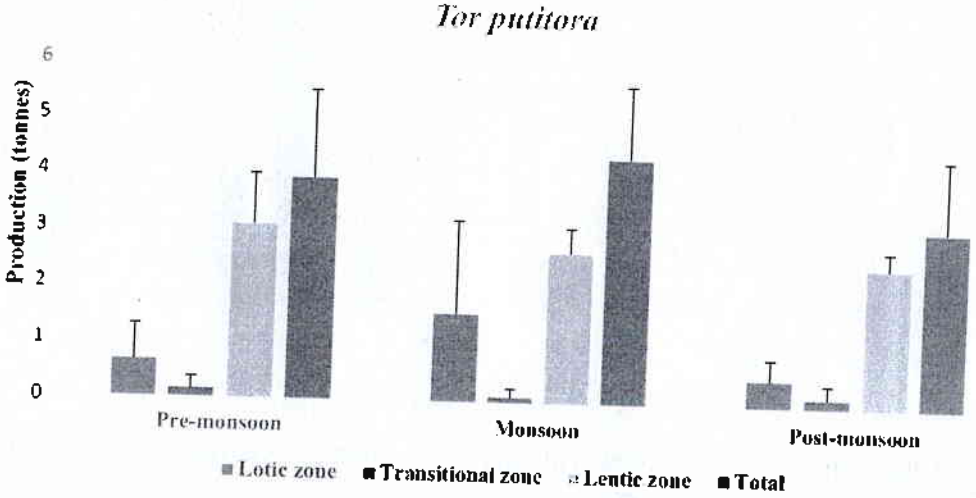

Fig. Average spatio- temporal variation of *Tor putitora* production during 2018-19 to 2021-22

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Labeo dero

Average production of *Labeo dero* was 13.53 tonnes per year, with a maximum of 39.61 tonnes per year during 2005-06 to 2020-21. The highest production of *L. dero* was in 2005–06, but immediately the production drastically declined. The production data of the last four years (2018-19 to 2021-22) indicated that the production of *L. dero* was almost nil in transitional and lentic zone of the reservoir in all the seasons. The production in the lotic zone of the reservoir varied from 89 – 1142 kg with highest during the post – monsoon and the lowest in pre – monsoon season.

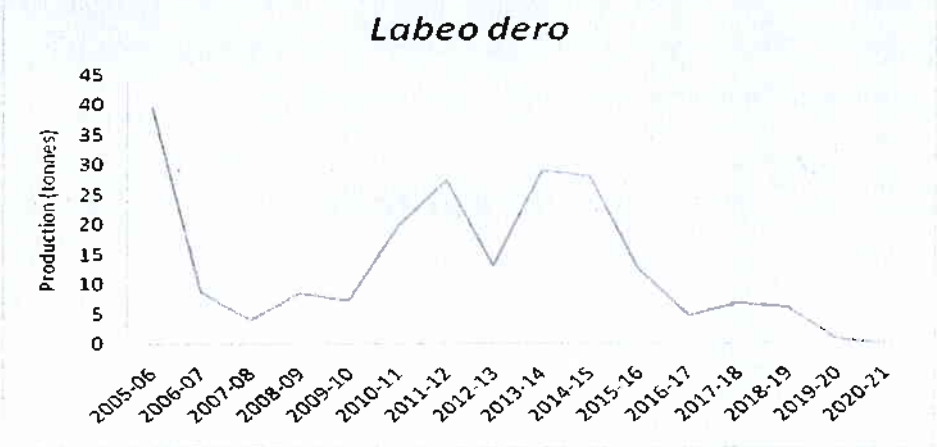

Fig. Year – wise production of *Labeo dero* from 2005 – 06 to 2020 – 21

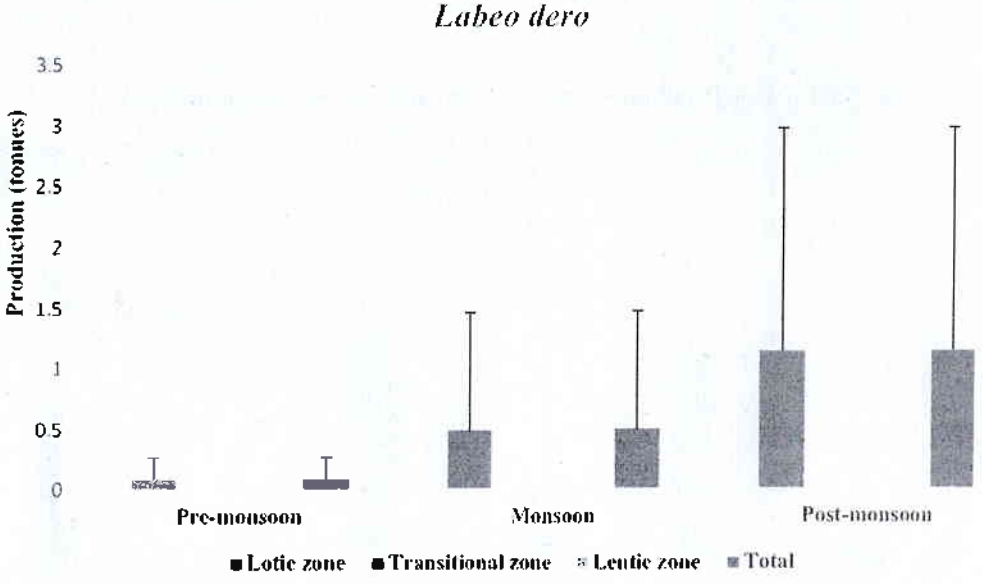

Fig. Average spatio- temporal variation of *Labeo dero* production during 2018-19 to 2021-22

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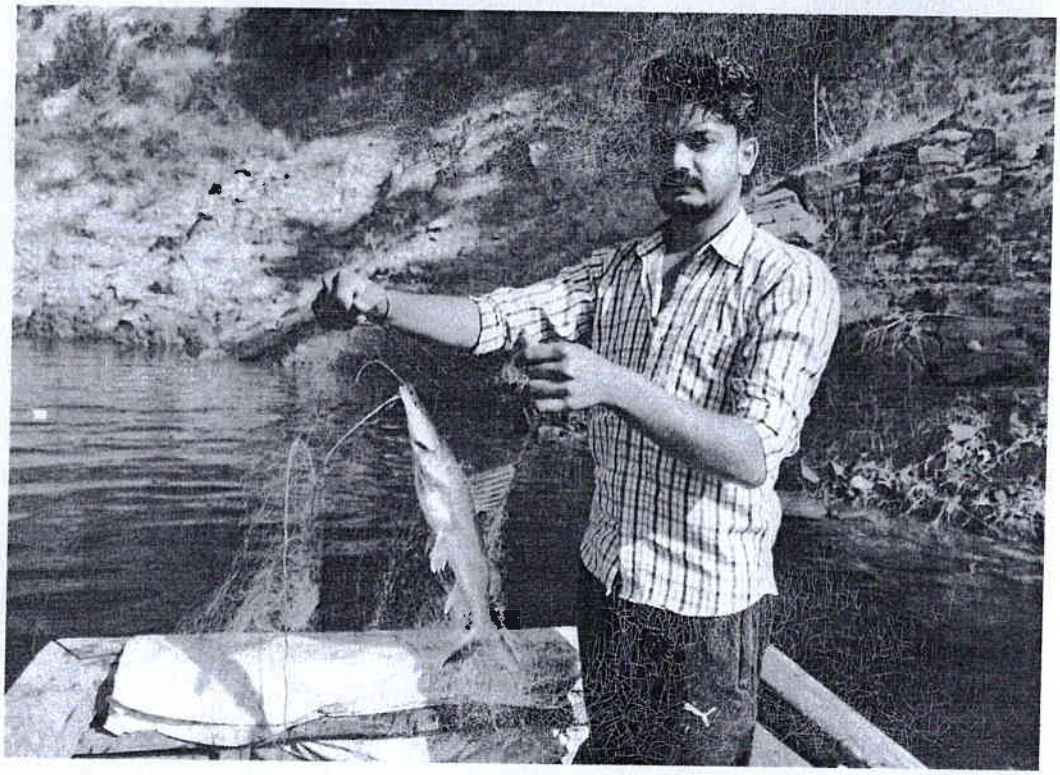

Gill net fishing in the reservoir

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Hypophthalmichthys molitrix

Silver carp, *Hypophthalmichthys molitrix*, is an important and dominant species in Gobindsagar reservoir. The average production of *H. molitrix* was 470.01 tonnes per year during 2005-06 to 2020-21, with the maximum of 1144.33 tonnes and the minimum of 94.46 tonnes. *H. molitrix* production was at the peak in 2013-14 but the production drastically suffered a significant fall and kept on decreasing. The time series data showed that silver carp is still maintaining its position as the most dominant species in the reservoir despite the steep decline in the catch.

The production data of the last four years (2018-19 to 2021-22) indicated a wide fluctuation of the production of silver carp among the zones in each season. The production in lentic zone was the highest in all the seasons. The seasonal variations of this fish catch indicated the production was higher in the monsoon as compared to other seasons but the lowest was in the post- monsoon season.

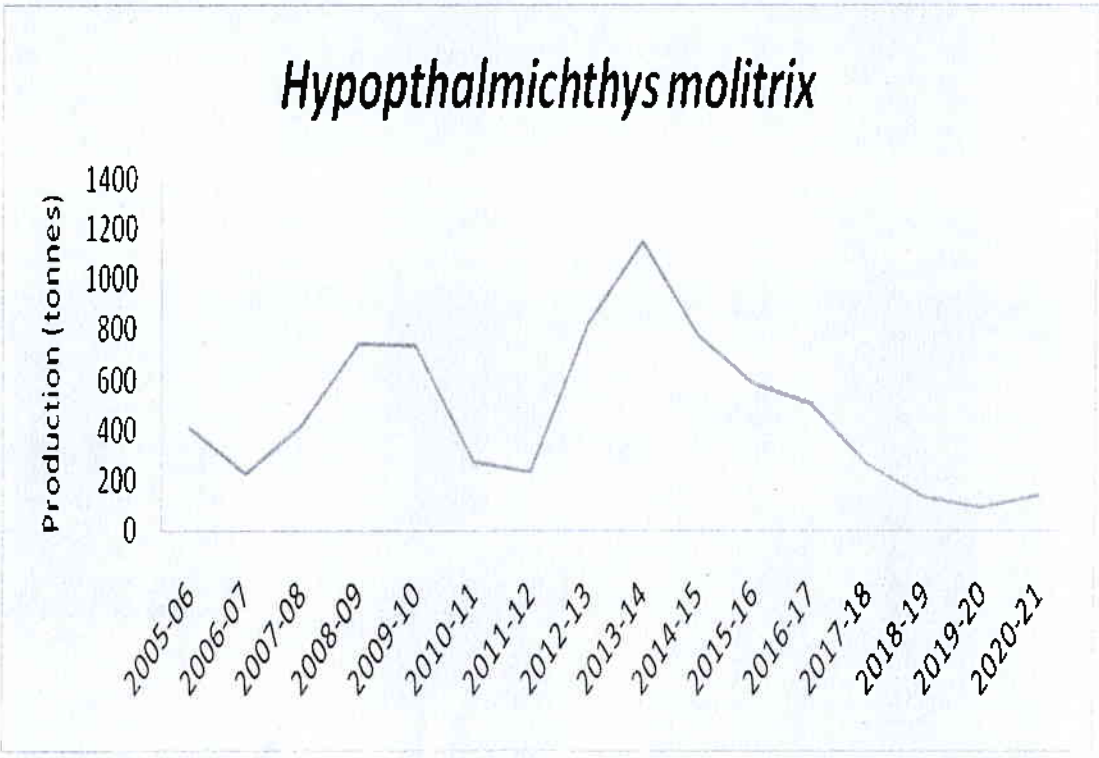

Fig. Year – wise production of *Hypophthalmichthys molitrix* from 2005 – 06 to 2020 - 21

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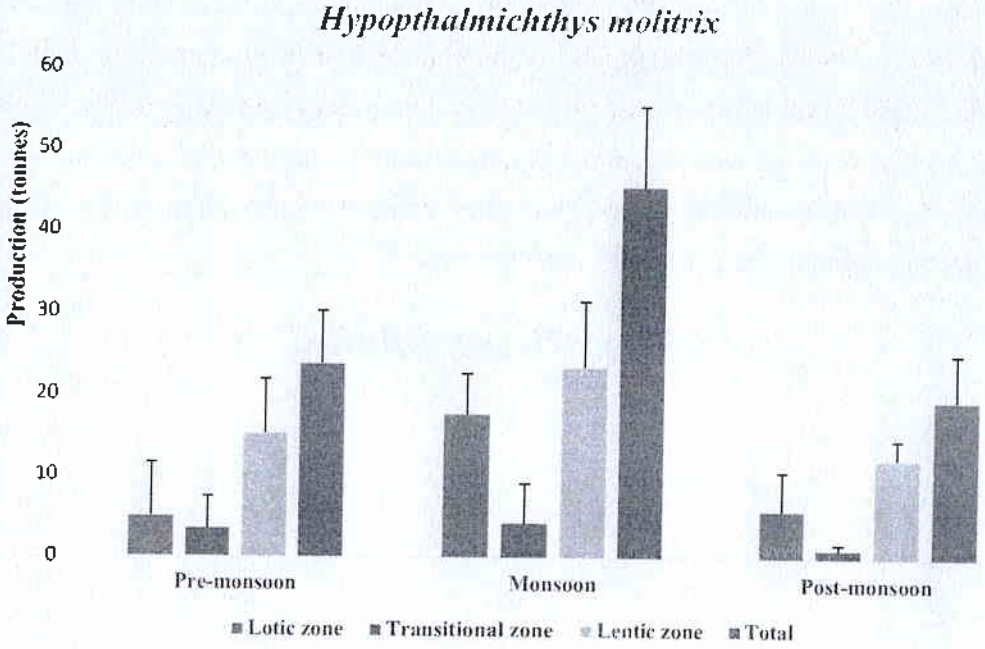

Fig. Average spatio- temporal variation of *Hypophthalmichthys molitrix* production during 2018-19 to 2021-22

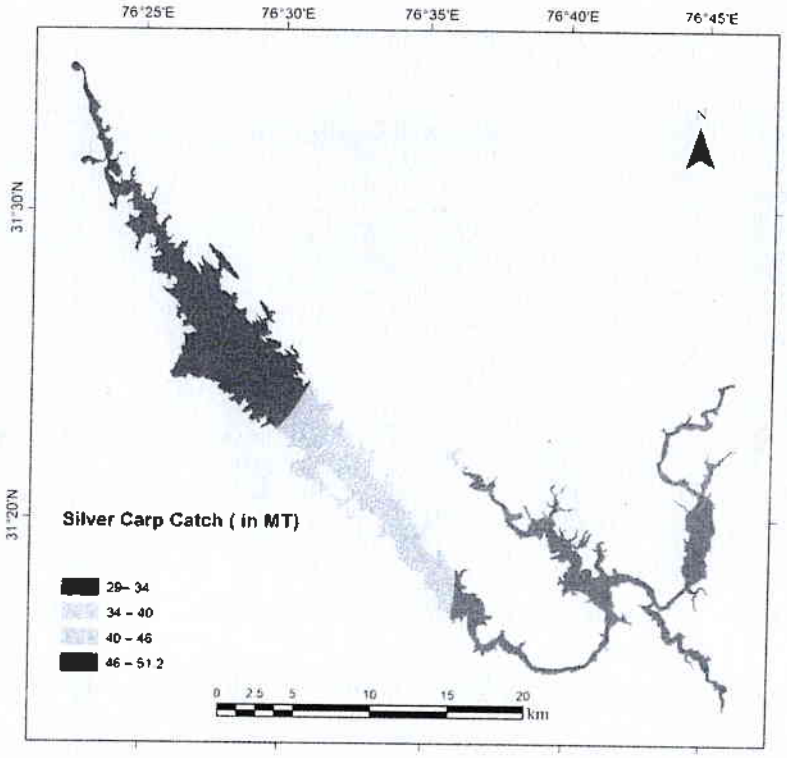

Fig. Spatial variation of *Hypophthalmichthys molitrix* production during 2018-19 to 2021-22

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Sperata seenghala

The average production of *Sperata seenghala* was 12.83 tonnes per year, with a maximum of 26.9 tonnes and a minimum of 6.99 tonnes during 2005-06 to 2020-21. There was a gradual increase in the production since last few years with the highest production in 2020-21. The production data of fish in the reservoir for the last four years (2018-19 to 2021-22) indicated that the production of *Sperata seenghala* was significantly higher in the lentic zone in all the seasons. The seasonal variation of the fish catches indicated the fish production was higher in the monsoon season as compared to the other seasons.

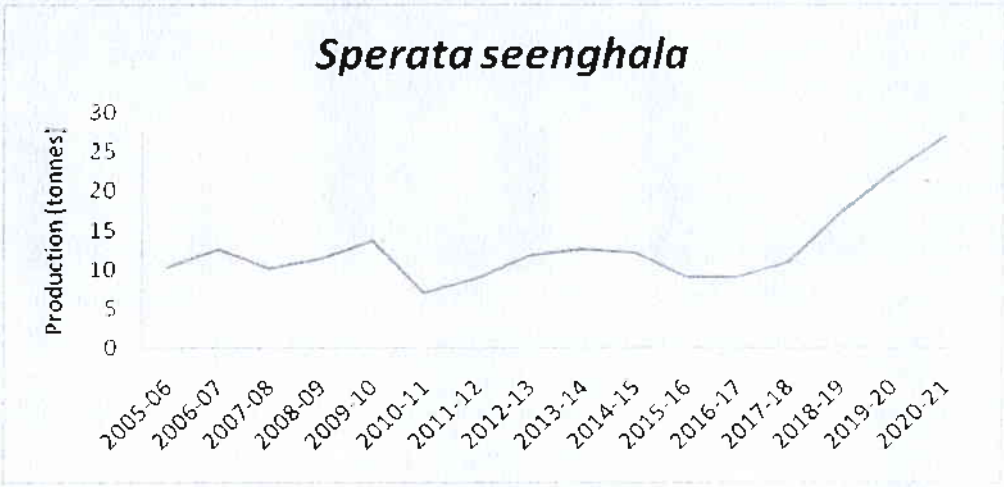

Fig. Year – wise production of *Sperata seenghala* from 2005 - 06 to 2020 - 21

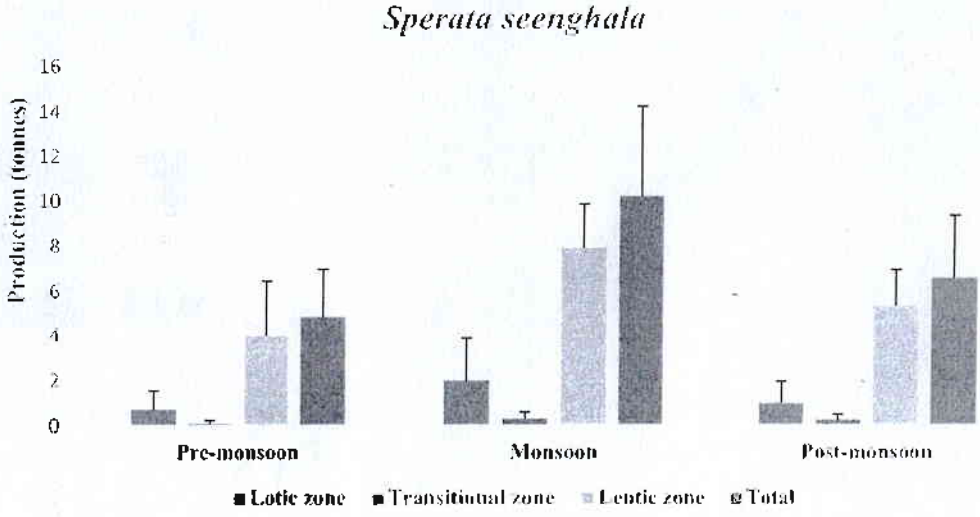

Fig. Average spatio- temporal variation of *Sperata seenghala* production during 2018-19 to 2021-22

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Ctenopharyngodon idella

Ctenopharyngodon idella, commonly known as grass carp is an important species of the Gobindsagar reservoir. Annual average production of *C. idella* was 7.14 tonnes with maximum production of 11.47tonnes and minimum production of 2.39 tonnes during 2005-06 to 2020-21. Annual production trend of this fish species revealed the decreasing trend after 2014-15 onwards. The production data of the last four years (2018-19 to 2021-22) indicated that the fish production was higher in the pre monsoon season. The fish production was higher in lentic zone in most of the seasons. The fish production was negligible in lotic and lentic zone in the post- monsoon season.

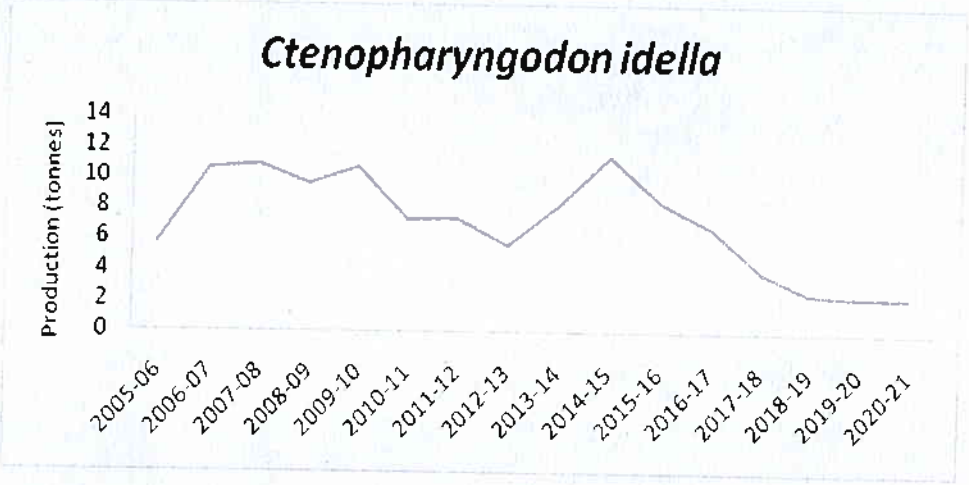

Fig. Year – wise production of *Ctenopharyngodon idella* from 2005 – 06 to 2020 - 21

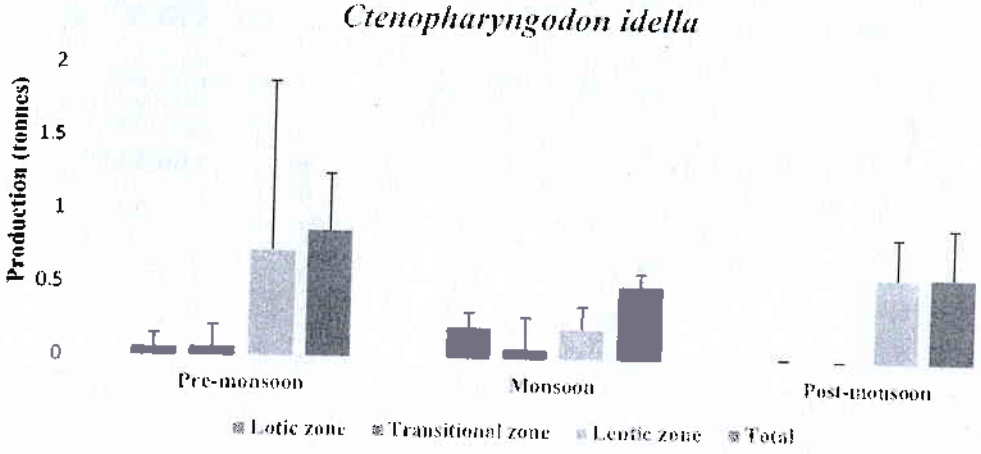

Fig. Spatio-temporal variation of *Ctenopharyngodon idella* production during 2018-19 to 2021-22

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6. Environmental parameters and fish productivity

It is very important to find the factors influencing the fish production from fisheries management point of view of inland open waters including reservoir. The present study also attempted to find out the importance of environmental parameters influencing the fish productivity. Canonical correspondence analysis (CCA) indicated that nutrient parameters nitrate-N and phosphate-P were the most influencing parameters for silver carp which was the most dominant fish catch in the reservoir. The results showed that alkalinity, specific conductivity, DO were the most important parameters influencing the abundance of common carp and minor carp. Transparency and pH were the most important parameters influencing the productivity of mahseer, rohu, mrigal, catla, grass carp, calbasu and seenghala.

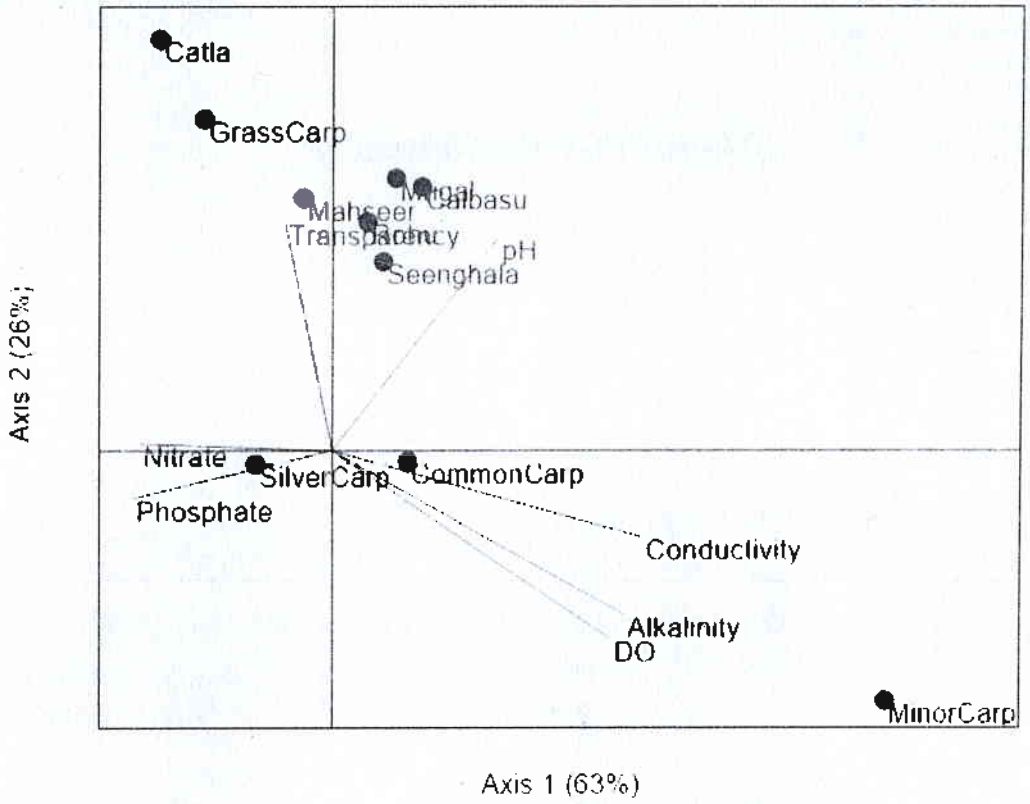

Fig. Relationship between environmental parameters and fish productivity

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7. Impact of fingerling stocking on fish production

Assessment of impact of stocking on fish production in reservoir is one of the most important aspects developing a reservoir fisheries enhancement strategy. The fingerling stocking is considered to be the most important and the only input item in inland open water fisheries including reservoirs. However, stocking of fish seed in large reservoir for enhancement of fish production is a great challenge due to the huge financial implications for procuring the fish seeds and difficulties of supplying the required fish seeds in terms of quality and quantity as most of the reservoirs are located in a remote and isolated place. Hence, the assessment of impact of stocking is necessary to avoid redundancy of stocking and refining the stocking programme to enhance the fish production especially in large reservoirs.

The impact of stocking in Gobindsagar reservoir based on the fish production and stocking data of the last decade (2012-2020) was carried out. The stocking density was highly fluctuating during 2012 to 2020 which ranged from 95 to 1823 nos./ha/yr with an average stocking density of 805 nos./ha/yr. The impact of stocking based on the total fish production and total stocking irrespective of species indicated the positive impact of stocking. However, the species-wise impact of stocking on fish production analysis indicated that none of the species showed significant impact on the fish production. Hence, the study clearly indicated that stocking has an impact on the fish production but other interventions like identification of breeding grounds and protecting the breeding ground can enhance the fish production in a sustainable manner.

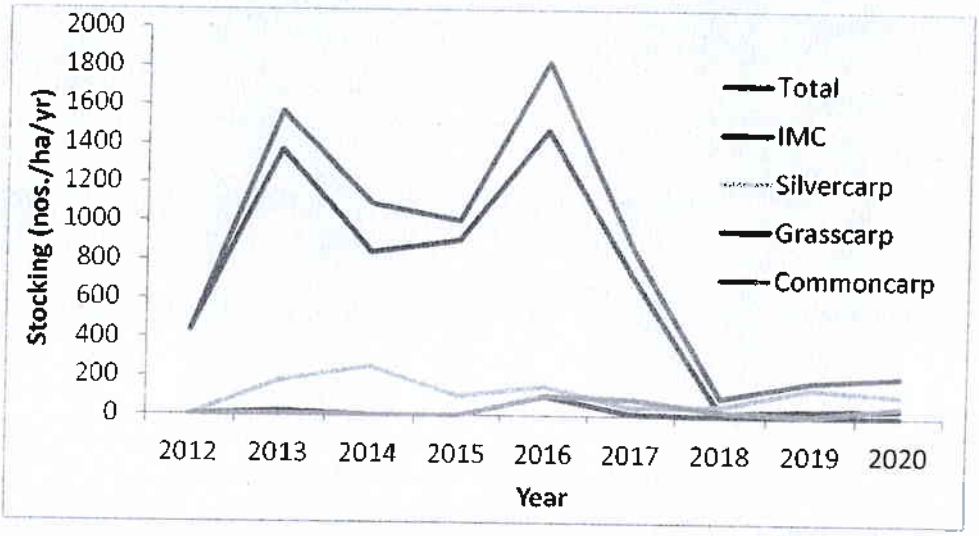

Fig. Stocking density of fish seeds in Gobindsagar during 2012-2020

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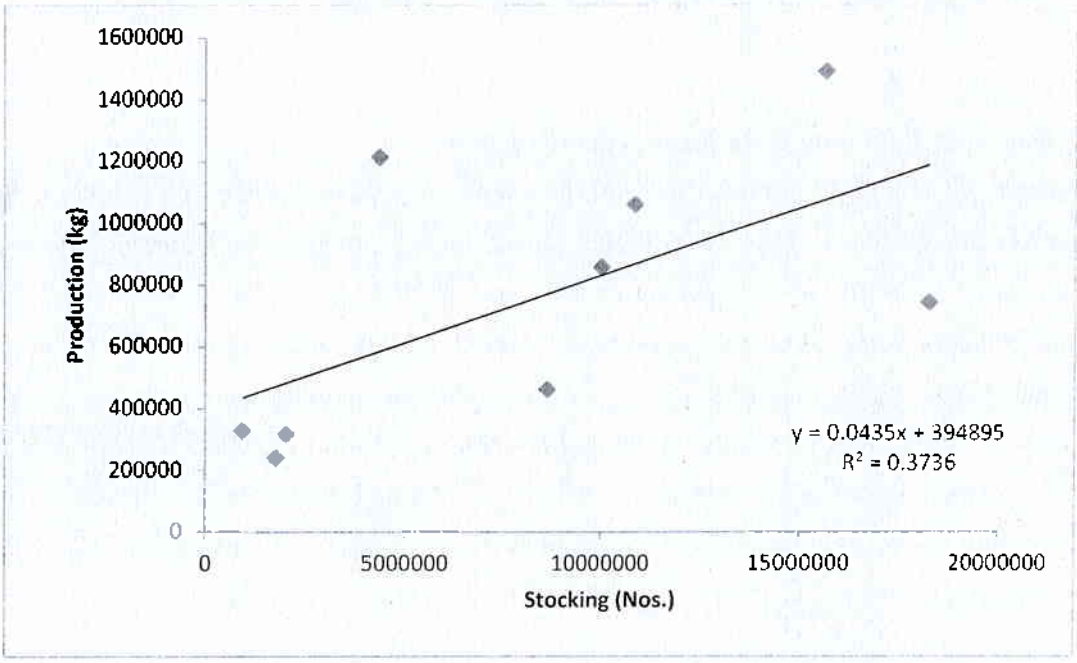

Fig. Impact of total stocking on total fish production in Gobindsagar reservoir

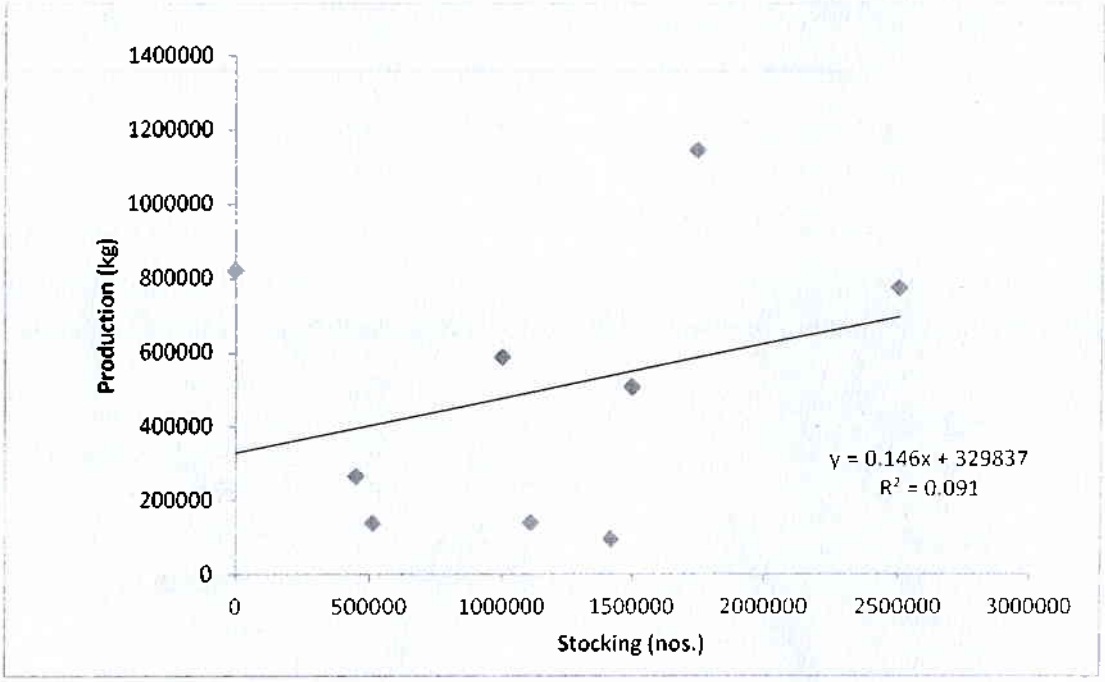

Fig. Impact of stocking on silver carp production in Gobindsagar reservoir

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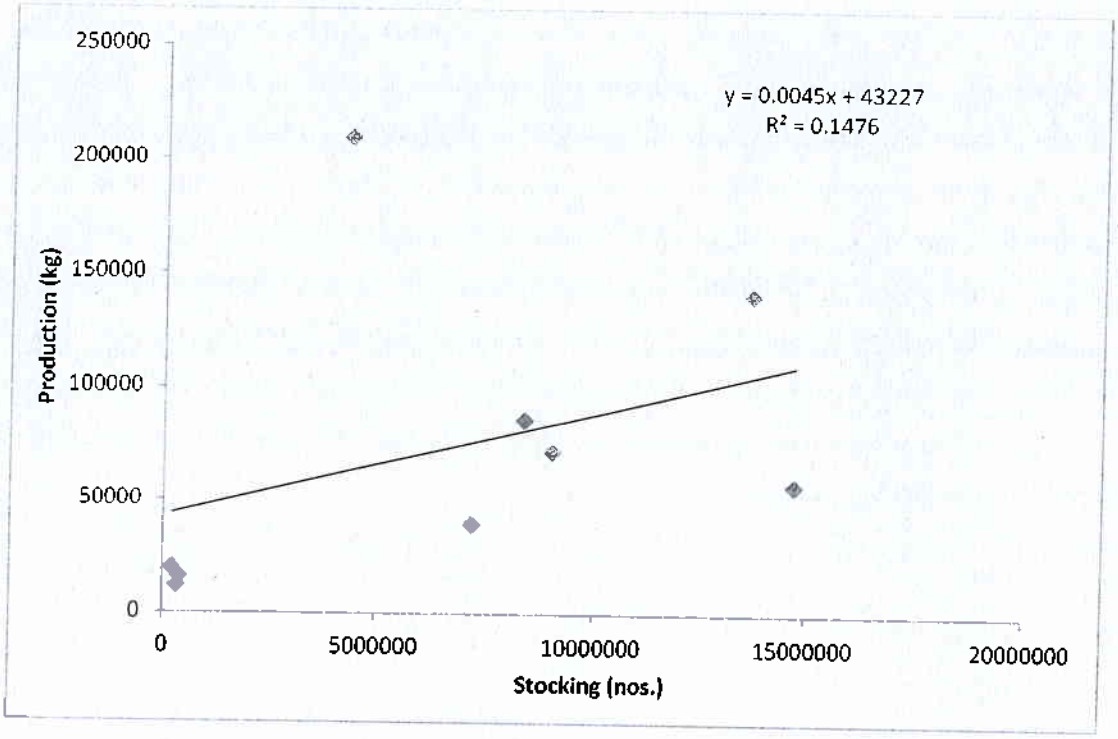

Fig. Impact of stocking on IMC production in Gobindsagar reservoir

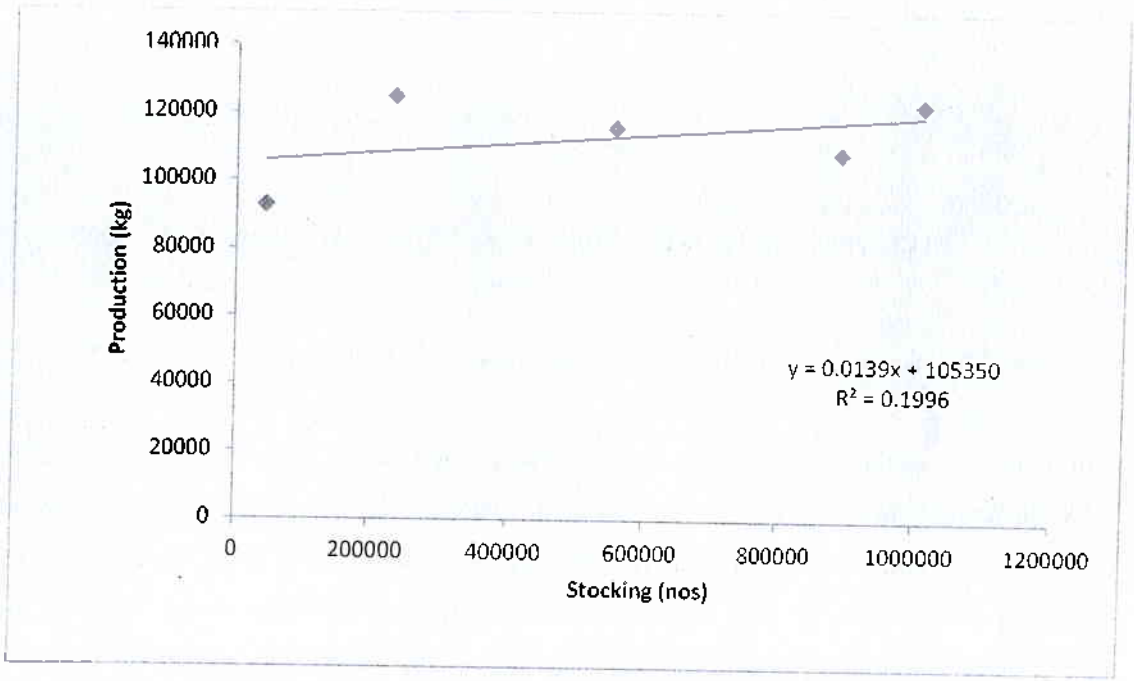

Fig. Impact of stocking on common carp production in Gobindsagar reservoir

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8. Fish production potential, optimum fishing effort and stocking density

The fish production potential was estimated using primary productivity of the water. Estimation of the fish production potential using primary productivity could be the most suitable options most of the commercial fish species are plankton feeders. The estimated potential fish yield was in the range of 136-153 kg/ha/yr (Average 145 kg/ha/yr) on the basis of the algal biomass model which is very modest for this ecosystem. In order to harness the fish potential of this large reservoir, plankton feeders are needed to be stocked or develop an auto-breeding population to efficiently utilize the natural fish foods availability in a sustainable manner. The fish yield ranged from 23-149 kg/ha/yr with an average of 72 kg/ha/yr indicated that the fish yield in the reservoir is much lower than the potential fish yield of 145 kg/ha/yr. The actual fish yield versus the potential fish yield indicated the scope for increasing the fish production from the reservoir.

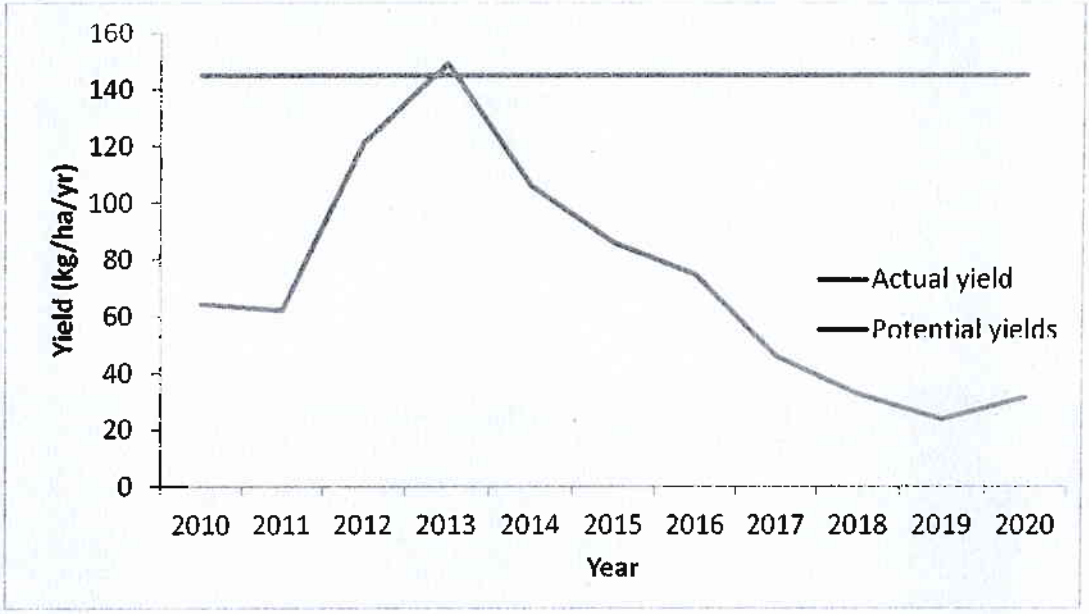

Fig. Fish production potential Vs the actual fish yield for the last decade (2010-20)

The maximum sustainable yield was also calculated based on the fish yield and fishing effort (gill net license) for the year 2007-08 to 2016-17 using Schaefer and Fox surplus production model. The Schaefer model estimated the MSY for the reservoir to be 101.42 kg/ha/yr and the fishing effort to attain the maximum sustainable fishing effort (fMSY) to be 2953 gill net license per year. The Fox model estimated the MSY for the reservoir to be 97.04 kg/ha/yr and

the fishing effort to attain the maximum sustainable fishing effort (fMSY) to be 3141 gill net license per year.

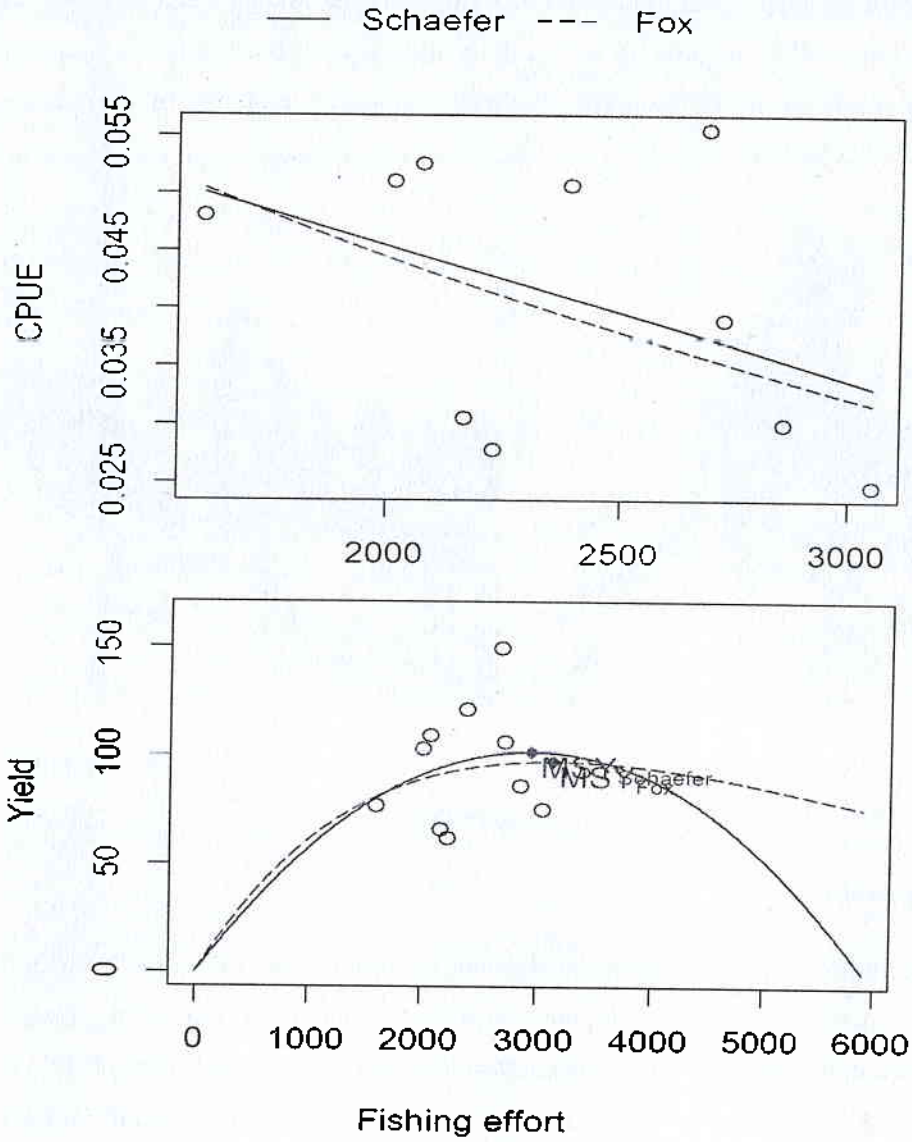

Fig 68. Estimation of MSY and fMSY using surplus production model

The estimation of the stocking density was carried out to attain the fish yield potential. Estimation was carried out by considering the average growth rate of 800 g/yr with the loss of 70% (mortality rate 50% and escape 20%). The stocking density of around 300 Nos./ha/yr is needed to attain the fish yield potential of the reservoir.

9. Water quality parameters

Water quality parameters including temperature, pH, specific conductivity, TDS, water depth, dissolved oxygen (DO), transparency, alkalinity, hardness and chlorinity were measured *in situ* and samples were brought to the laboratory for further analysis. A total of 24 water quality parameters were analyzed from the reservoir. Apart from the routine water quality parameters trophic state index (TSI) and primary productivity were also assessed to know the productivity and the ecological health of the reservoir. Spatio-temporal variations of the water quality parameters were assessed.

Collection of water samples and *in situ* analysis of water quality parameters in Gobindsagar reservoir

Water temperature

Water temperature is a crucial factor determining the productivity of the reservoir in terms of fisheries and plankton dynamics. The annual average water temperature of the reservoir was 18.3°C. Seasonal variation of water temperature in the reservoir varied from 11.01 – 27.72°C, with lowest during the post – monsoon season. The spatial water temperature varied from 16.70 – 20.52°C. The annual average water temperature of the reservoir is comparable with the water temperature of Kol dam (18.5°C).

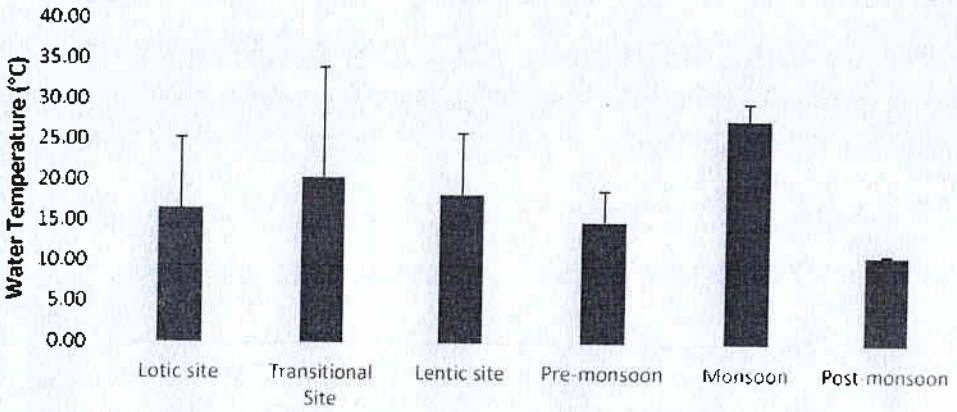

Fig. Graphical representation of seasonal and spatial variation of water temperature (°C)

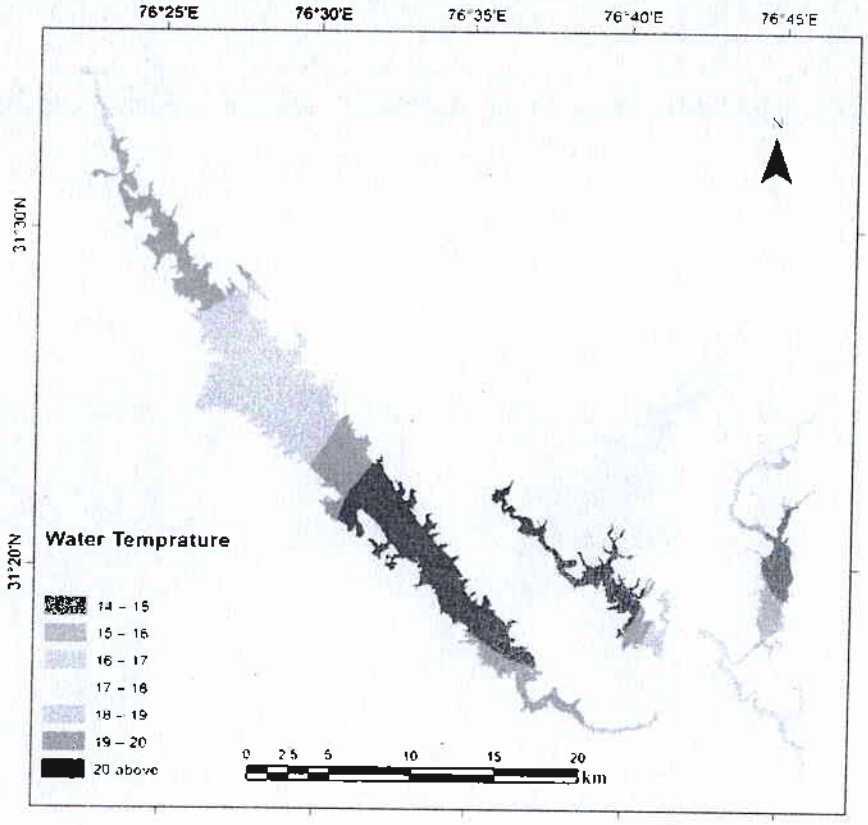

Fig. Graphical representation of spatial variation of water temperature (°C)

Transparency

The water transparency was measured by Secchi disk. The annual average transparency of the reservoir was 238.9 cm. Seasonal variation of water transparency of the reservoir varied from 130.11 – 378.44 cm, with the highest being recorded during the post – monsoon season and the

lowest during the monsoon season. The spatial water transparency varied from 121.0 – 356.72 cm. The highest water transparency recorded was 356.72 cm at the lentic / dam site of the reservoir and the lowest water transparency recorded was 121.0 cm at the lotic or riverine site of the reservoir. Water transparency is a crucial factor determining the productivity of the reservoir in terms of fisheries and plankton dynamics. The water transparency of the reservoir was higher than Kol dam (175 cm).

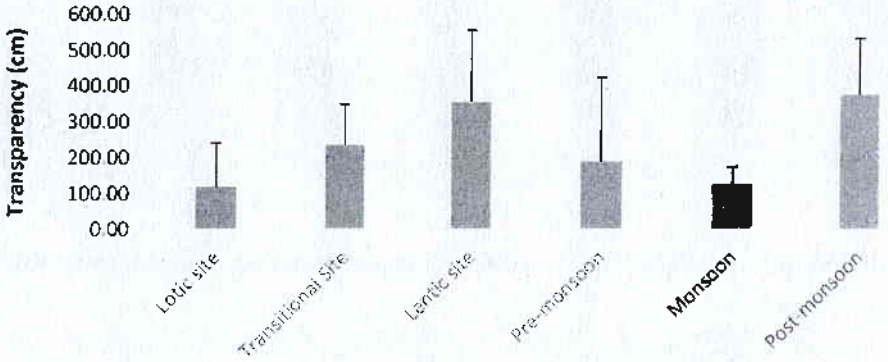

Fig. Graphical representation of seasonal and spatial variation of water transparency (cm)

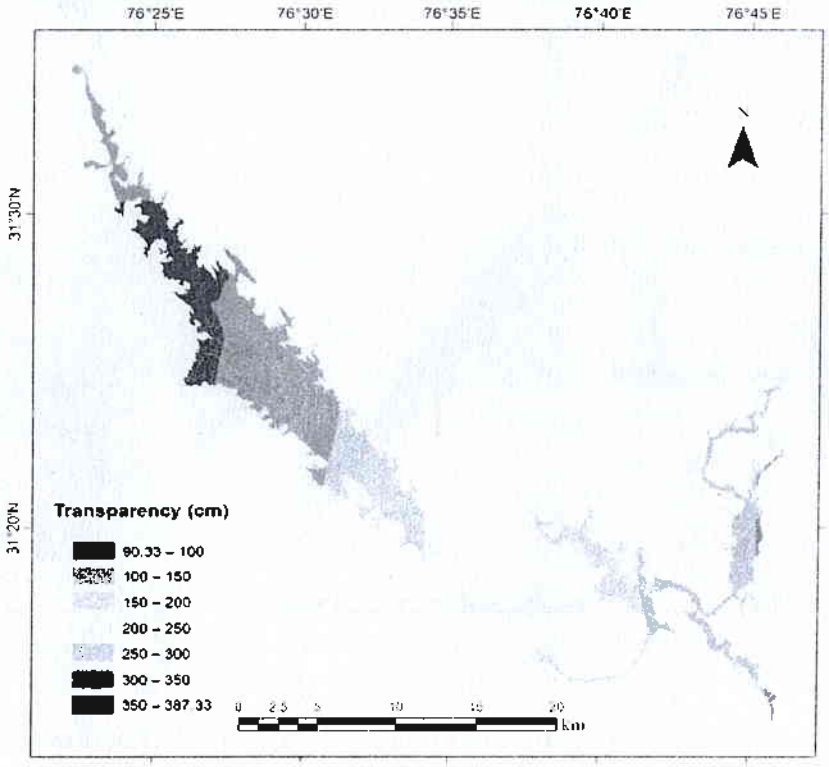

Fig. Graphical representation of spatial variation of water transparency (cm)

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Directorate of Fisheries HP
Bilaspur 174001

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Onsite sampling and analysis

Specific conductivity

The annual average specific conductivity of the reservoir was 227.2 µS/cm indicating the reservoir to be medium productive. Seasonal variation of specific conductivity of the reservoir varied from 218.28 – 288.63µS/cm, with the highest being recorded during the pre–monsoon season and the lowest during the monsoon season. The spatial specific conductivity varied from 186.12–276.11µS/cm. The highest specific conductivity 276.1 µS/cm was recorded at the lotic site of the reservoir and the lowest recorded 186.1 µS/cm was at the

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intermediate/transitional zone of the reservoir. The water specific conductivity of the reservoir was lower than Kol dam (306.3 µS/cm).

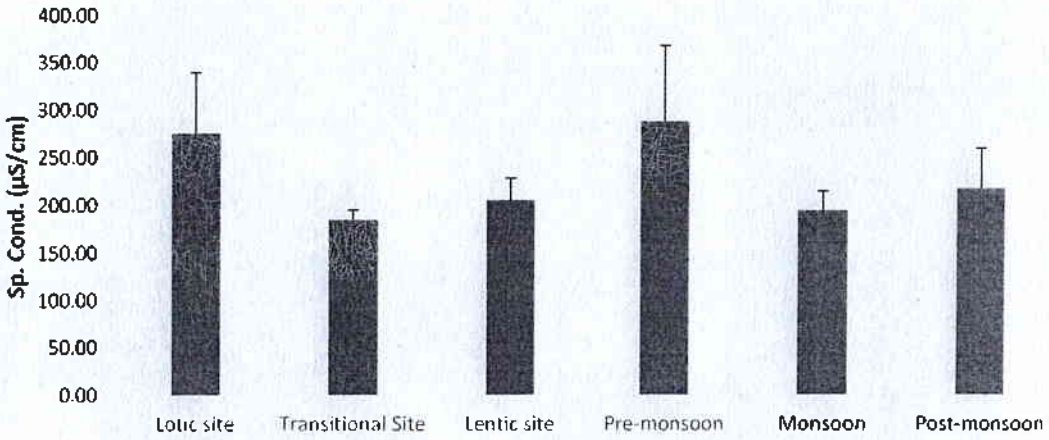

Fig. Graphical representation of seasonal and spatial variation of specific conductivity (µS/cm)

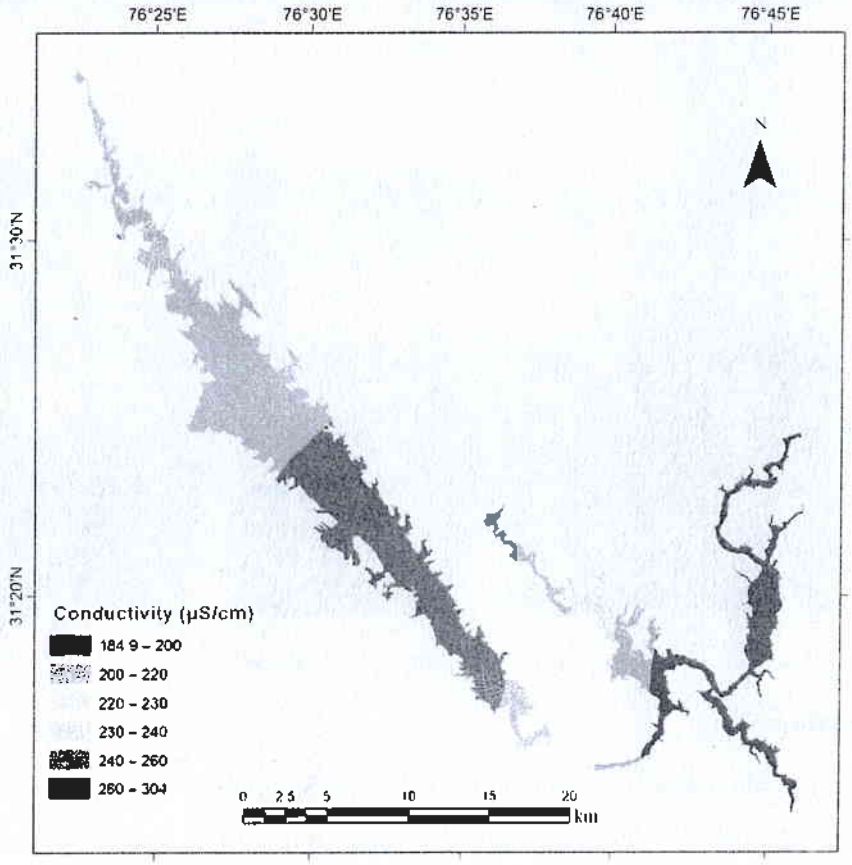

Fig. Graphical representation of spatial variation of specific conductivity (µS/cm)

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pH

pH is one of the most important parameters for the ecological health and fish productivity point of view. The pH value indicated that the reservoir is moderately productive. The annual average pH of the reservoir was 8.3. The spatial pH values varied from 8.17 – 8.45. The highest pH was recorded at the lentic/dam site of the reservoir while the lowest pH was recorded at the lotic zone of the reservoir. Seasonal variation of pH of the reservoir varied from 8.10 – 8.46, with highest being recorded during the post – monsoon and lowest in monsoon season. The present findings revealed that the pH values were almost similar across the different zones of the reservoir. The annual average water pH of the reservoir was higher than Kol dam (7.74).

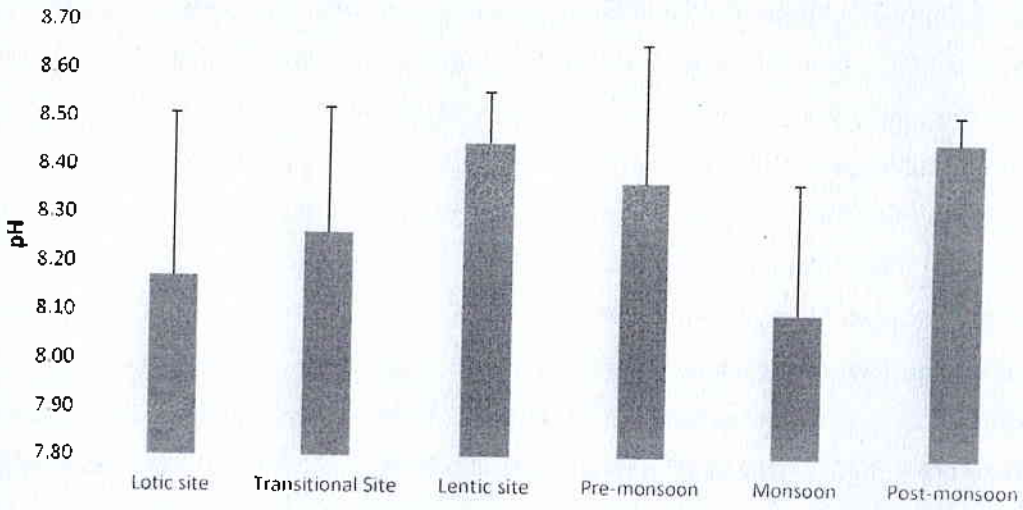

Fig. Graphical representation of seasonal and spatial variation of pH

Dissolved Oxygen

Dissolved oxygen (DO) content of water is critical for fish health. The annual average DO of the reservoir was recorded to be 7.5 mg/l indicating sufficient oxygen for fish. The DO level also indicated the reservoir to be medium productive. Seasonally, the DO values ranged between 7.27 & 7.7mg/l, with the highest being recorded during pre – monsoon season (7.7mg/l) and lowest in monsoon season (7.27mg/l). The DO values ranged between 7.17 & 7.84mg/l across the sampling sites with highest in the lotic zone (7.8 mg/l) of the reservoir and lowest in lentic zone (7.17mg/l) of the reservoir. The annual average water DO of the reservoir was higher than Kol dam (6.9 mg/l).

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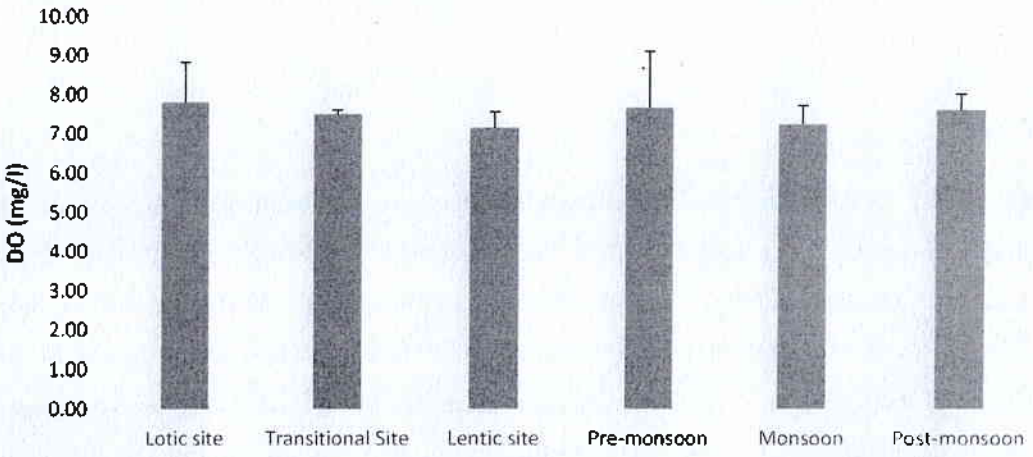

Fig. Graphical representation of seasonal and spatial variation of DO (mg/l)

Total alkalinity

Total alkalinity (TA) measures the buffering capacity of the water to control fluctuation of pH value. Alkalinity of surface water is primarily a function of carbonate, hydroxide content and also includes the contributions from borates, phosphates, silicates and other bases. The annual mean total alkalinity of the reservoir was 62.5 mg/l which was sufficient to buffer the pH fluctuation. The alkalinity value indicated the reservoir to be medium productive. Seasonal variation of total alkalinity varied from 60.1 to 69.25mg/l with highest during the pre – monsoon season (69.25mg/l) and lowest in post – monsoon (60.1mg/l). Spatial study indicated that the total alkalinity values ranged between 52.2 and 76.7 mg/l with the lowest at the transitional zone of the reservoir (52.17mg/l) and highest at the lotic/riverine zone of the reservoir (76.7 mg/l). The annual average water alkalinity of the reservoir was lower than Kol dam (74.6 mg/l).

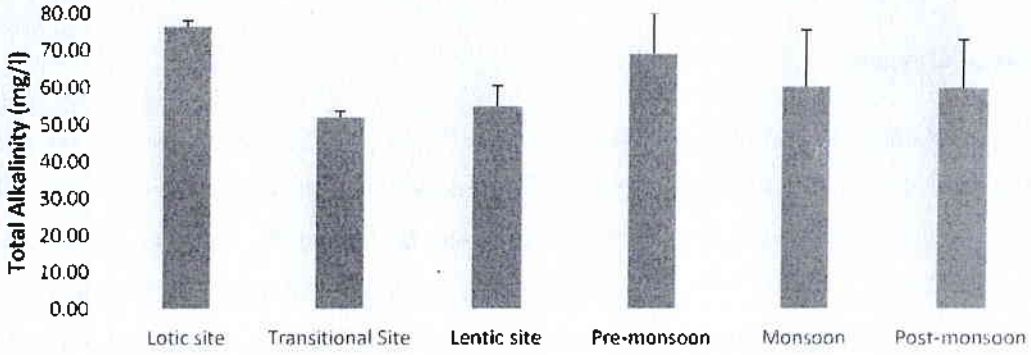

Fig. Seasonal and spatial variation of total alkalinity (mg/l)

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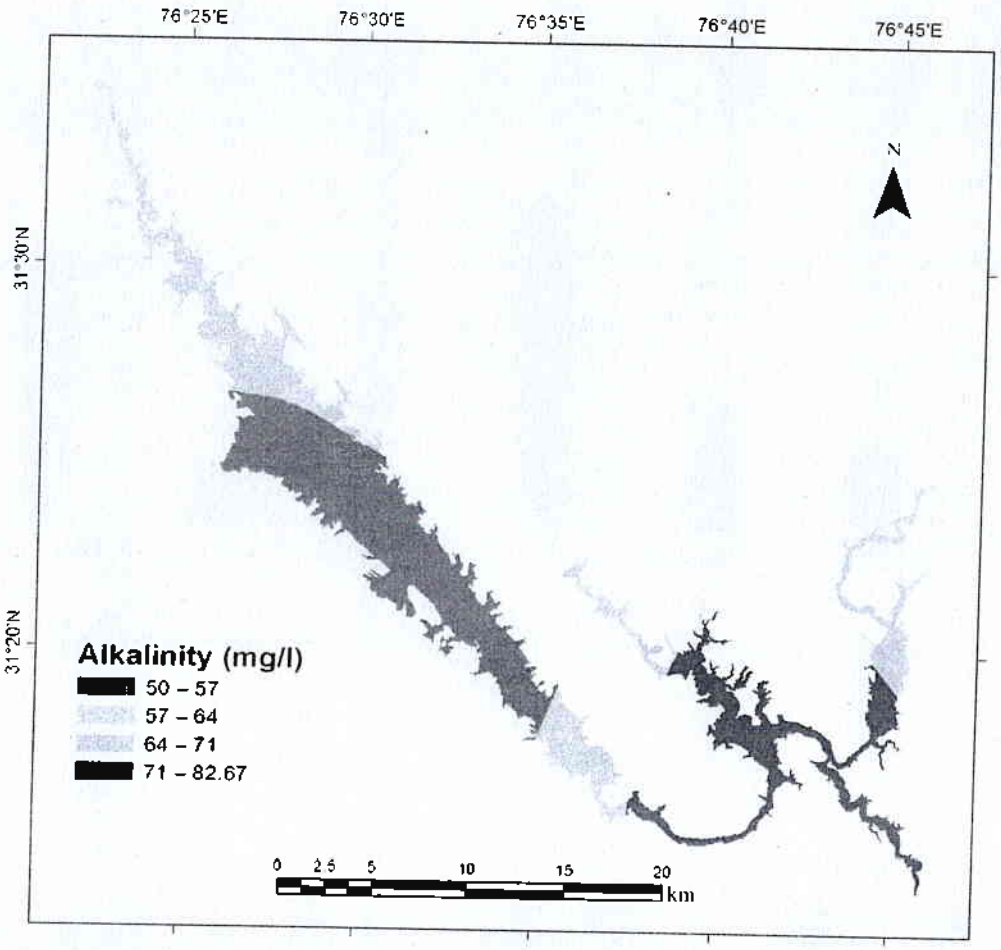

Fig. Spatial variation of total alkalinity (mg/l)

Carbonate, Bi-carbonate and Free CO_2

Free CO_2 concentration in an open water body is an important factor as it controls the pH value of the waterbody. pH level influences the CO_2 concentrations(mg/l) in water by favoring the formation of bicarbonate at the alkaline conditions, which leads to an under-saturation of dissolved CO_2, promoting the absorption of atmospheric CO_2in water. Seasonal study of the reservoir revealed that the CO_3^{2-}, HCO_3^- and free CO_2 values ranged from 4.0-14.89mg/l, 45.89 – 56.33mg/l and 0 – 2.0 mg/l respectively. Similarly, the spatial study indicated that the values of CO_3^{2-}, HCO_3^- and free CO_2 ranged from 4.67 -18 mg/l, 37.17 – 72.0 mg/l and 0.0 – 2.39mg/l respectively.

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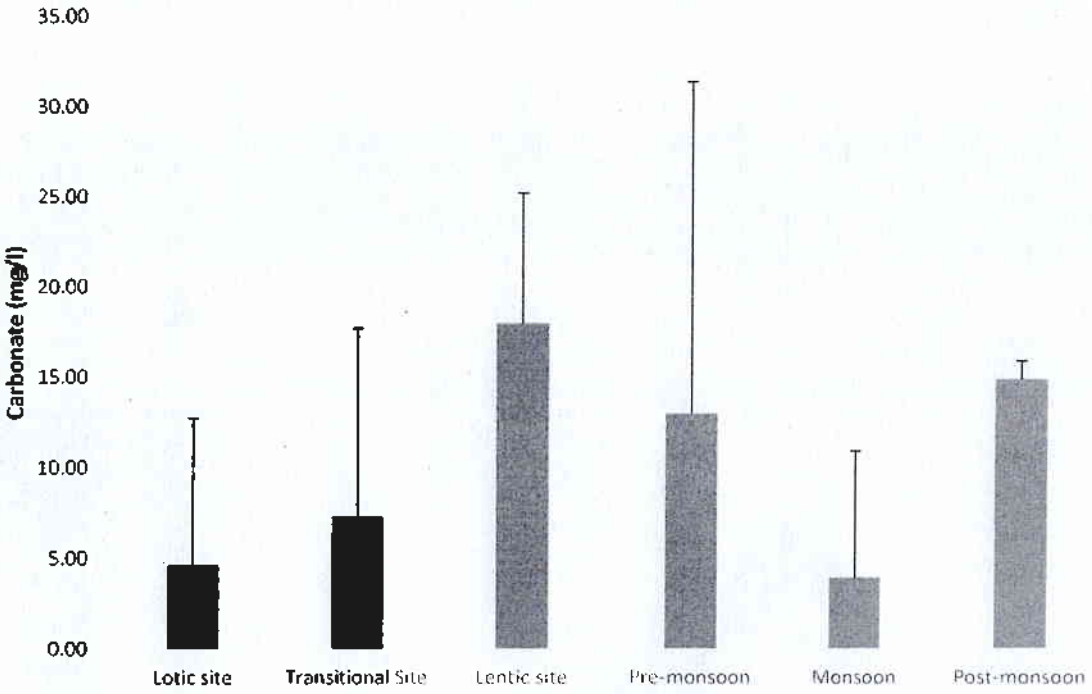

Fig. Graphical representation of seasonal and spatial variation of carbonate (mg/l)

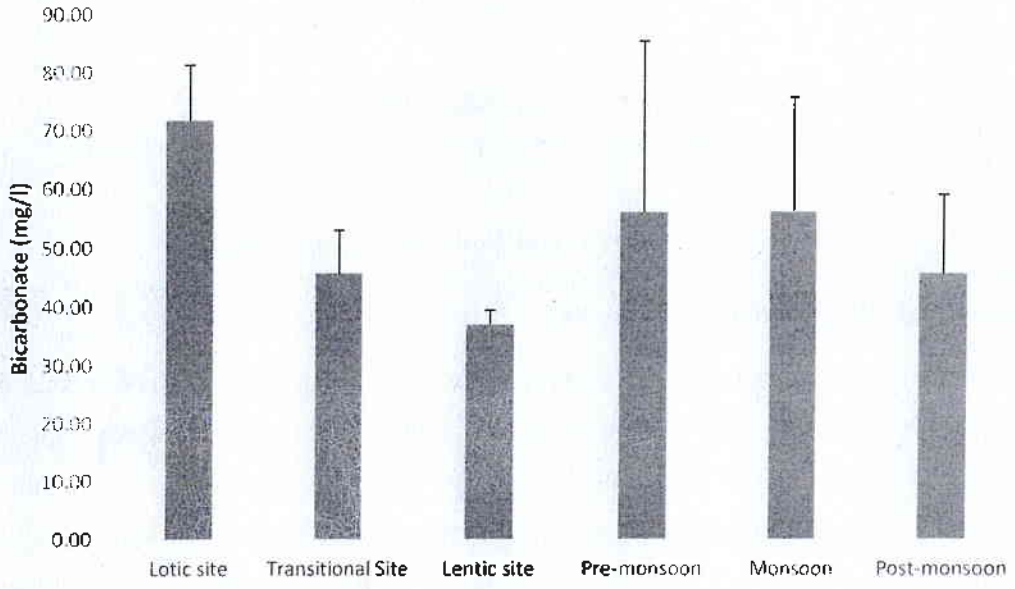

Fig. Graphical representation of seasonal and spatial variation of bi-carbonate (mg/l)

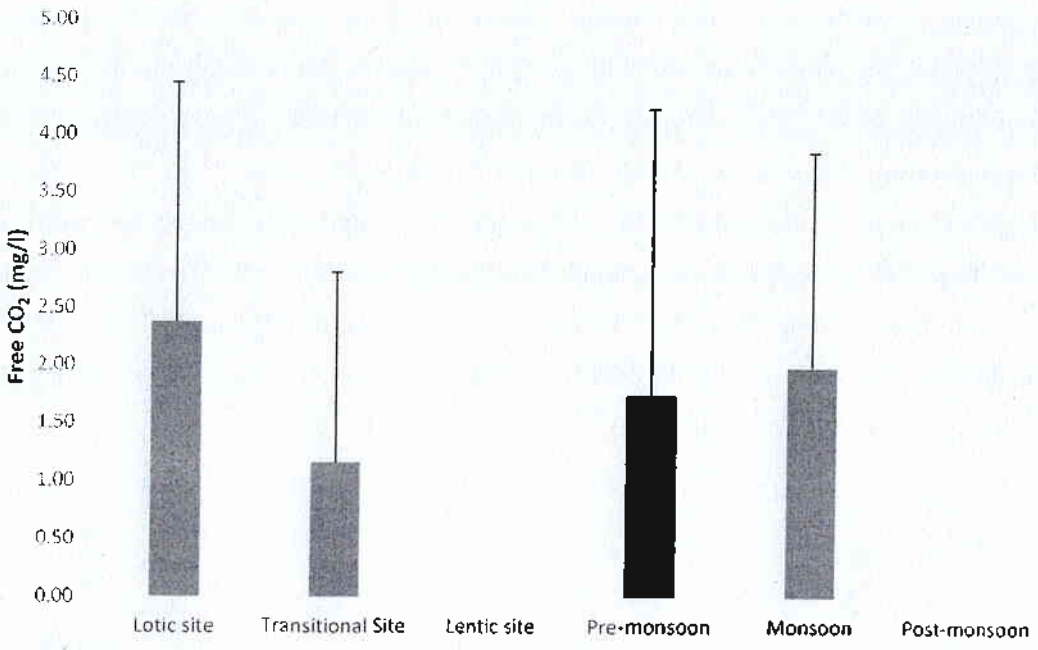

Fig. Graphical representation of seasonal and spatial variation of Free CO_2 (mg/l)

Chlorinity

The annual average chlorinity was 8.7 mg/l. Spatial study revealed the chlorinity value between 6.8 & 10.7 mg/l with highest in the lotic sector of the reservoir. Seasonal analysis of chlorinity values ranged from 7.39 – 9.82mg/l with the highest during pre – monsoon (9.82mg/l).

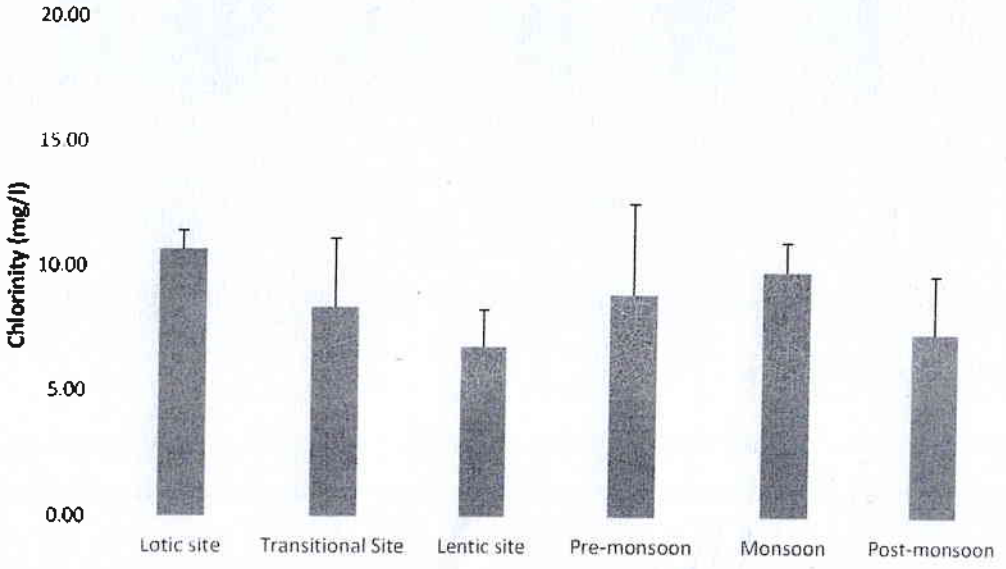

Fig. Seasonal and spatial variation of chlorinity (mg/l)

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Total Solids (TS), Total Dissolved Solids (TDS) and Total Suspended Solids (TSS)

The total solid (TS) is also one of the most important indicators of productivity in lakes and reservoirs. The analysis indicated that the seasonal TS values ranged from 154 – 221mg/l with highest during the post – monsoon and lowest in monsoon. Spatial study also showed that TS values ranged from 158 – 216 mg/l with highest at the riverine zone and lowest at the transitional zone. The seasonal Total Dissolved Solids (TDS) ranged from 91 – 186mg/l and the spatial variation ranged from 87 – 160 mg/l. The spatial Total Suspended Solids (TSS) ranged from 39 – 49 mg/l and the seasonal TSS variation ranged from 35 – 66mg/l. The annual average values of TS, TDS and TSS values (mg/l) were 190.8, 138.3 and 43.1 mg/l respectively. The TS (0.30 mg/l), TDS (0.22 mg/l) and TSS (0.07 mg/l) were higher in Kol dam as compared to the reservoir.

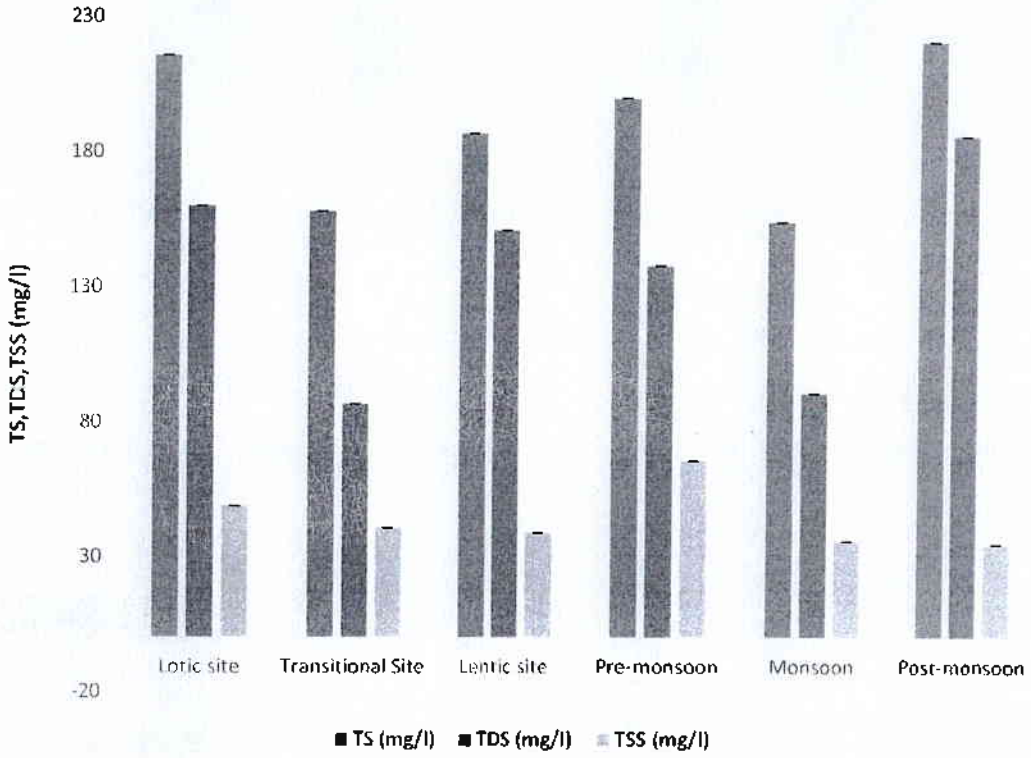

Fig. Graphical representation of seasonal and spatial variation of TS, TDS and TSS (mg/l)

Nitrate-N and Total Nitrogen

Nitrate-N plays a very important role in influencing the primary producers of the water, i.e., the phytoplankton and algae absorbs the nitrate-N in water for their metabolism. The annual

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average mean of nitrate-N and total nitrogen values were 0.0132 mg/l and 0.0557 mg/l respectively. The nitrate-N value indicates the reservoir to be medium productive. Spatial study across the reservoir revealed that nitrate-N and total nitrogen values ranged from 0.013 – 0.014 mg/l and 0.026 – 0.076 mg/l respectively. Seasonal study across the reservoir revealed that nitrate-N and total nitrogen values ranged from 0.013 – 0.014 mg/l and 0.018 – 0.135mg/l respectively. The total nitrogen was lower in the reservoir as compared to Kol dam (0.08 mg/l) but the nitrate-N value was comparable with the Kol dam (0.01 mg/l).

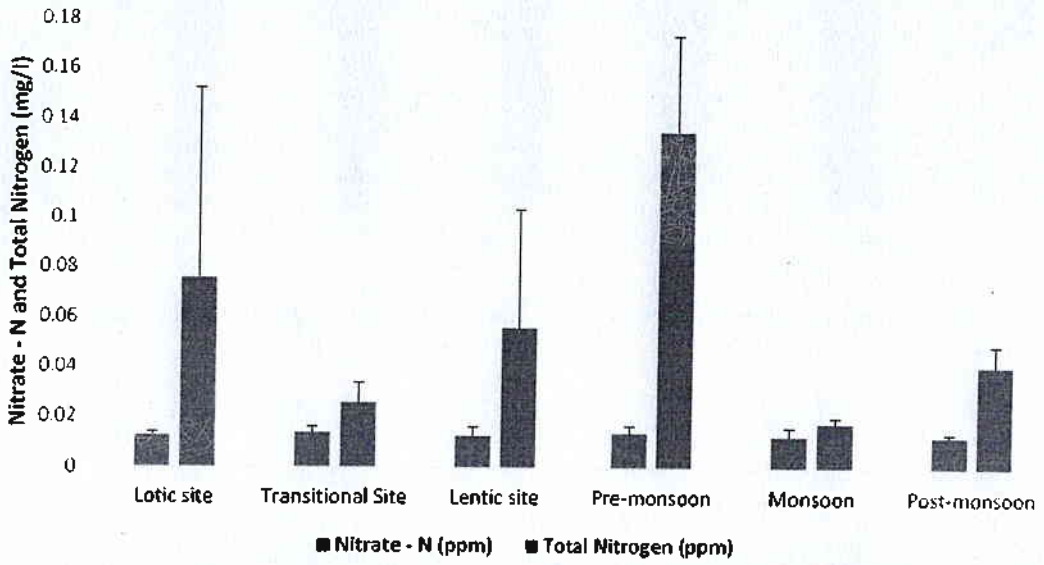

Fig. Graphical representation of seasonal and spatial variation of Nitrate -N (mg/l) and Total Nitrogen (mg/l)

Available Phosphate and Total Phosphorus

Phosphate (PO_4-P) and Total Phosphorus values (mg/l) are significant for reservoir productivity because of their role in phytoplankton abundance which is the primary natural available fish food organisms for many commercial fish. Phosphate-P stimulates the growth of planktons and other aquatic plants which in turn provide natural food for the fishes inhabiting in the water. The annual average mean of phosphate-P and total phosphorus values were 0.0196 mg/l and 0.3822 mg/l respectively which indicated that the reservoir is medium productive in nature. Spatial study across the reservoir revealed that phosphate-P and total phosphorus values ranged from 0.0026 – 0.021 mg/l and 0.039 – 0.859 mg/l respectively. Seasonal study across the reservoir revealed that phosphate-P and total phosphorus values

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ranged from 0.01 – 0.027mg/l and 0.027 – 1.425mg/l respectively. The phosphate-P value of the reservoir was comparable with Kol dam (0.01 mg/l).

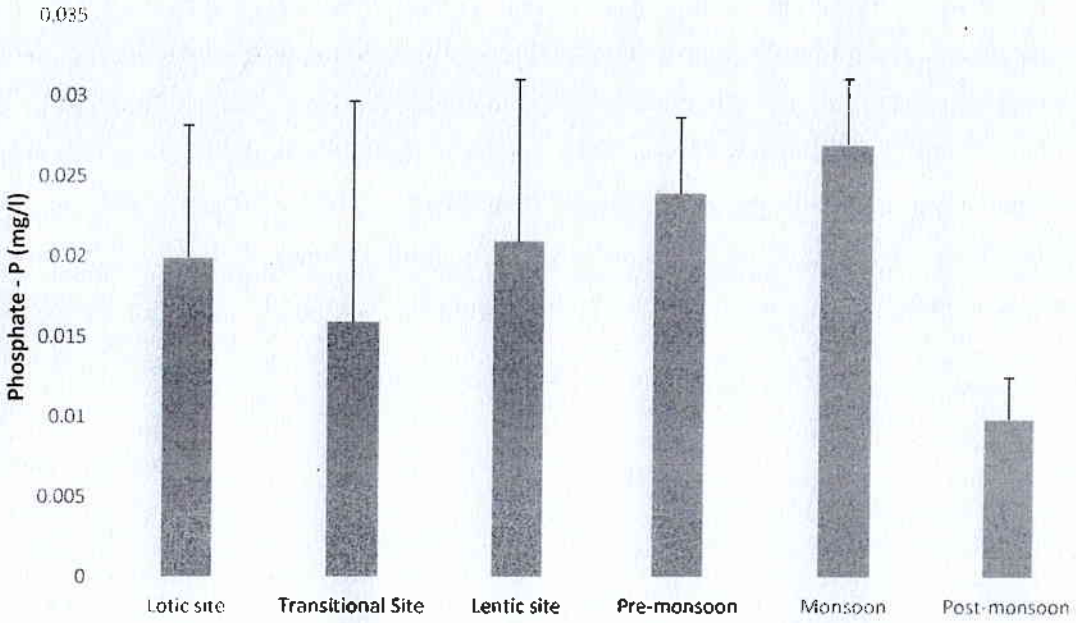

Fig. Graphical representation of seasonal and spatial variation of Phosphate-P

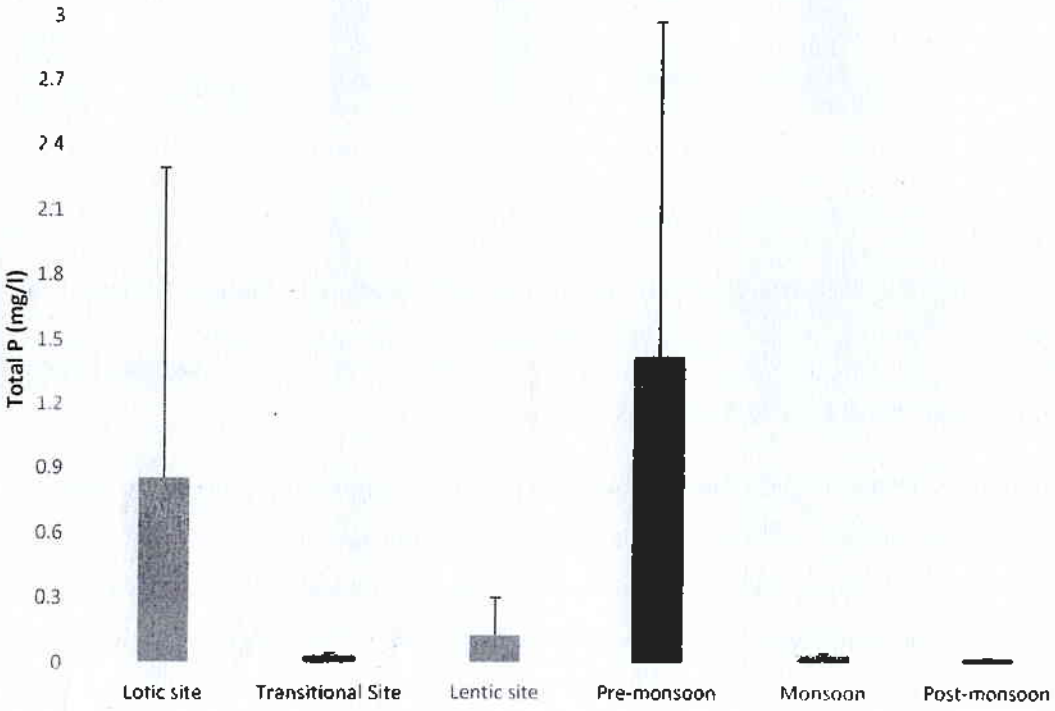

Fig. Graphical representation of seasonal and spatial variation of Total Phosphorus

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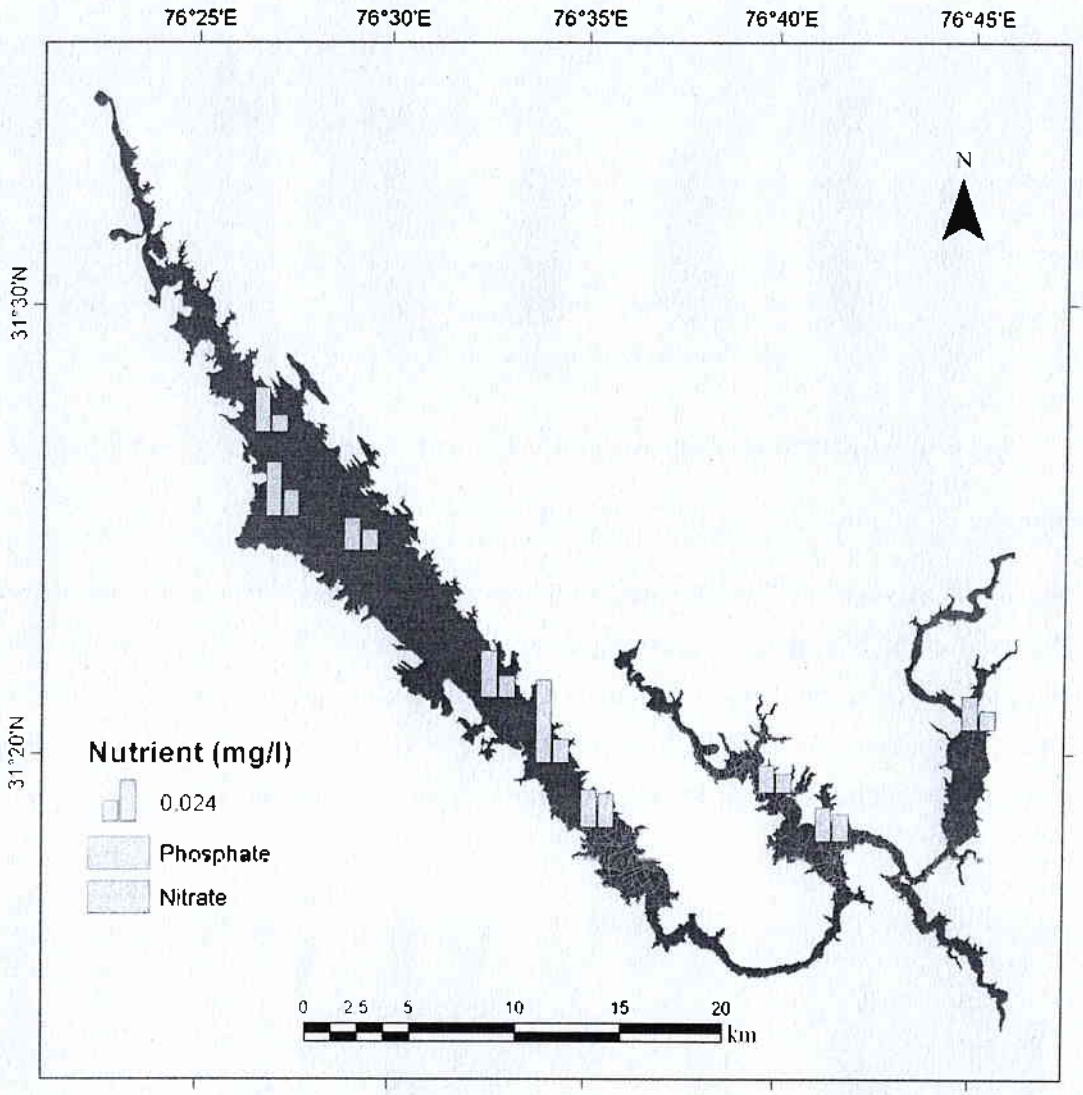

Fig. Spatial variation of available nitrate and phosphate

Silicate-Silicon

The annual average silicate-Si level was estimated to be 6.20 mg/l. Spatial study indicated the silicate-Si level ranged from 4.987 – 7.917mg/l with maximum at the riverine sector and lowest at lentic site, might be due to silt laden water at the lotic sector rendering more silicate-Si. Seasonal study indicated the silicate-Si level ranged from 3.392 – 8.476mg/l with the highest during monsoon season and lowest in post-monsoon. The silicate-Si value was higher in the Kol dam (9.08 mg/l) as compared to the reservoir.

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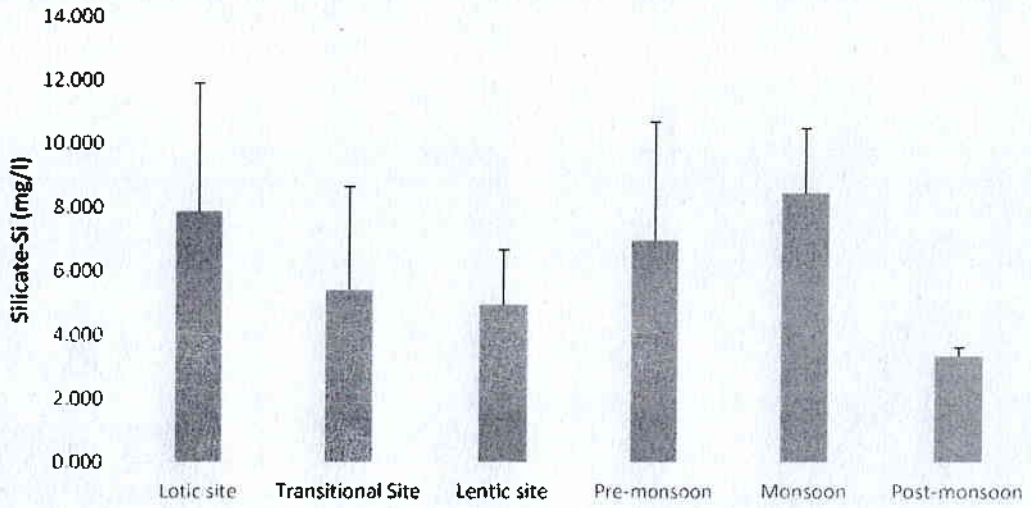

Fig. Graphical representation of seasonal and spatial variation of silicate-Si (mg/l)

Sulphate

The annual average level of sulphate level was estimated to be 0.09 mg/l. Spatial study indicated the sulphate level ranged from 0.082 – 0.116 mg/l with maximum at the riverine sector and lowest at the lentic site. Seasonal study indicated the sulphate level ranged from 0.081 – 0.110mg/l with highest during pre – monsoon season and lowest in post -- monsoon which might be due to the higher evaporation during pre – monsoon months.

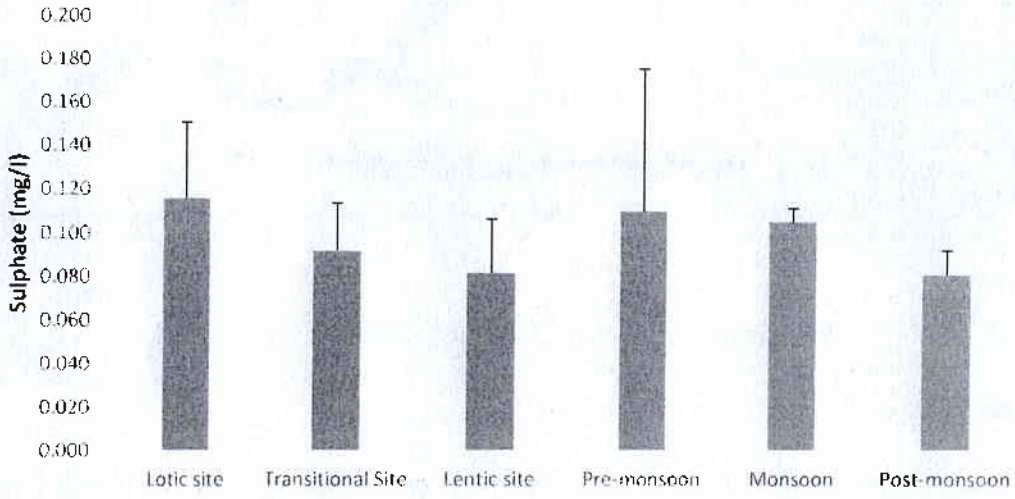

Fig. Graphical representation of seasonal and spatial variation of sulphate (mg/l)

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Biochemical Oxygen Demand (BOD)

Biochemical oxygen demand (BOD) is the amount of dissolved oxygen needed by aerobic biological organisms to break down organic materials present in a given water sample at certain temperature over a specific period of time. In Gobindsagar reservoir, the annual average BOD value was estimated to be 0.47 mg/l which indicated that the reservoir is free from organic pollution. Spatial study revealed BOD values to be within 0.37 – 0.62 mg/l with the highest at the lotic site and the lowest at lentic site. Seasonal study revealed BOD values was ranged from 0.311 – 0.667mg/l with the highest during the monsoon season and the lowest in post – monsoon. The BOD level was higher in the reservoir as compared to Kol dam (0.2 mg/l).

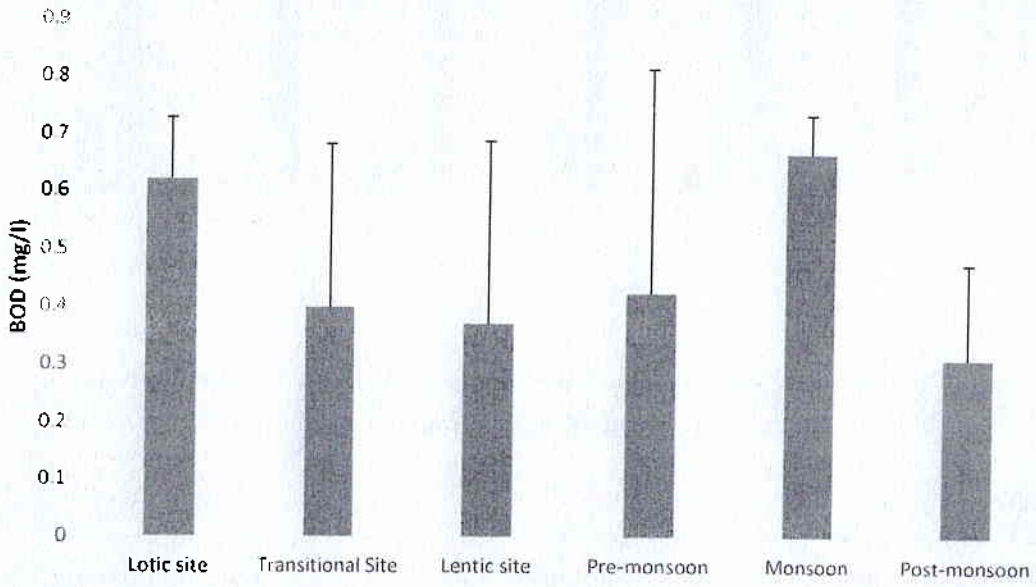

Fig. Graphical representation of seasonal and spatial variation of BOD (mg/l)

Total Hardness, Calcium and Magnesium Hardness

Water hardness is an important parameter affecting fish growth and is a commonly reported aspect of water quality. It is a measure of the quantity of divalent cations such as calcium, magnesium and/or iron in water. Hardness can be a mixture of divalent salts; however, calcium and magnesium are the most dominant sources of water hardness. Hardness is traditionally measured by chemical titration. The hardness of a water sample is reported in milligrams per litre as calcium carbonate (mg/las $CaCO_3$). Calcium carbonate hardness is a general term that indicates the total quantity of divalent salts present and does not specifically identify whether

calcium, magnesium and/or some other divalent salts is causing water hardness. Spatial and seasonal studies of the Gobindsagar reservoir revealed that total hardness of the reservoir water ranged from 89.05 – 115.88 mg/l and 89.11 – 112.75mg/l respectively. For calcium hardness, the spatial and seasonal studies of the Gobindsagar reservoir revealed that the hardness values ranged from 23.11 – 27.70 mg/l and 21.55 – 28.65mg/l respectively. For magnesium hardness, the spatial and seasonal studies of the Gobindsagar reservoir revealed the hardness values ranged from 6.1 – 11.2 mg/l and 7.68 – 9.866mg/l respectively. The total hardness was lower in the reservoir as compared to Kol dam (150 mg/l).

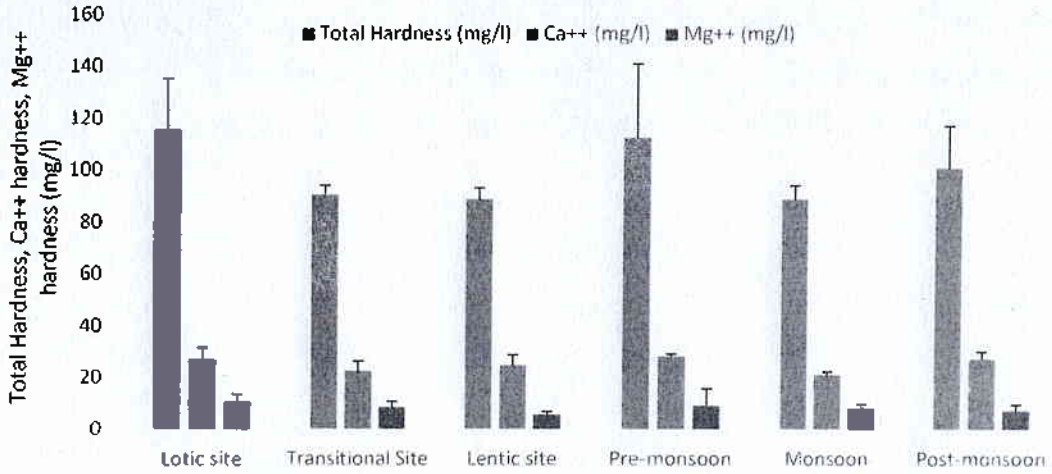

Fig. Graphical representation of seasonal and spatial variation of total water hardness, Ca^{++} and Mg^{++} hardness (mg/l)

Chlorophyll – a

The concentration of chlorophyll a value determines the productivity of the reservoir. Spatial and seasonal studies in the pan reservoir revealed the values ranged from 3.33 - 3.92 mg/m^3 and 2.32 – 4.06 mg/m^3 respectively. Spatial and seasonal high values of chlorophyll a was noticed at the dam site of the reservoir.

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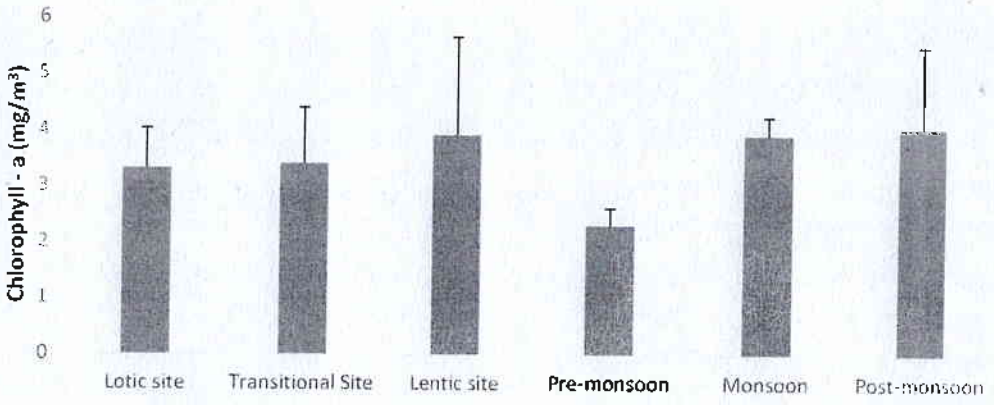

Fig. Graphical representation of seasonal and spatial variation of Chlorophyll a (mg/m³)

Trophic State Index (TSI)

The trophic status of Gobindsagar reservoir was assessed based on chlorophyll-a, Secchi depth, and Total phosphorus. The seasonal and spatial TSI value based on chlorophyll-a (41.504 and 43.030 respectively) indicated oligotrophic nature of the reservoir. The seasonal and spatial TSI value based on Secchi depth (49.878 and 48.787 respectively) indicated mesotrophic nature. The seasonal and spatial TSI value based on Total Phosphorus (71.235 and 77.761 respectively) indicated eutrophic nature. However, chlorophyll-a can be considered as the most reliable TSI based on the three parameters as the chlorophyll can indicate the biomass of the primary producers of an aquatic environment. Thus, Gobindsagar reservoir can be considered to be in an oligotrophic state by considering the chlorophyll-a value indicating less plankton biomass.

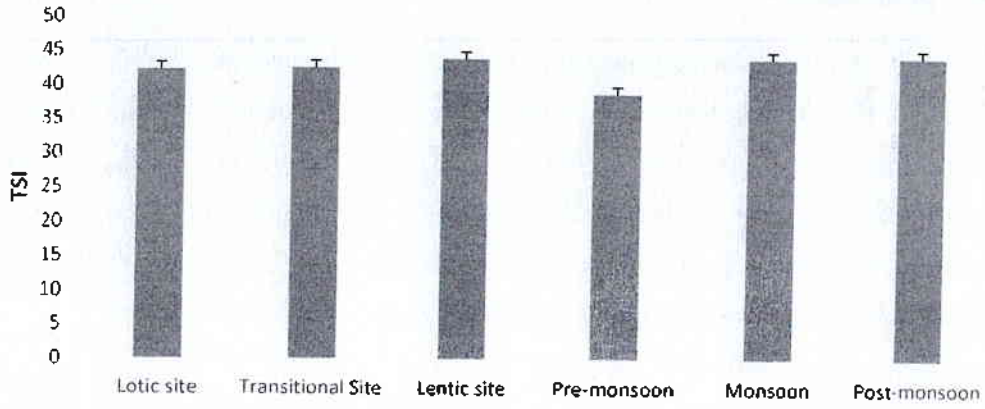

Fig. Graphical representation of seasonal and spatial variation of TSI status

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Table 4. Water quality parameters of different zone of Gobindsagar reservoir, H.P

Parameters	Lotic site	Intermediate site	Lentic site
Water Temp (°C)	16.70	20.51	18.41
Transparency (cm)	121.0	238.99	356.72
Sp. Cond. (µS / cm)	276.11	186.11	205.70
pH	8.17	8.26	8.45
DO (mg/l)	7.84	7.53	7.16
Total Alkalinity (mg/l)	76.66	52.16	55.16
Carbonate (mg/l)	4.66	7.33	18.00
Bicarbonate (mg/l)	72.00	45.83	37.16
Free CO_2 (mg/l)	2.38	1.16	0.00
Chlorinity (mg/l)	10.72	8.41	6.83
TS (g/l)	0.21	0.15	0.18
TDS (g/l)	0.16	0.087	0.15
TSS (g/l)	0.04	0.041	0.039
Nitrate - N (mg/l)	0.013	0.014	0.013
Total Nitrogen (mg/l)	0.076	0.026	0.056
Phosphate - P (mg/l)	0.020	0.016	0.021
Total Phosphate (mg/l)	0.85	0.039	0.134
Silicate-Si (mg/l)	7.91	5.44	4.98
Sulphate (mg/l)	0.11	0.092	0.082
BOD (mg/l)	0.62	0.40	0.37
Total Hardness (mg/l)	115.88	91.00	89.05
Ca++ (mg/l)	27.70	23.11	25.38
Mg++ (mg/l)	11.19	8.87	6.14
Chlorophyll - a (mg/m^3)	3.33	3.41	3.92

Primary productivity

Being a gorgy reservoir with steep nature in the lentic and intermediate zone, the reservoir does not provide shelter for macrophyte succession. The spatio - temporal gross carbon production fluctuated from 36.98- 44.79 and 39.84 – 45.51 mgC/m^3/hr. The spatio- temporal net production varied between 27.34 - 31.25 and 27.78 - 31.25 mgC/m^3/hr respectively. Spatio-temporal cellular respiration varied from 8.92 - 14.8 and 11.20 - 13.59 mgC/m^3/hr respectively. The primary productivity indicated the reservoir to be medium productive.

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10. Heavy metals

The investigation of heavy metal concentrations and distribution is useful to determine the pollution level in aquatic environments and to provide basic information for the assessment of environmental health risks. The heavy metal concentration was studied spatially in the reservoir. The chromium content in water ranged from 0.007 to 0.059 mg/l and significantly higher values were observed in lotic and lentic zone compared to transitional zone. The manganese content ranged from 0.01 to 0.45 mg/l with the highest concentration recorded in the lotic zone and the lowest in transitional zone. The iron content ranged from 0.021 to 1.91 mg/l with the highest in lotic zone and the lowest in transitional zone. The copper concentration ranged from 0.006 to 0.02 mg/l with the higher values recorded in the lotic and lentic zone while the lowest in transitional zone. The zinc concentration ranged from 0.33 to 0.70 mg/l with the highest in the transitional zone and the lowest concentration in lotic zone. The cadmium content ranged from nil to 0.005 mg/l with the highest in the lotic zone and the lowest content in transitional zone. The lead content ranged from 0.001 to 0.018 mg/l with the highest in the lotic zone and the lowest in transitional zone. The variation pattern of heavy metal contents in water phase indicated that the water of the transitional zone was in a better condition from pollution point of view as most of the heavy metal contents were of lower order in the transitional zone while comparatively high values of heavy metal content were observed in lotic zone.

Table 4. Heavy metals concentration in water of Gobindsagar reservoir

Sampling sites	Heavy metals concentration (mg/l or ppm)						
	Cr	Mn	Fe	Cu	Zn	Cd	Pb
Lotic site	0.040	0.454	1.913	0.020	0.332	0.005	0.018
Transitional site	0.007	0.010	0.021	0.006	0.427	0.000	0.001
Lentic / Dam site	0.059	0.204	0.494	0.022	0.707	0.004	0.021

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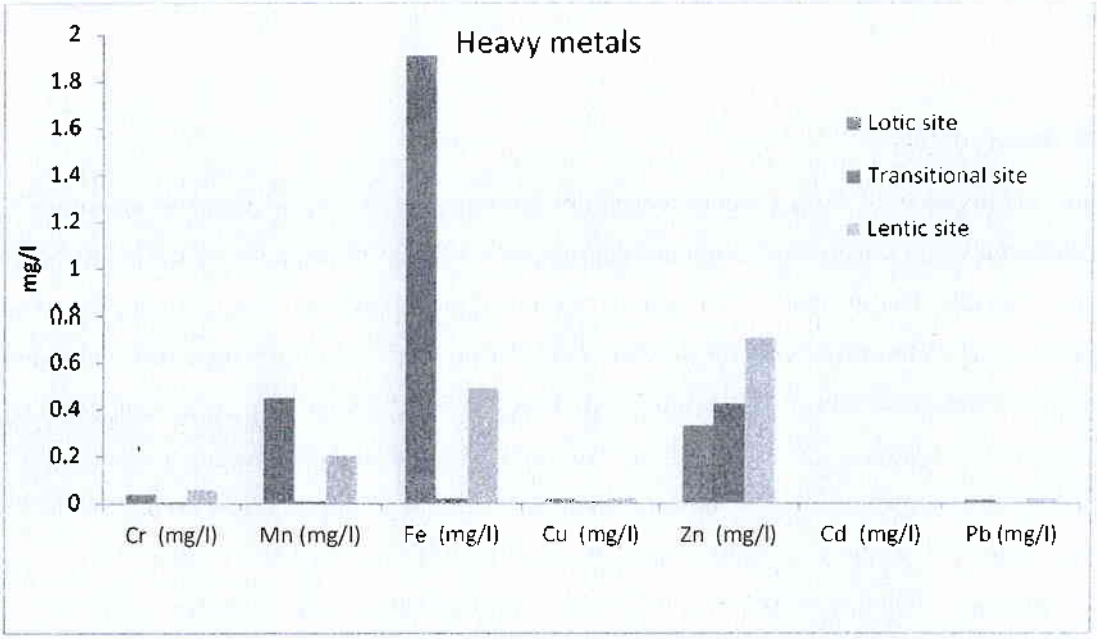
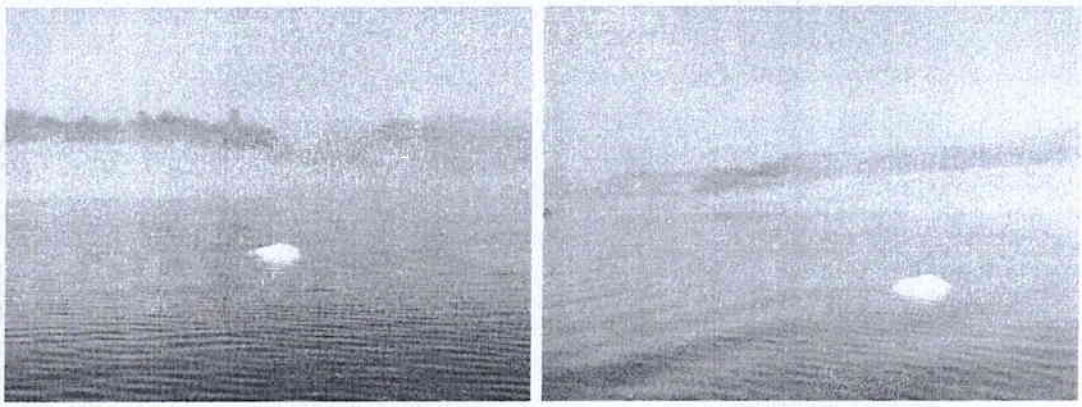


Fig. Graphical representation of different trace metals concentrations (mg/l)

The water quality parameters and other productivity parameters clearly indicated that the reservoir is medium productive in nature. Some critical parameters like DO, pH, alkalinity etc. were in the favorable range for fish production. The BOD value indicated that reservoir is free from high organic load. Productivity parameters like specific conductivity, alkalinity, DO, pH, nitrate-N, phosphate-P, and primary productivity indicated the reservoir to be medium productive.



Floating domestic wastes at Maidan, Bilaspur

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11. Sediment parameters

Sediment plays an important role for the water quality parameters and productivity of reservoir. Assessment of sediment parameters is highly recommended prior to formulating any fisheries management strategies. During the present study, 11 sediment parameters influencing fisheries and productivity were assessed from the reservoir. Spatio-temporal variations of the sediment parameters were also highlighted.

Collection of sediment from Gobindsagar reservoir

pH

The annual average pH of sediment was 7.87 which clearly indicated that the sediment was slightly alkaline in nature - indicating the productive nature of the reservoir. Spatial analysis of sediment pH was ranged from 7.22 to 8.37 with the highest at the transitional zone of the reservoir. Seasonal sediment pH was ranged from 7.30 to 8.43, with the highest value during the post – monsoon season.

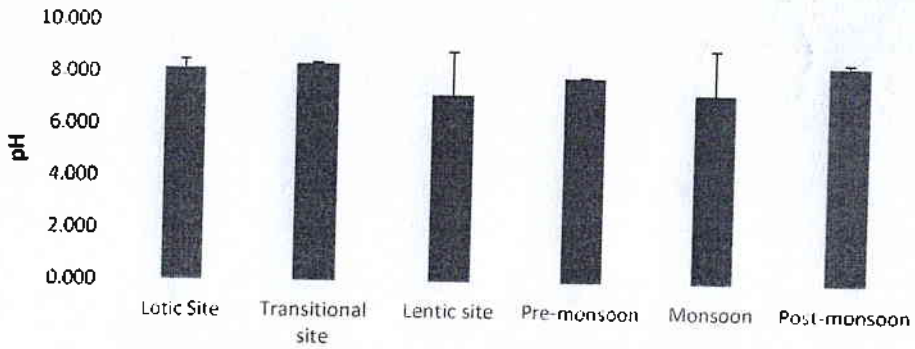

Fig. Graphical representation of seasonal and spatial variation of sediment pH

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Specific conductivity

Spatial analysis of specific conductivity in sediment revealed a range at 0.16 – 0.35 mS/cm. with the highest at the lotic zone of the reservoir. Seasonal study of the sediment of Gobindsagar reservoir also revealed that the specific conductivity was ranged from 0.14 – 0.38 mS/cm, with the highest in monsoon season.

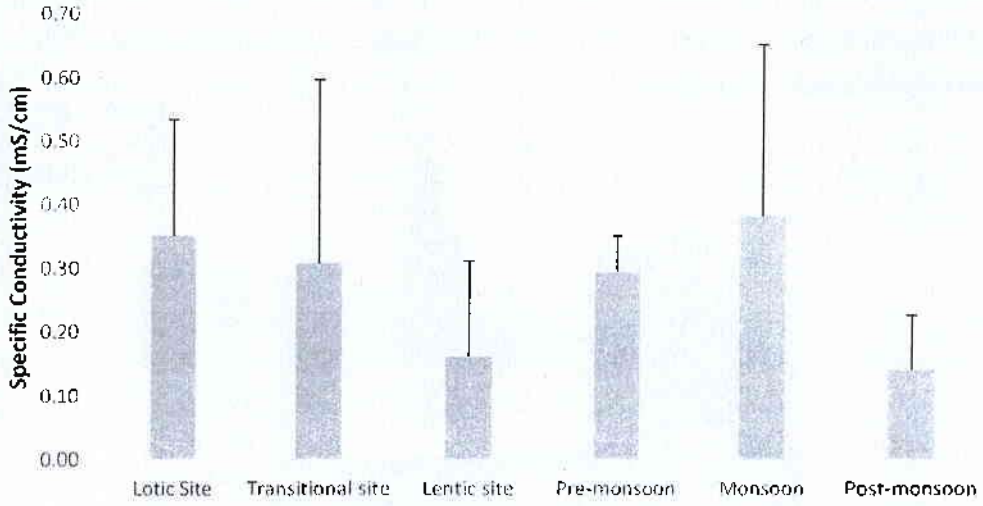

Fig. Seasonal and spatial variations of sediment specific conductivity

Sediment Texture (Sand, Silt & Clay contents)

The sediment is predominantly sandy in all the three zones of the reservoir where sand content varied from 44.5 to 59.50%. Silt content in the sediment ranged from 22.22–44.0%, while clay content in the sediment varied from 8.33 - 16.44%. Spatially, the transitional zone had high sand content than the other zones of the reservoir. The seasonal analysis of the sediment texture indicated more sand contents in monsoon and post-monsoon season as compared to the pre-monsoon season.

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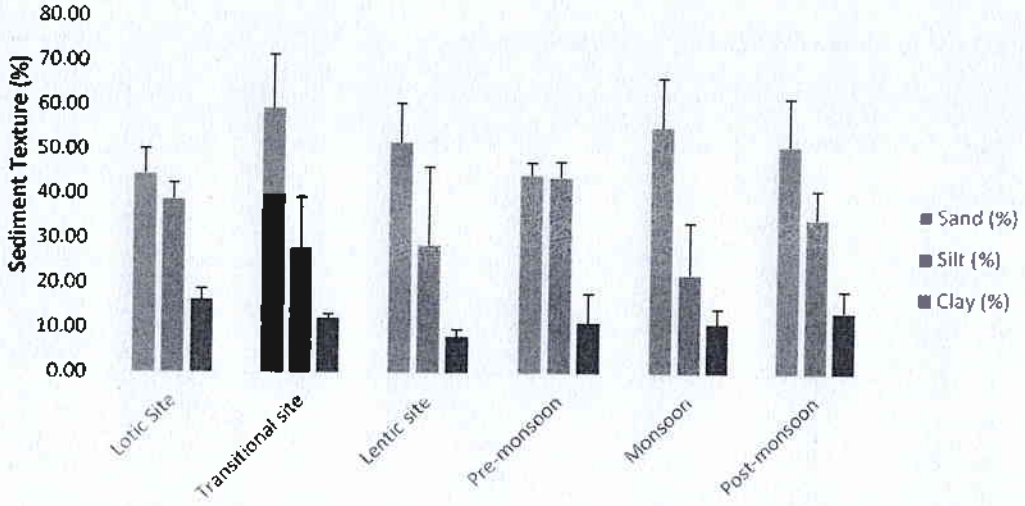

Fig. Graphical representation of seasonal and spatial variation of sediment texture

C/N Ratio

The C/N ratio across the reservoir ranged from 7.88 – 27.34. Spatial study revealed the C/N ratio 16.58 – 19.33 with the highest at the transitional zone of the reservoir. Seasonal study indicated that the C/N ratio was in the range of 7.88 – 27.34 with the highest in the post – monsoon season. The reservoir is medium productive as indicated from the values of C/N ratio.

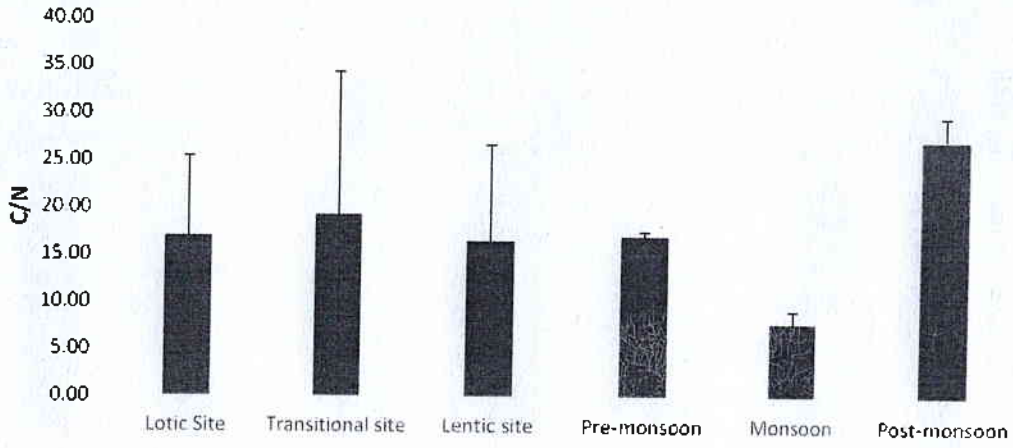

Fig. Graphical representation of seasonal and spatial variation of sediment C/N ratio

Sediment Nitrogen

The spatial study revealed that the total nitrogen concentration of the sediment ranged from 0.033 – 0.041%, with the higher values recorded at the lotic and transitional zone of the reservoir. Seasonal study revealed that the total nitrogen ranged from 0.018 – 0.056% with the

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highest content observed in the monsoon and the lowest during post – monsoon. The spatial study of available nitrogen in the sediment ranged from 7.42 – 12.88 mg/100g with the highest at the lentic zone and the lowest at the transitional zone of the reservoir. The seasonal study of the available nitrogen values indicated that the values were ranged from 7.68 – 15.68 mg/100g, with the lowest during the monsoon season and the highest in the pre – monsoon season. The contents of sediment available and total-N indicated that the reservoir is moderately productive.

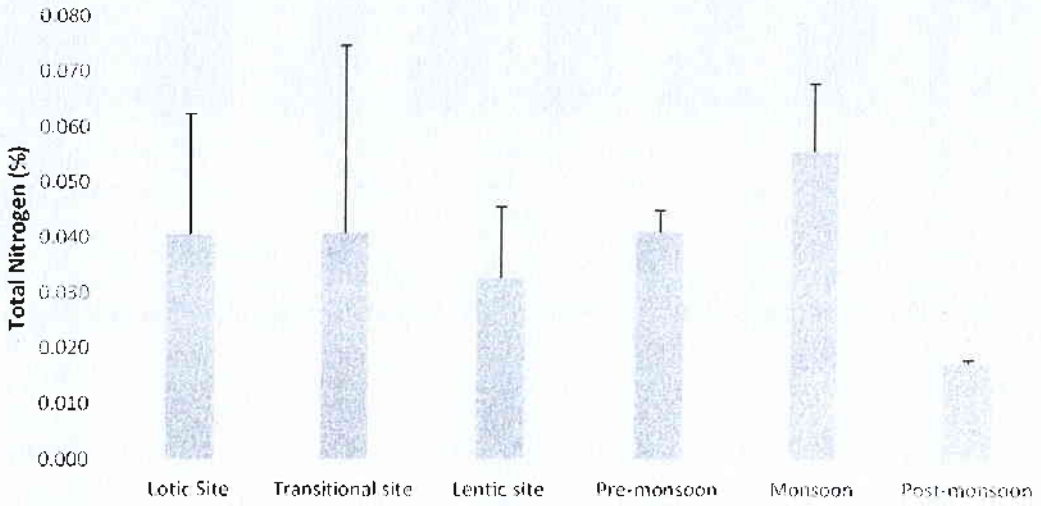

Fig. Seasonal and spatial variation of sediment total nitrogen (%)

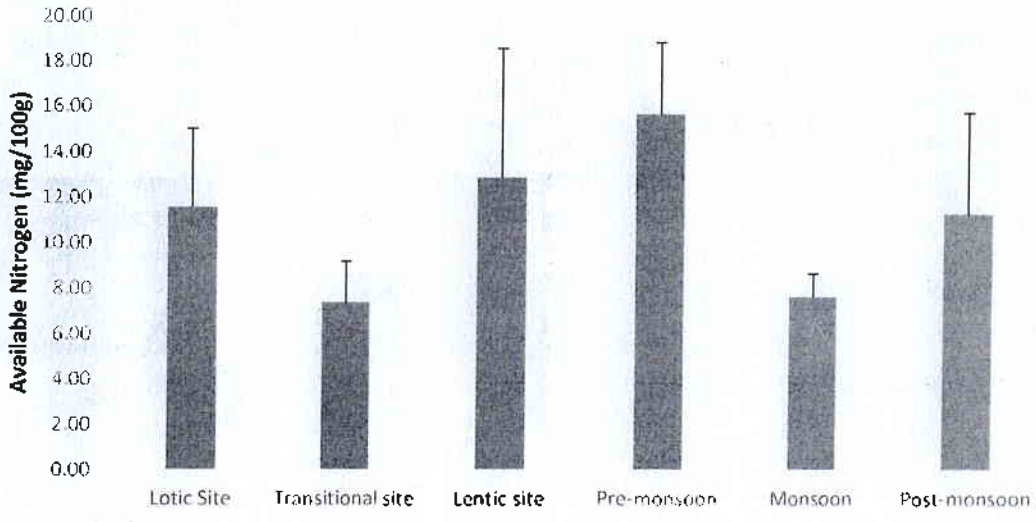

Fig. Seasonal and spatial variation of sediment available nitrogen (mg/100g)

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Sediment phosphate

The available phosphorus concentration in the sediment ranged from 1.48 – 2.22 (mg/100g) across the different zones of the reservoir, with the highest values observed in the lentic zone and the lowest in transitional zone of the reservoir. Seasonal study revealed that the available phosphorus ranged from 0.98 – 3.41 (mg/100g) with the highest concentration noticed in pre-monsoon and the lowest during the monsoon.

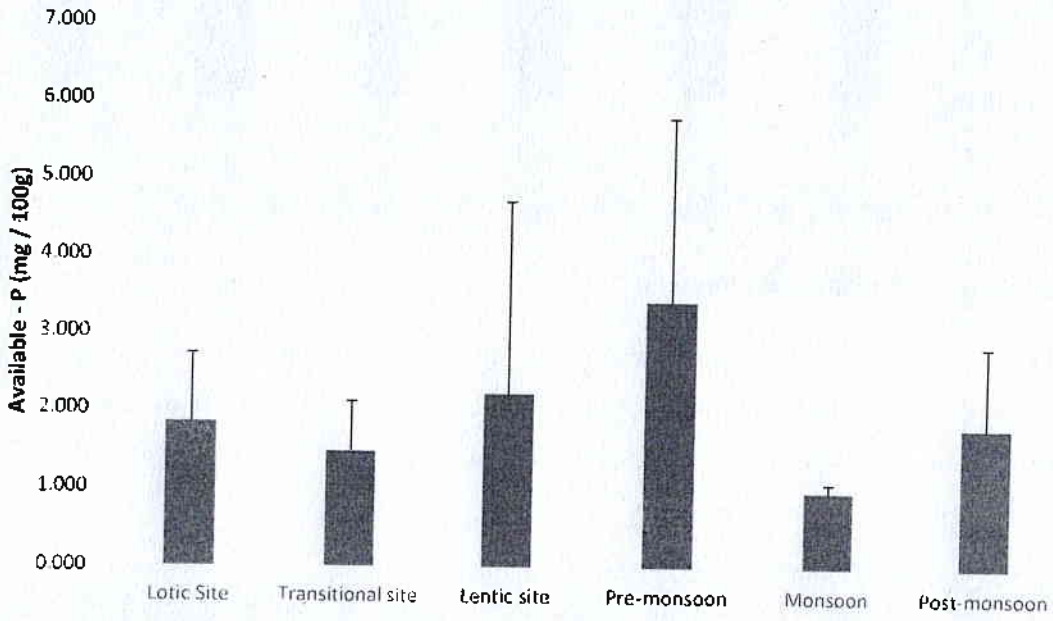

Fig. Seasonal and spatial variation of sediment available phosphate (mg/100g)

Sediment organic carbon

The sediment organic carbon (%) of the reservoir across the different zones ranged from 0.51 - 0.574% with the highest in lotic zone and the lowest in lentic zone. Seasonal sediment organic carbon (%) in sediment of the reservoir ranged from 0.478 - 0.705% with the highest in pre-monsoon and the lowest during the post – monsoon. The organic carbon content of the sediment indicated that reservoir is low to medium productive.

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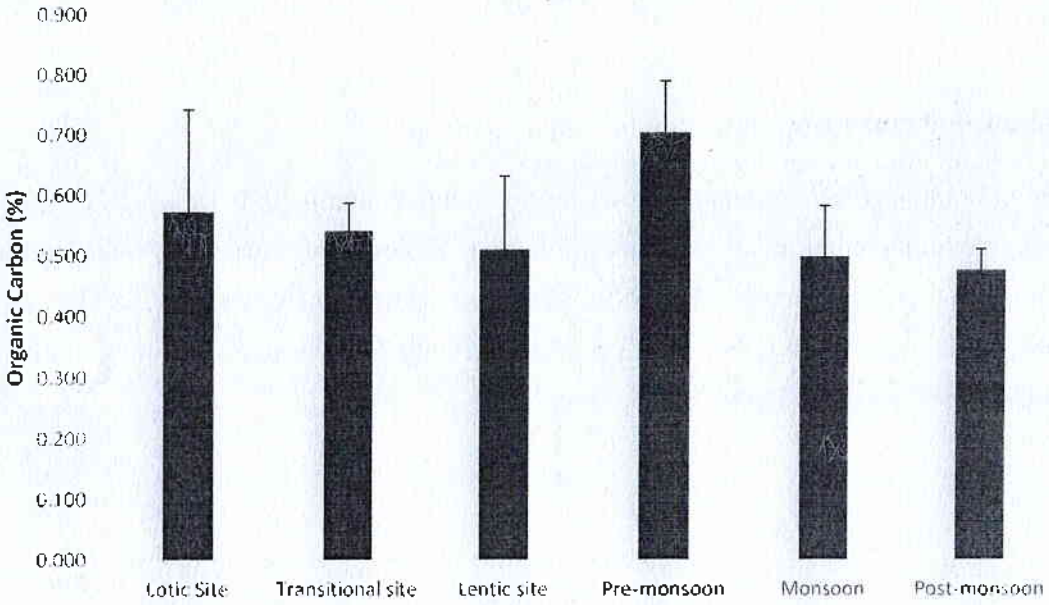

Fig. Seasonal and spatial variation of sediment organic carbon (%)

Sediment free calcium carbonate

Spatial sediment free calcium carbonate (%) of the reservoir ranged from 2.67 - 7.86% with the highest in the lotic zone and the lowest in lentic zone. Seasonal variation of sediment free calcium carbonate (%) content ranged from 4.94 - 6.0% with highest in the pre-monsoon and the lowest during the monsoon.

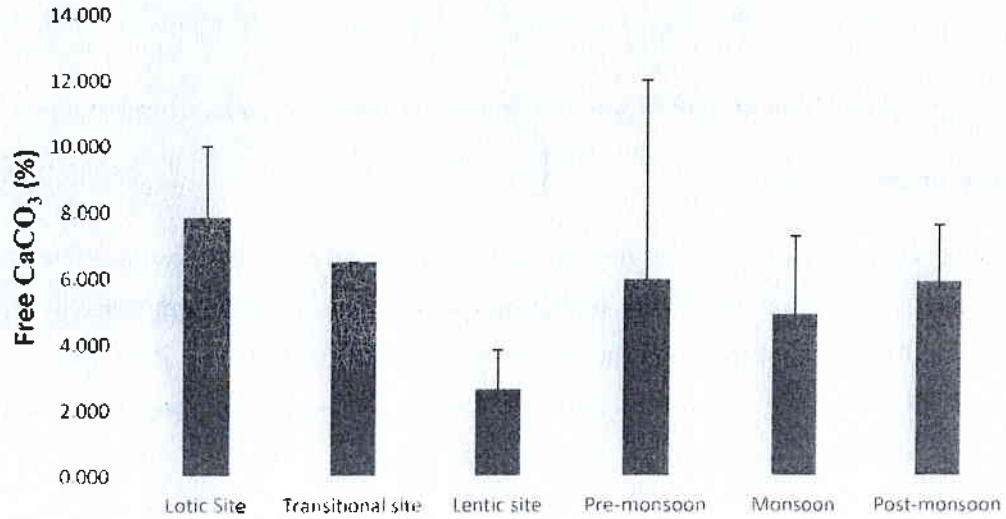

Fig. Seasonal and spatial variation of sediment free calcium carbonate (%)

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Table 5. Sediment quality parameters of Gobindsagar reservoir

Parameters	Lotic site	Intermediate site	Lentic site	Pre - monsoon	Monsoon	Post - monsoon
pH	8.140	8.378	7.223	7.930	7.528	8.464
Specific Conductivity (mS/cm)	0.299	0.309	0.164	0.243	0.427	0.146
Total Nitrogen (%)	0.044	0.041	0.033	0.046	0.048	0.018
Available-N (mg/100g)	13.603	7.420	12.880	16.987	7.863	12.530
Available P (mg/100g)	2.156	1.480	2.225	3.296	0.904	2.018
Organic Carbon (%)	0.663	0.543	0.512	0.780	0.428	0.448
Free $CaCO_3$ (%)	6.583	6.500	2.667	4.917	6.333	7.313
Sand (%)	48.750	59.500	51.833	50.000	51.750	54.875
Silt (%)	36.417	28.167	28.722	39.000	27.917	29.625
Clay (%)	14.833	12.333	8.333	11.000	12.000	15.500
C/N	17.037	19.333	16.581	17.012	7.875	25.506

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12. Water spread area fluctuation

The water spread area fluctuation pattern of Gobindsagar reservoir was studied for the last decade (2012-2020). The annual water spread area was highly fluctuating in the recent years. The water spread area was less fluctuating during 2012 to 2014, but the fluctuation was increasing 2016 onwards. The high fluctuations of the water spread area in the recent years could be the main possible reason for the declining of the fish production. The water fluctuations can have a large impact on the fish breeding ground habitat influencing the natural recruitment of the auto-breeding population and also the natural food availabilities in inland open water bodies. The water spread area of the reservoir is mainly depending on the rainfall pattern, water supply from the upper stretch of the parent rivers and utilization of the water for power generation, irrigation, water supply and water discharge from the reservoir to the downstream.

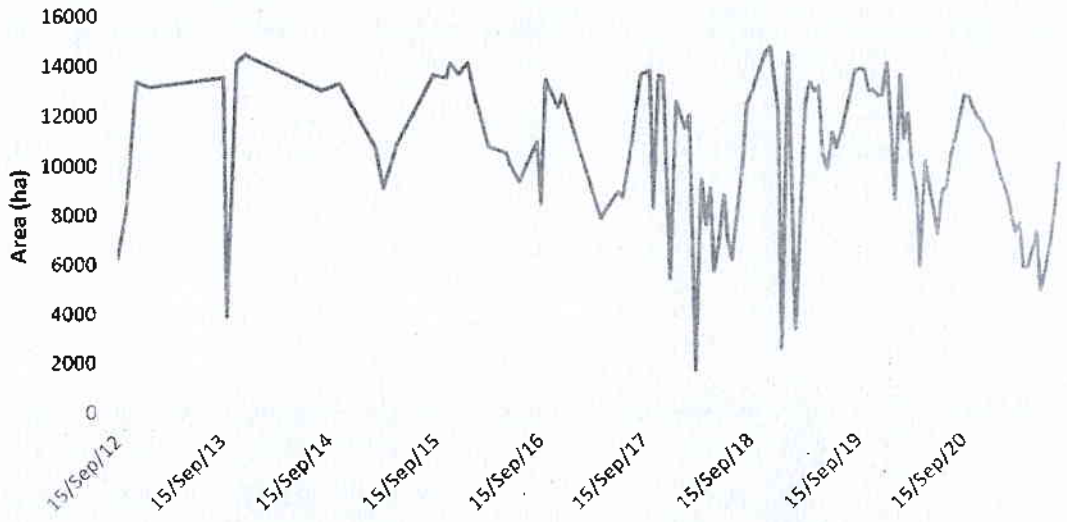

Fig. Water spread area fluctuations in Gobindsagar reservoir during 2012 to 2020

The regression analysis between the water spread area with the fish production clearly indicated that water spread area has a great impact on the fish production in Gobindsagar reservoir. The fish production was positively influenced by the water spread area as indicated by regression analysis "Production (t) = 0.227*Water Spread area (ha) - 2539" (R^2=0.326).

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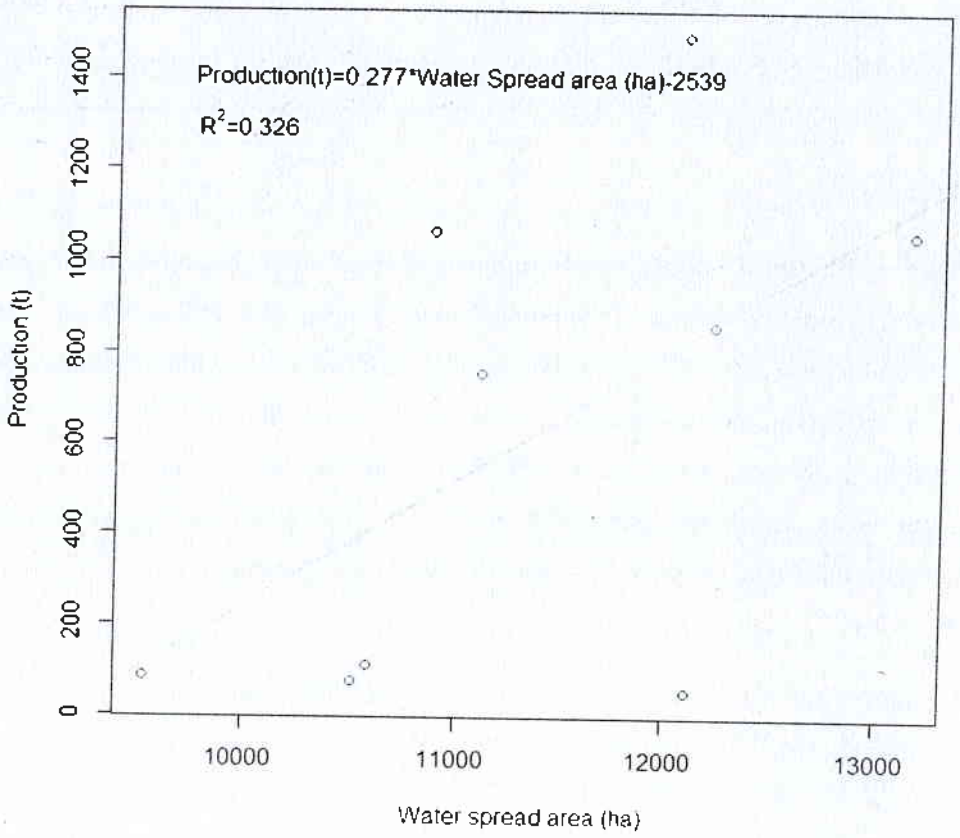

Fig. Regression analysis showing the impact of water spread on the fish production

Meeting with DoF official, Govt. of H.P

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13. Plankton

Plankton is considered to be the most important biotic component in reservoir fisheries. Most of the important commercial fishes are plankton feeders. Assessment of the plankton diversity and its abundance is essential for the development of fisheries management strategy of reservoir.

Phytoplankton

Phytoplankton abundance was assessed from the three zones of the reservoir covering the three seasons. The seasonal abundance of the phytoplankton ranged from 266 to 978 nos./l with the mean annual abundance of 712 nos./l. The seasonal variation of the phytoplankton abundance indicated the highest in the pre-monsoon season and the lowest in monsoon season. The lower phytoplankton in the monsoon season might be due to the increase in water volume with dilution and water spread area during that season. The spatial or zone-wise variations of the phytoplankton abundance indicted the highest was recorded in the lotic zone (815 nos./l) of the reservoir.

A total number of 31 species was recorded from Gobindsagar reservoir. The group Bacillariophyceae had the maximum number of species with 15 species, followed by Cyanophyceae (7 species), Chlorophyceae (5) and Euglenophyceae (4 species). The most dominant species was *Oscilatoria* sp. (17.94%) followed by *Chlorella* sp. (13.25%), *Nitzschia* sp. (7.59%), *Synedra* sp. (7.31%) and *Fragillaria* sp. (7.26%); the contributions of other species were insignificant. Among the various groups of phytoplankton, the population of Bacillariophyceae (50%) was the highest during the study period followed by Cyanophyceae (24 %), Chlorophyceae (16 %) and Euglenophyceae (10 %).

Table 6. Phytoplankton abundance in Gobindsagar reservoir

Class	Species	Abundance (%)
Bacillariophyceae	*Fragillaria* sp.	7.31
	Synedra sp.	7.26
	Synedra ulna	0.78
	Nitzschia sp.	7.59
	Melosira sp.	4.13
	Navicula sp.	1.23
	Pinnularia sp.	2.73
	Stauroneis sp.	1.01
	Gomphonema sp.	3.46
	Cymbella sp.	3.72

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	Diatomia sp.	2.42
	Entomoneis alata	2.03
	Amphora sp.	1.64
	Cyclotella sp.	1.65
	Coscinodiscus sp.	2.73
Cyanophyceae	*Oscillatoria tenuis*	0.78
	Oscillatoria sp.	17.94
	Lyngbyia sp.	0.78
	Phormidium sp.	3.66
	Hormogonium sp.	0.47
	Chroococcus sp.	0.31
	Microcystis aeruginosa	0.31
Chlorophyceae	*Oocystis* sp.	0.16
	Selenastrum sp.	2.10
	Chlamydomonas sp.	0.39
	Chlorella sp.	13.25
	Closterium sp.	3.04
Euglenophyceae	*Phacus longicauda*	0.08
	Phacus sp.	2.96
	Trachelomonas sp.	3.43
	Euglena sp.	0.62

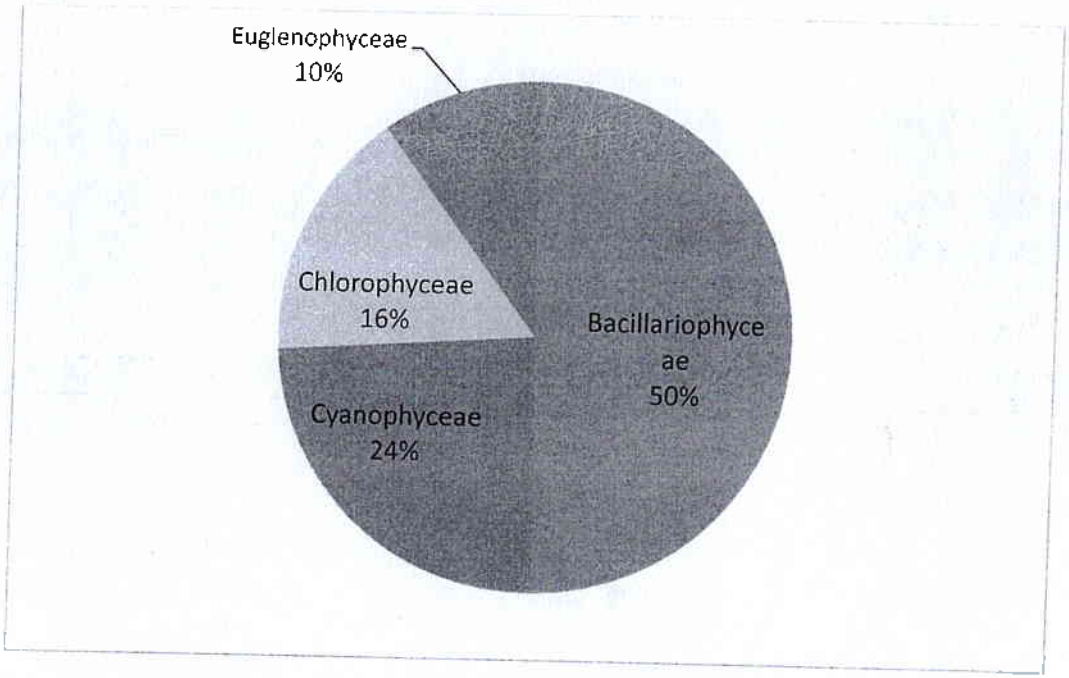

Fig. Abundance of different phytoplankton group in Gobindsagar reservoir

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Zooplankton

Zooplankton abundance and diversity was also assessed from the three zones of the reservoir covering the three seasons. The seasonal abundance of the zooplankton varied from 16 nos./l in monsoon to 785 nos./l in post-monsoon season with the mean annual abundance of 337 nos./l. Similar to the phytoplankton, the lower abundance of zooplankton was in monsoon might be due to the increase in the water volume with increase in water spread area during that season. The spatial or zone-wise variation of the phytoplankton abundance indicted the highest was in the lentic zone (651 nos./l) of the reservoir. A total number of 18 species were recorded from Gobindsagar reservoir including crustacean nauplii. The group Cladocera had the maximum number of species with 11 species, followed by Rotifera (4 species) and Copepoda (3 species). The most dominant zooplankton were Cyclopoid Copepod (31.69 %), *Bosmina* sp. (15.45%), *Keratella tropica* (15.02%) and Calanoid copepod (8.88%). Among the various groups of zooplankton, the population of Cladocera (50%) was the highest during the study period followed by Copepoda (42 %), and Rotifera (8 %).

Table 7. Zooplankton abundance in Gobindsagar reservoir

Zooplankton group	Species	Abundance (%)
Copepoda	Calanoid copepod	8.88
	Cyclopoid copepod	31.69
	Crustacean nauplii	1.68
Cladocera	Cladocera	2.14
	Daphnia sp.	0.66
	Ceriodaphnia sp.	2.47
	Diaphanosoma sp.	1.31
	Leydigia sp.	0.49
	*Alonella*sp.	7.23
	Bosmina sp.	15.45
	Brachionus calyciflorus	2.63
	Brachionus forficulatus	0.99
	Brachionus divesiicornis	1.31
	Keratella tropica	15.02
Rotifera	*Asplanchna* sp.	4.11
	Trichocerca sp.	1.15
	Polyarthra sp.	0.33
	Filinia camasecla	2.40

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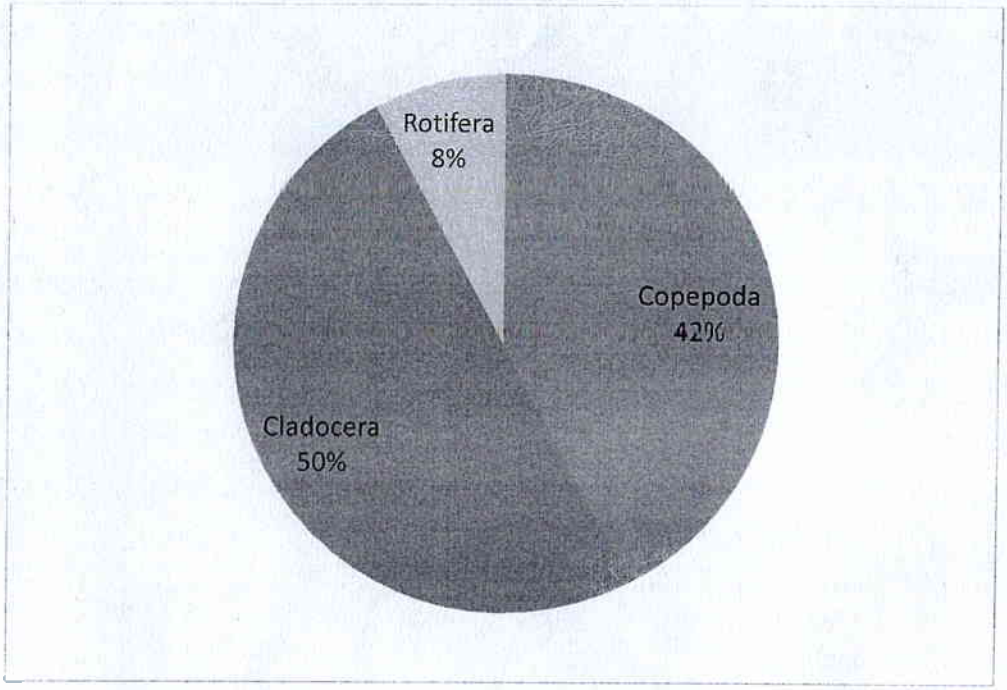

Fig. Abundance of different zooplankton group in Gobindsagar reservoir

Collection of plankton from Gobindsagar reservoir

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Directorate of Fisheries HP
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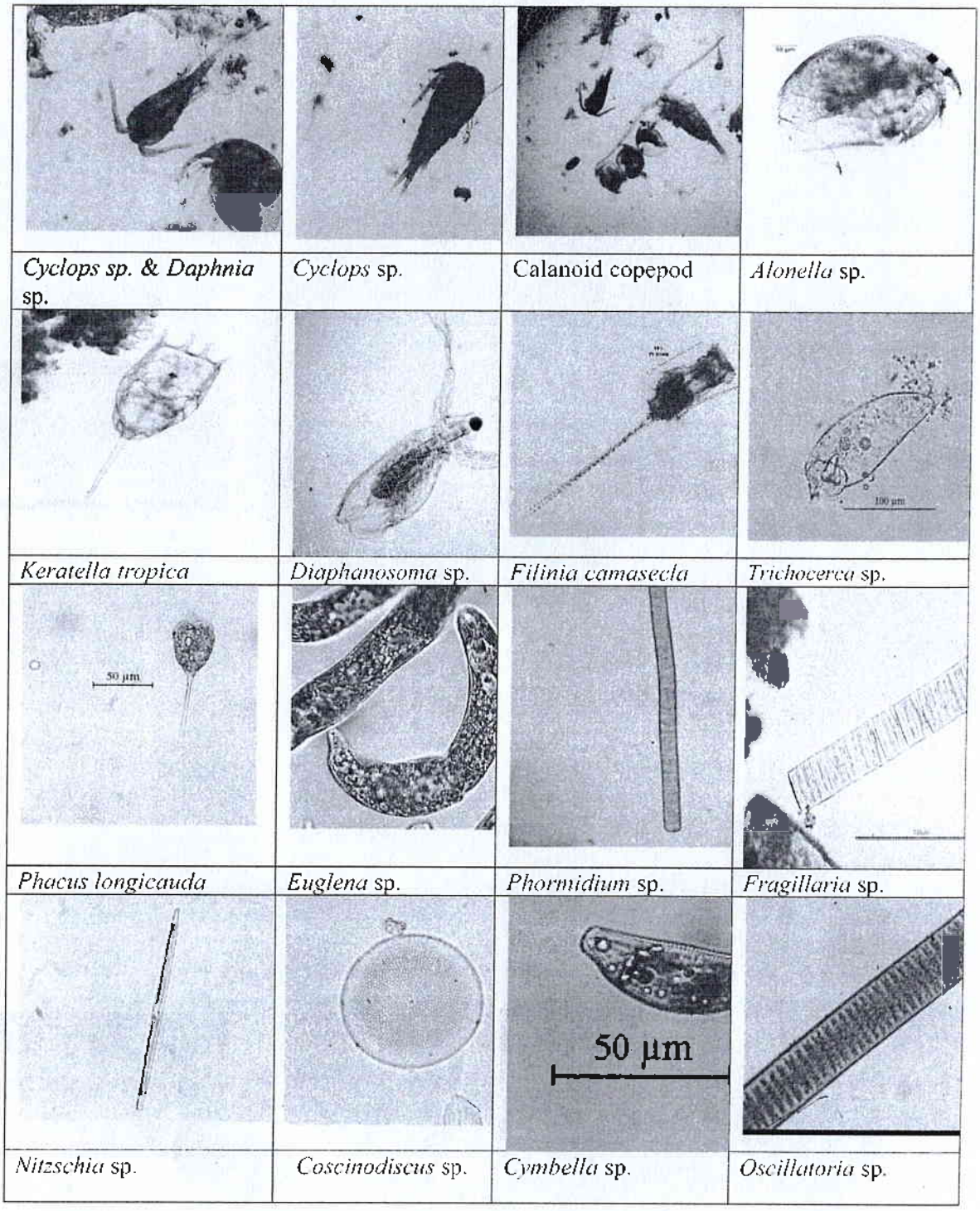

Cyclops sp. & Daphnia sp.	*Cyclops* sp.	Calanoid copepod	*Alonella* sp.
Keratella tropica	*Diaphanosoma* sp.	*Filinia camasecla*	*Trichocerca* sp.
Phacus longicauda	*Euglena* sp.	*Phormidium* sp.	*Fragillaria* sp.
Nitzschia sp.	*Coscinodiscus* sp.	*Cymbella* sp.	*Oscillatoria* sp.

Fig. Commonly occurring plankton in Gobindsagar reservoir

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14. Benthic communities

Benthos include animals that live in and on sediments of all kinds in an aquatic environment. The sampling was carried out in Gobindsagar reservoir using a 22.9 cm x 22.9 cm Peterson grab sampler. Seasonal study of the benthic communities of the Gobindsagar reservoir in different zones of the reservoir recorded 11benthic species. Dominating species among the benthic communities were *Tubifex* sp. followed by Chironomid larvae, *Gyraulus* sp. and *Pristina* sp. The seasonal variation in abundance of benthic organisms indicated that the benthic organisms were predominant in pre-monsoon due to stabilization.

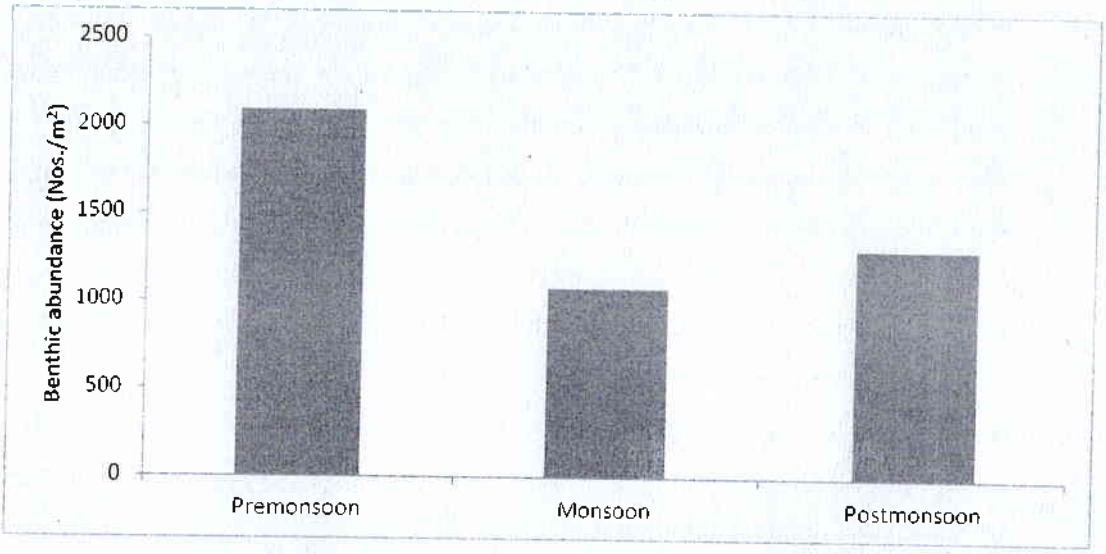

Fig. Seasonal variation of benthic abundance

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15. Recommendations

- It is observed that stocking of the fish seed in the reservoir was done mainly for the IMCs (catla, rohu and mrigal) with the size ranging from 25 to 80 mm, but in most of the case, small size fish seed 25-30 mm were stocked in the reservoir. Small size fish seed are prone to predation and other natural mortality resulting in very low survival. Moreover, the stocking practice followed is not regular and varying from year to year. Thus, regular stocking of bigger sized fish seed with more than 100 mm size (Total Length) is recommended for augmenting the fish production in the reservoir.
- IMCs share 80.32% of the total stocking during 2012 to 2020 but contributed only 9.7% of the fish production in the reservoir which clearly indicated that present level of stocking is not significantly contributing to fish production. However, silver carp which merely shared 14.11% of the total stocking contributed 66.51% of the total fish production from the reservoir. The present findings clearly indicated that auto-breeding population of silver carp established in the reservoir was contributing to the fish catch. The failure in auto-breeding due to disturbance in the fish breeding owing to habitat degradation, water level fluctuation, change in rainfall pattern, targeted fishing of large sized silver carp, less number of brooders and other factors, the population of the silver carps has gone down significantly which has significantly impacted the commercial fish catch in the reservoir.
- Special efforts should be undertaken to identify the potential breeding grounds and protecting those habitats along with periodical stocking of fish fingerlings to rejuvenate the population of silver carp in the reservoir.
- The water spread area fluctuation pattern during 2012-2020 indicated that the water spread area of the reservoir has been widely fluctuating in the recent years. The fluctuation in water spread area was less during 2012 to 2014, but the fluctuation in area increased from 2015 onwards. The highly fluctuating water spread area in the recent years could be the most possible reasons for the declining of the fish production in the reservoir as the breeding of fish needs sufficient water availability during the breeding season especially in the upstream of dam. The water fluctuations can have a large impact on the breeding grounds which will drastically influence the natural recruitment of the auto-breeding species and also the natural food availability in reservoirs. Sufficient water area and volume are highly essential to maintain good health and growth of fish. The drastic water level fluctuation can have a greater impact

Dy. Director of Fisheries (Hq)
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on the water quality and other environmental parameters which are very crucial for the overall well-being of the fish. Maintaining the water spread area fluctuation pattern need to be monitored to ensure sufficient water availability for the recruitment of the auto-breeding species, availability of the natural fish food organisms and good water quality parameters.

- One of the most important parameters in open water fisheries is the optimum fishing effort. Estimation of the optimum fishing effort to attain the MSY is essential in large reservoir fisheries management. As per the estimation made through the surplus production model, fishing effort of 2,953 to 3,141 gill net license per year is recommended for the reservoir to attain the MSY.
- Fingerling stocking is one of the most important and crucial aspects in reservoir fisheries management. In order to achieve the estimated fish potential of 145 kg/ha/yr, stocking of fingerlings of IMC and common carp with a size not less than 100 mm or 10 g with a stocking density of 300 Nos./ha/yr is recommended in Gobindsagar reservoir. The stocking ratio should be 3:3:2:1 for catla, common carp, rohu and mrigal respectively. Stock enhancement is one of the most important technologies for sustainable fish enhancement in large reservoir. Rejuvenation of auto-breeding of silver carp by establishing a breeding population is recommended through systematic stocking of silver carp with advanced fingerlings (>100mm) @ 300 fingerlings per ha for at least 5 consecutive years is recommended.
- The rapid depletion of fish diversity and production in the reservoir is a matter of serious concern. Therefore, systematic ranching programme of the threatened fish species is recommended to re-establish the declining fish species.
- The long-term studies on recruitment of silver carp and identification of breeding ground along with climate change impact and ecological modeling are proposed for sustainable fisheries in Gobindsagar reservoir.

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Dy. Director of Fisheries (Hq)
Directorate of Fisheries HP
Bilaspur 174001

BEFORE THE NATIONAL GREEN TRIBUNAL AT NEW DELHI

REPLY FOR ORIGINAL APPLICATION NO. 1004 OF 2024

IN THE MATTER OF:-
Prahlad Goenka & Anr.

Applicants.

VERSUS

Union of India & Ors.

Respondents.

VAKALATNAMA

I/We, Vivek Chandel, S/o Sh. Man Singh, aged 47 years working at present as Director-cum-Warden of Fisheries, Himachal Pradesh Appellants(s) /Petitioner(s)/Respondent(s)/Opposite party in the above Suit/Appeal/ Petition/Reference do hereby appoint and retain Sh./Smt. Ms. Shimpy Sharma, Advocate to act and appear for me/us in the above Original Application/Petition/Reference and on my/our behalf to conduct and prosecute (or defend) the same and all proceedings that may be taken in respect of an application connected with the same of any decree order passed therein, including proceedings in taxation and application for Review, to file and obtain return of documents, and to deposit and receive money on my/our behalf in the said Original Application/Petition Reference and in application of Review, and to represent me/us and to take all necessary steps on my/our behalf in the above matter, I/We agree to ratify all acts done by the aforesaid Advocate in pursuance of this authority.

Dated this the 12 day of 03 2025

Director-cum-Warden of Fisheries
Himachal Pradesh, Bilaspur

APPELLANT(s) (SIGNED)
PETITIONER(s) INTERVENOR(s) RESPONDENT(s)

Sh. Sharma
SHIMPY SHARMA
(D/1364/A/03)

( )
ADVOCATE

MEMO OF APPEARANCE

ADVOCATES' WELFARE FUND STAMP ₹25 1599184 TWENTYFIVE RUPEES

₹5 NCT OF DELHI COURT FEE DLCT1058343L2456M 10-DEC-2024

To
The Registrar,
National Green Tribunal,
New Delhi.

Sir,

Please enter my appearance on behalf of the Petitioner(s)/Appellant(s) Respondent(s) Intervenor in the matter above mentioned.

Dated this the 12 day of 03. 2025

Yours faithfully,

Advocate for Petitioners(s)/Appellant (s)/ Respondent(s)

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PROOF OF SERVICE

Gmail

Alexandra Celestine <alexandra.celestine@anandsharmaassociates.com>

Advance Service | Reply on behalf of Respondent No. 4 | OA No. 1004 of 2024| Prahlad Roy Goenka & And. vs. UOI & Ors.| National Green Tribunal

Alexandra Celestine <alexandra.celestine@anandsharmaassociates.com> Wed, Mar 12, 2025 at 7:37 PM

To: "ankursoodoffice@gmail.com" <ankursoodoffice@gmail.com>
Cc: Shimpy Sharma <shimpy@anandsharmaassociates.com>, ishanika das <ishanika.das@anandsharmaassociates.com>

Dear Sir,

We write on behalf of our Client, State of Himachal Pradesh Through the Department of Fisheries arrayed as Respondent No. 4 in the captioned matter.

Pursuant to the order of November 19, 2024, the Hon'ble National Green Tribunal issued notice to the Respondents in the captioned matter, directing them to file their reply in the captioned matter.

Accordingly, please find attached the Reply on behalf of the Respondent No. 4 to OA No. 1004 of 2024 for your records.

Please treat this email as an advance service upon yourself.

Regards,

Alexandra Celestine

Senior Associate

Anand Sharma and Associates (ASA)

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