

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI – 110 002

STATEMENT OF EXPENDITURE IN RESPECT OF MAJOR RESEARCH PROJECT

1. Name of Principal Investigator : Prof. S.P. Biswas
2. Deptt. of Principal Investigator: Life Sciences,
 University/College: Dibrugarh University
3. UGC approval Letter No. and Date: F.No. 41-20/2012 (SR) Date: 10.07.2012
4. Title of the Research Project: 'Distribution, ecology and fish community structure in relation to environmental variables of certain tropical streams of the Brahmaputra drainage system'
5. Effective date of starting the project 01.07.2012
6. a. Period of Expenditure: From 01.07.2012 to 30.06.2015
 b. Details of Expenditure _____

| S. No. | Item | Amount Approved (Rs.) | Expenditure Incurred (Rs.) |
|--------|----------------------------------|-----------------------|----------------------------|
| i. | Books & Journals | Nil | Nil |
| ii. | Equipment | 1,00,000/- | 1,00,000/- |
| iii. | Contingency | 80,000/- | 54,847/- |
| iv. | Travel/ Field Work | 50,000/- | 45,061/- |
| v. | Hiring Services | 50,000/- | 44,950/- |
| vi. | Chemicals & Glassware | 30,000/- | 15,370/- |
| vii. | Overhead | 68,800/- | 68,800/- |
| viii. | Any other items (Please specify) | | |

c . Staff

Date of Appointment 28.08.2012

| S. No | Items | From | To | Amount Approved (Rs.) | Expenditure incurred (Rs.) |
|-------|--|------------|------------|-----------------------|----------------------------|
| 1. | Honorarium to PI (Retired Teachers) @ Rs. 18,000/-p.m. | | | Nil | Nil |
| 2. | Project fellow: | | | | |
| | i) Bikramaditya Bakalial | 29.08.2012 | 28.07.2014 | 4,98,064.00 | 4,48,258/- |
| | ii) Anurag Protim Das | 17.12.2014 | 30.09.2015 | | |

1. It is certified that the appointment(s) have been made in accordance with the terms and conditions laid down by the Commission.

2. If as a result of check or audit objection some irregularly is noticed at later date, action will be taken to refund, adjust or regularize the objected amounts.
3. Payment @ revised rates shall be made with arrears on the availability of additional funds.
4. It is certified that an amount of Rs.7,77,286/- (Rupees Seven lakh seventy seven thousand two hundred eighty six) only out of the grant of Rs.8,06,058/- (Rupees eight lakh six thousand fifty eight) only received from the University Grants Commission under the scheme of support for Major Research Project entitled 'Distribution, ecology and fish community structure in relation to environmental variables of certain tropical streams of the Brahmaputra drainage system' vide UGC letter No. F.No. 41-20/2012 (SR) dated 10.07.2012 has been fully utilized for the purpose for which it was sanctioned and in accordance with the terms and conditions laid down by the University Grants Commission. The unspent of Rs.28,772/- and accrued interest of Rs.7,963/- total Rs.36,735/- (Rupees thirty six thousand seven hundred thirty five) only has been refunded to UGC vide UTR No.SBIN223005960272 dtd.05.01.2023.



SIGNATURE OF THE
PRINCIPAL INVESTIGATOR

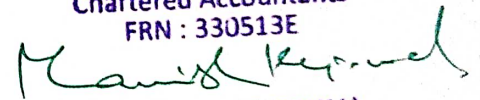


REGISTRAR/PRINCIPAL
Registrar
Dibrugarh University
(Seal)

STATUTORY AUDITOR
(Govt. Internal Auditor/
Chartered Accountant)

(Seal)

FOR MANISH KEJRIWAL & ASSOCIATES
Chartered Accountants
FRN : 330513E



(CA. MANISH KEJRIWAL)

Proprietor

M. No. 068212

SIGNATURE OF THE CO-INVESTIGATOR

UDIN: 23068212BGVSVT6131
dated 01.06.2023



Annexure - IV

**UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110 002**

STATEMENT OF EXPENDITURE INCURRED ON FIELD WORK

Name of the Principal Investigator: Prof. S.P. Biswas

| Name of the Place visited | Duration of the Visit | | Mode of Journey | Expenditure Incurred(Rs.) |
|---------------------------|-----------------------|------------|-----------------|---------------------------|
| | From | To | | |
| Lakhimpur to Dibrugarh | 09.08.2012 | 11.08.2012 | Hired car | 5,680/- |
| Dibrugarh to Miao | 15.02.2013 | 18.02.2013 | Hired car | 12,360/- |
| Dibrugarh to Jonai | 18.07.2013 | 21.07.2013 | Hired car | 6,960/- |
| Dibrugarh to Kakapather | 27.11.2014 | 28.11.2014 | Hired car | 5,100/- |
| Dibrugarh to Sonari | 19.07.2015 | 19.07.2015 | Hired car | 1,800/- |
| Dibrugarh to Jagun | 02.08.2015 | 02.08.2015 | Hired car | 2,500/- |
| Dibrugarh to Jonai | 08.09.2015 | 12.09.2015 | Hired car | 10,661/- |

Certified that the above expenditure is in accordance with the UGC norms for Major Research Projects.

SIGNATURE OF THE
PRINCIPAL INVESTIGATOR

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Dibrugarh University
(Seal)

STATUTORY AUDITOR
(Govt. Internal Auditor/
Chartered Accountant)

(Seal)
FOR MANISH KEJRIWAL & ASSOCIATES
Chartered Accountants
FRN : 330513E

Manish Kejriwal
(CA. MANISH KEJRIWAL)
Proprietor

M. No. 068212

UDIN: 23068212 BGVSVT 6131
dttd 01.06.2023.



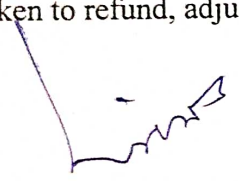
SIGNATURE OF THE CO-INVESTIGATOR

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110 002

Utilization certificate

It is certified that an amount of Rs.7,77,286/- (Rupees Seven lakh seventy seven thousand two hundred eighty six) only out of the grant of Rs.8,06,058/- (Rupees eight lakh six thousand fifty eight) only received from the University Grants Commission under the scheme of support for Major Research Project entitled 'Distribution, ecology and fish community structure in relation to environmental variables of certain tropical streams of the Brahmaputra drainage system' vide UGC letter No. F.No. 41-20/2012 (SR) dated 10.07.2012 has been fully utilized for the purpose for which it was sanctioned and in accordance with the terms and conditions laid down by the University Grants Commission. The unspent of Rs.28,772/- and accrued interest of Rs.7,963/- total Rs.36,735/- (Rupees thirty six thousand seven hundred thirty five) only has been refunded to UGC vide UTR No.SBIN223005960272 dtd.05.01.2023.

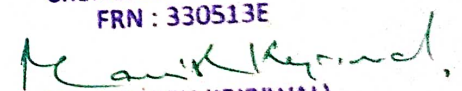
If as a result of check or audit objection some irregularly is noticed at later date, action will be taken to refund, adjust or regularize the objected amounts.


SIGNATURE OF THE
PRINCIPAL INVESTIGATOR


REGISTRAR/PRINCIPAL
Registrar
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(Seal)

STATUTORY AUDITOR
(Govt. Internal Auditor/
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(Seal)

FOR MANISH KEJRIWAL & ASSOCIATES
Chartered Accountants
FRN : 330513E


(CA. MANISH KEJRIWAL)
Proprietor
M. No. 068212


SIGNATURE OF THE CO-INVESTIGATOR

UDIN: 23068212 BGUSVT6131
dtd 01.06.2023



Annexure – VI



PRORORMA FOR SUPPLYING THE INFORMATION IN
RESPECT OF THE STAFF APPOINTED UNDER
THE SCHEME OF MAJOR RESEARCH PROJECT

UGC FILE NO. F 41-20/2012 (SR) YEAR OF COMMENCEMENT

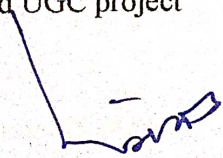
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TITLE OF THE PROJECT: Distribution, ecology and fish community structure in relation to environmental variables of certain tropical streams of the Brahmaputra drainage system

| | | | | | | |
|----|--|--|----------------|--------------------------|-------|-------|
| 1. | Name of the Principal Investigator | Prof. S.P. Biswas | | | | |
| 2. | Name of the University | Dibrugarh University | | | | |
| 3. | Name of the Research Personnel appointed | Bikramaditya Bakalial Anurag Protim Das(after B. Bakalial left the job) | | | | |
| 4. | Academic qualification | Bikramaditya Bakalial | | | | |
| | | S. No. | Qualifications | Year | Marks | %age |
| | | 1. | M.Sc | 2008 | 715 | 70.13 |
| | | 2. | M. Phil | | | |
| | | 3. | Ph.D | Registered on 27.12.2010 | | |
| | | Anurag Protim Das | | | | |
| | | S. No. | Qualifications | Year | Marks | %age |
| | | 1. | M.Sc | 2008 | 715 | 70.13 |
| | | 2. | M. Phil | | | |
| | | 3. | Ph.D | | | |
| 5. | Date of joining | 28.08.2012 - Bikramaditya Bakalial & 17.12.2014 - Anurag Protim Das | | | | |
| 6. | Amount of HRA, if drawn | Nil | | | | |
| 7. | Name of Candidate applied for the post | Bikramaditya Bakalial; Anurag Protim Das, | | | | |

CERTIFICATE

This is to certify that rules and regulations of UGC Major Research Project outlined in the guidelines have been followed. Any lapse on the part of the University will liable to terminate of said UGC project


Principal Investigator

Head of the Deptt.


Registrar/Principal
Registrar
Dibrugarh University

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI – 110 002

**Annual/Final Report of the work done on the Major Research Project.
(Report to be submitted within 6 weeks after completion of each year)**

1. Project report No. 1st /2nd /3rd/Final **Final Report**
2. UGC Reference No.F. DU/RP/UGC/MRP/Life Sc/2011/1249
3. Period of report: from 01.07.2012 to 30.06.2015
4. Title of research project: 'Distribution, ecology and fish community structure in relation to environmental variables of certain tropical streams of the Brahmaputra drainage system'
5. (a) Name of the Principal Investigator: Prof. S.P. Biswas (b) Dept. Life Sciences
(c) University/College where work has progressed:Dibrugarh University
6. Effective date of starting of the project:10.07.2012
7. Grant approved and expenditure incurred during the period of the report:
 - a. Total amount approved: Rs. 9,06,800
 - b. Total expenditure: Rs. 7,77,286
 - c. **Report of the work done:** (Please attach a separate sheet)
 - i. Brief objective of the project: The northeastern part of India is blessed with rich aquatic resources in form of fast flowing rivers, stagnant wetlands, slow running streams and temporary ephemeral streams. Present scenario depicts decline of aquatic biodiversity at a rapid rate. With increasing change in global climate coupled with anthropogenic activities has drastically affected aquatic ecology as well as the fish community dwelling therein. The prime objective of this project is to assess the impact of environmental variables on distribution, ecology and fish species existing in certain tropical streams of the Brahmaputra drainage system.
 - ii. Work done so far and results achieved and publications, if any, resulting from the work (Give details of the papers and names of the journals in which it has been published or accepted for publication)
An assessment of the fish community presently dwelling in certain tropical as well as ephemeral streams linked with river Brahmaputra were done. The study areas included various tropical as well as ephemeral streams of Assam, Arunachal Pradesh, Meghalaya and Sikkim. The impacts of various environmental variables on the ecology of the fish population were also evaluated. The bionomic adaptations to cope with the adverse environment were assessed.

Publications:

1. Report of IUCN Red Listed *Pillaia indica* Yazdani, 1972 from Lakhimpur District of Assam, Northeast India with a note on its habitat ecology. Archives of Applied Science Research, 2014, 6 (1):223-228 (www.scholarsresearchlibrary.com)

2. Checklist of Fishes of Lower Subansiri river drainage, Northeast India. Annals of Biological Research, 2014, 5 (2):55-67 (<http://scholarsresearchlibrary.com/archive.html>)

iii. Has the progress been according to original plan of work and towards achieving the objective.

Yes (If not, state reasons)

iv. Please indicate the difficulties, if any, experienced in implementing the project ____

Fund was not released for the 3rd year


v. If project has not been completed, please indicate the approximate time by which it is likely to be completed. A summary of the work done for the period (Annual basis) may please be sent to the Commission on a separate sheet.


vi. If the project has been completed, please enclose a summary of the findings of the study. One bound copy of the final report of work done may also be sent to University Grants Commission.

vii. Any other information which would help in evaluation of work done on the project. At the completion of the project, the first report should indicate the output, such as (a) Manpower trained (b) Ph. D. awarded (c) Publication of results (d) other impact, if any

The Project Fellow, Mr. Anurag Protim Das has been awarded Ph. D. Degree under Dibrugarh University (Vide Memo No. DU/RG/Ph.D/06/2021/4450 dt. 01.07.2021)


SIGNATURE OF THE
PRINCIPAL INVESTIGATOR


SIGNATURE OF THE CO-INVESTIGATOR


REGISTRAR/PRINCIPAL
(Seal) Registrar
Dibrugarh University

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI – 110 002

PROFORMA FOR SUBMISSION OF INFORMATION AT THE TIME OF SENDING THE
FINAL REPORT OF THE WORK DONE ON THE PROJECT

1. Title of the Project 'Distribution, ecology and fish community structure in relation to environmental variables of certain tropical streams of the Brahmaputra drainage system'
2. NAME AND ADDRESS OF THE PRINCIPAL INVESTIGATOR **Prof. S.P. Biswas**
Department of Life Sciences, Dibrugarh University, Dibrugarh-786004, (Assam)
3. NAME AND ADDRESS OF THE INSTITUTION Department of Life Sciences,
Dibrugarh University, Dibrugarh-786004 (Assam)
4. UGC APPROVAL LETTER NO. AND DATE: F.No. 41-20/2012 (SR) Date: 10.07.2012
5. DATE OF IMPLEMENTATION 10.07.2012
6. TENURE OF THE PROJECT 01.07.2012 to 30.06.2015
7. TOTAL GRANT ALLOCATED. Rs. 9,06,800
8. TOTAL GRANT RECEIVED Rs. 8,06,058
9. FINAL EXPENDITURE Rs. 7,77,286
10. TITLE OF THE PROJECT 'Distribution, ecology and fish community structure in relation to environmental variables of certain tropical streams of the Brahmaputra drainage system'
11. OBJECTIVES OF THE PROJECT With increasing change in global climate coupled with anthropogenic activities has drastically affected aquatic ecology as well as the fish community dwelling therein. The prime objective of this project is to assess the impact of environmental variables on distribution, ecology and fish species existing in certain tropical as well as ephemeral streams of the Brahmaputra drainage system.
12. WHETHER OBJECTIVES WERE ACHIEVED Yes
(GIVE DETAILS) - Please see below
13. ACHIEVEMENTS FROM THE PROJECT
The present status of fish community dwelling in certain tropical as well as ephemeral streams linked with river Brahmaputra were assessed. The impacts of various environmental variables such as fragility of catchment areas and substrate, siltation and sediment load, rising temperature, pollution both land and aquatic etc. on the ecology of the fish population were also evaluated. A strategy of aquatourism is formulated for sustainable utilization of these landscapes as well as conservation.
14. SUMMARY OF THE FINDINGS (IN 500 WORDS)
An assessment of the fish diversity presently dwelling in certain tropical as well as ephemeral streams linked with river Brahmaputra were done. The study areas included various streams of Assam, Arunachal Pradesh, Meghalaya and Sikkim. The impacts of various environmental variables on the fish ecology as well as distribution were also evaluated. During the study a considerable number of fish specimens were collected and preserved in laboratory conditions. The specimens were identified based on standard literature and morphometric study was conducted for complete specification. A total of 204 species belonging to 34 families and 101 genera were recorded from downstream Subansiri river drainage. Cyprinidae was the dominant family comprising 72 species, followed by Bagridae (16), Sisoridae (15 species), Erethistidae (13 species), Nemacheilidae (11 species), Cobitidae (9 species), Channidae (8 species), Schilbeidae (7 species), Osphronemidae (5 species) and Siluridae (5 species). Each of Abbasside, Amblycipitidae and Psilorhynchidae contained four species whereas families viz. Clupeidae, Badidae and Mastacembelidae contained

three species each. On the other hand, Notopteridae, Anabantidae, Clariidae and Symbranchidae were represented by two and the remaining 14 families contained single species. Again, at genus level, *Labeo* contain maximum 10 species followed by *Channa* (8 species). Each of the genus *Garra*, *Glyptothorax* and *Mystus* contained 7 species while *Puntius*, *Pseudolaguvia* and *Schistura* included 6 species each. On the other hand, *Barilius*, *Lepidocephalichthys* and *Trichogaster* were also rich in species composition and contained 5 species each. The genus *Amblyceps*, *Batasio*, *Hara* and *Psilorhynchus* contained four species whereas each of *Devario*, *Pethia*, *Tor*, *Ompok* and *Badis* contained three species while *Aborichthys*, *Anabas*, *Botia*, *Bagarius*, *Cirrhinus*, *Clarias*, *Clupisoma*, *Crossocheilus*, *Danio*, *Eutropiichthys*, *Erethistoides*, *Gagata*, *Macrognathus*, *Monopterus*, *Nangra*, *Neolissocheilus*, *Parambassis*, *Rasbora*, *Salmophasia*, *Sperata* and *Systemus* were represented by two species. The remaining 60 genus were represented by single species. Some species of genera - *Amblyceps*, *Crossocheilus*, *Channa*, *Garra*, *Glyptothorax*, *Mystus*, *Puntius*, *Trichogaster*, *Pseudolaguvia* and *Schistura* could not be done up to species level and presently considered as separate species. Four species viz. *Amblyceps arunchalensis*, *Clarias magur*, *Pillaia indica* and *Tor putitora* of Subansiri drainage belonging to Endangered category and *Botia rostrata*, *Cyprinion semplotum*, *Cyprinus carpio*, *Devario assamensis* and *Schizothorax richardsonii* belongs to Vulnerable category. The Near Threatened category of IUCN included 22 species from the present collection. Most of the fishes (68.14%, 139 species) of the fishes of Subansiri basin belongs to Least Concern category while 16 fish other fish species regarded as Data Deficient by IUCN. However, the conservation statuses of 6 fish species were not available in IUCN database.

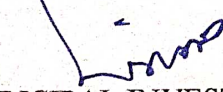
54 fish species were recorded from the selected streams of the study area. *Lepidocephalichthys* was the dominant genera found abundantly in all the studied ephemeral steams followed by *Channa*, *Puntius*, *Mystus*, *Devario*, *Botia*, and *Barilius*. Each ephemeral stream was unique in its ecology, structure, flow pattern and diverse fish composition. Rivers and streams flowing through Eastern and North Eastern Himalayas have been designated as global hotspots of freshwater biodiversity. Presence of diverse natural water bodies is an added advantage for the abundance of ornamental fishes in this region. Scientific and systemic exploration of this potential will definitely help in chalking out conservatiob strategies, besides employment generation and earning foreign exchange.

15. CONTRIBUTION TO THE SOCIETY: At present date conservation of the environment and its resources is of outmost importance. Fish germplasm is an integral part of the aquatic ecosystem as well as linked with global food security and with increasing biodiversity loss the protection of fish community is need of the hour. Tropical streams are some of the last global frontiers of rich freshwater diversity, endangered and threatened species. At the same time, they support millions of livelihoods and indigenouse people. An attempt has been made to assess the effect of the dynamically changing environmental variables indistribution, ecology and fish species dwelling in certain tropical streams of the Brahmaputra drainage system. The outcome of this noble work will aid in proposition of strategy of aqua ecotourism for future conservation of the fish species inhabiting in the tropical streams.

16. WHETHER ANY PH.D. ENROLLED/PRODUCED OUT OF THE PROJECT(Give details):

i. Ph.D enrolled - 2 ii. Ph.D produced – 2 (**Bikramaditya Bakalial&Anurag Pratim Das**)

17. NO. OF PUBLICATIONS OUT OF THE PROJECT - 2(PLEASE ATTACH)


(PRINCIPAL INVESTIGATOR)

(CO-INVESTIGATOR)


(REGISTRAR/PRINCIPAL)
(Seal)

Registrar
Dibrugarh University

Table1: Ephemeral streams with the co-ordinates and connecting rivers

| Sl. No | Connecting River | Local name of the ephemeral Stream | Coordinate | Elevation (M) | State |
|--------|------------------|------------------------------------|-------------------------------|---------------|-------------------|
| 1. | Bogi Nadi | Bogi nadi | N27°20'36.0" E094°10'55.8" | 88.4 | Assam |
| 2. | Subansiri | Kana nadi | N27°26'13.5" E094°12'26.9" | 96.2 | Assam |
| 3. | Kameng | Dirangchu | N27°48.3" E 2°26'38" | 20,669 | Arunachal Pradesh |
| 4. | Dikrong | Shu Pabung | N 27°2'30" E 93°54'57" | 750 | Arunachal Pradesh |
| 5. | Kynrem | Awrah | N25°18'2.02" E91°41'19.61" | 1484 | Meghalaya |
| 6. | Kynrem | Nampho | N25°18'2.02" E91°41'19.61" | 1484 | Meghalaya |
| 7. | Teesta | Gumpto | N27°19' 48" E88° 37' 12" | 1560 | Sikkim |
| 8. | Teesta | Shawin | N27°19' 48" E88° 37' 12" | 1560 | Sikkim |

Ichthyofaunal diversity of the studied ephemeral streams

Altogether, 54 species belonging to 14 families have been recorded from the six different fish landing zone during the study period. Out of 40 species following species *Amblypharyngodon mola*, *Anabas testudineus*, *Channa punctatus*, *Mystus cavasius*, *Mystus tengara*, *Clarias magur*, *Heteropneustes fossilis*, *Ompok bimaculatus* and *Monopterus albus* have high market value as food fish (NCF & CFF). We found a serious issue during study that was; highly market demanded fishes like *Ompok bimaculatus*, and *Ompok pabo* have coming into IUCN 2014.3 Near threatened category. Due to this reason; these four species may be totally extinct from the streams in near future. And species like *Lepidocephalichthys guntea*, *Acanthocobitis botia*, *Mystus Cavasius*, *Chanda nama*, *Trichogaster fasciata*, *Trichogaster lalia*, *Xenentodon cancila*, *Esomus dandricus*, *Barilius barila*, *Nandus nandus*, *Macrognathus pancalus*, *Badis badis*, *Badis assamensis* have high

ornamental value around the globe. And it is also to be mentioned that certain species *Badis badis*, *Macrognathus pancalus* and *Ompok pabda* were seldom recorded during the investigation and therefore, it is necessary to conserve those species in the studied streams. The Shannon-Weiner diversity index of the collected ephemeral stream fishes indicated a diverse distribution with overall index of 3.56. The species richness variation across different study sites ranged from 3.47 to 3.58. Simpson's diversity and Margalef diversity indices were also estimated for the eight study sites (Table 3). The values of diversity indices reflect high fish assemblage across the studied areas.

Table 2: Fish species from the ephemeral streams and their current conservation status

| Family | Species | IUCN Status | Economic Importance | Relative abundance |
|---------------------|--|-------------|---------------------------------------|--------------------|
| 1. Ambassidae | 1. <i>Chanda nama</i> (Ham) | NE | Edible, Aquarium species (ornamental) | O |
| 2. Anabantidae | 1. <i>Anabas testudineus</i> (Ham.) | VU | Edible, medicinal, ornamental | C |
| 3. Belontiidae | 1. <i>Trichogaster fasciata</i> (Bloch-Schn) | NA | Edible, ornamental | C |
| | 2. <i>Trichogaster lalia</i> (Ham.) | NA | Edible, ornamental | O |
| | 3. <i>Trichogaster sota</i> (Ham.) | NA | Edible, ornamental | O |
| 4. Belontiidae | 1. <i>Xenentodon cancila</i> (Ham.) | LR-nt | Edible, ornamental | O |
| 5. Bagridae | 1. <i>Mystus tengra</i> (Ham.) | NA | Edible, ornamental | C |
| | 2. <i>Mystus Cavasius</i> (Ham) | LR-nt | Edible, ornamental | C |
| 6. Cobitidae | 1. <i>Lepidocephalichthys guntea</i> (Ham) | LC | Edible, ornamental | C |
| | 2. <i>Acanthocobitis botia</i> (Ham) | DD | Edible, ornamental | R |
| | 3. <i>Botia dario</i> (Ham) | NE | Edible, ornamental | O |
| 7. Cyprinidae | 1. <i>Amblypharyngodon mola</i> (Ham.) | LRlc | Edible, medicinal, ornamental | C |
| | 2. <i>Aspidoparia jaya</i> (Ham) | VU | Edible, ornamental | O |
| | 3. <i>Barilius barila</i> (Ham) | VU | Edible, ornamental | R |
| | 4. <i>Esomus dandricus</i> (Ham) | LRlc | Edible, ornamental | O |
| | 5. <i>Puntius sophore</i> (Ham.) | LR-nt | Edible, ornamental | O |
| | 6. <i>Puntius ticto</i> (Ham) | LR-nt | Edible, ornamental | C |
| | 7. <i>Botia rostrata</i> (Gun) | NE | Edible, ornamental | O |
| | 8. <i>Balitora brucei</i> (Gray) | NT | Edible, ornamental | O |
| 8. Channidae | 1. <i>Channa punctatus</i> (Bloch.) | LR-nt | Edible, medicinal, ornamental | C |
| 9. Heteropneustidae | 1. <i>Heteropneustes fossilis</i> (Bloch) | VU | Edible, medicinal, ornamental | C |
| 10. Gobiidae | 1. <i>Glossogobius giuris</i> (Ham) | LRnt | Edible, medicinal ornamental | C |
| 11. Mastacembelidae | 1. <i>Mastacembelus armatus</i> (Lacepede) | LR-nt | Edible ornamental | R |
| | 2. <i>Macrognathus pancalus</i> (Ham) | LR-nt | Edible ornamental | R |
| 12. Nandidae | 1. <i>Nandus nandus</i> (Ham) | LT-nt | Edible, ornamental | R |
| | 2. <i>Badis assamensis</i> (Ahl) | NE | Edible, ornamental | O |
| 13. Synbranchidae | 1. <i>Monopterusuchia</i> (Ham) | LR-nt | Edible, ornamental | C |

| | | | | |
|---------------|-------------------------------------|----|--------------------|---|
| 14. Siluridae | 1. <i>Ompok bimaculatus</i> (Bloch) | EN | Edible, ornamental | R |
| | 2. <i>Gagata cenia</i> (Ham) | LC | Edible, ornamental | O |
| | 3. <i>Chaca chaca</i> (Ham) | EN | Ornamental species | R |
| | 4. <i>Glyptothorax sp</i> (Ham) | VU | Edible, ornamental | O |
| | 5. <i>Rita rita</i> (Ham) | EN | Edible, ornamental | R |

Table 3. Diversity Indices of the studied streams

| Diversity Indices | Bogi nadi | Kana nadi | Dirangchu | Shu Pabung | Awrah | Nampho | Gumpto | Shawin |
|------------------------------------|-----------|-----------|-----------|------------|--------|--------|--------|--------|
| Species richness | 57 | 56 | 57 | 52 | 45 | 49 | 47 | 45 |
| Shannon-Wiener index (H) | 3.43 | 3.53 | 3.43 | 3.54 | 3.47 | 3.56 | 3.51 | 3.47 |
| Simpson's Dominance (D) | 0.0432 | 0.0374 | 0.0432 | 0.0368 | 0.036 | 0.033 | 0.037 | 0.036 |
| Simpson's Index of Diversity (1-D) | 0.957 | 0.9625 | 0.957 | 0.963 | 0.857 | 0.898 | 0.875 | 0.857 |
| Evenness (e ^H /S) | 0.546 | 0.613 | 0.546 | 0.663 | 0.497 | 0.484 | 0.475 | 0.497 |
| Margalef index (d) | 7.37 | 7.06 | 7.37 | 6.90 | 19.419 | 18.896 | 18.005 | 18.496 |

Microfauna of selected ephemeral streams

The post monsoon survey recorded 9 orders, 25 families and 29 genera of macro-invertebrates as compared to 10 orders, 28 families and 33 genera during pre-monsoon and monsoon. Order Trichoptera consisting of 5 families (Hydroptillidae, Limnephilidae, Molonaidae, Leptoceridae and Glossosmatidae) 6 genera (*Leucotrichia*, *Ochrotrichia*, *Psycnopsyche*, *Molanna*, *Leptocerus* and *Agapetus*) dominated the group like the previous two season followed by Diptera with 5 families (Culicidae, Ephydriidae, Simuliidae, Chironomidae, and Tipulidae) and 5 genera (*Chaoborus*, *Simulium*, *Chironomus*, *Limnophora* and *antocha*). Coleopteran with 4 families (Psephenidae, Dryopidae, Limnichidae and Elmidae), 5 genera (*Zaitzevia*, *Lutrochus*, *Heterlimnius*, *Ampuimixis* and *Psephenus*); Ephemeroptera with 4 families (Ephemeridae, Ephemerellidae, Hydroptillidae, Baetidae and Heptageniidae) and 5 genera (*Callibaetis*, *Ephemerella*, *Stenonema*, *Baetis* and *Heptagenia*) were other notable group in the population. Plecoptera consists of 2 families (Pteronarcidae and Peltoperlidae), 3 genera (*Isocapnia*, *Megaleuctra* and *Isoperla*) and Cladoceran and Nematodes were also recorded during the study

Table 4: List of macro-invertebrates (benthic organisms) in ephemeral streams

| Sl.No. | Phylum/Class Order | | Family | Genus |
|--------------------|-----------------------|---------------|----------------|----------------------|
| 1 | Branchiopoda | Cladocera | Macrothricidae | <i>Moina</i> |
| 2 | | Nematoda | Plectidae | <i>Anonchus</i> |
| | | | Mononchidae | <i>Ethmolaimus</i> |
| 3 | Mollusca/Bivalvia | Pelecypoda | Sohaeriidae | <i>Glossostylus</i> |
| 4 | Insecta | Ephemeroptera | Ephemeridae | <i>Callibaetis</i> |
| | | | Ephemerellidae | <i>Ephemerella</i> |
| | | | Baetidae | <i>Baetis</i> |
| | | | Heptageniidae | <i>Stenonema</i> |
| <i>Heptagenia</i> | | | | |
| 5 | | Trichoptera | Hydroptilidae | <i>Leucotrichia</i> |
| | | | | <i>Ochrotichia</i> |
| | | | Limnephilidae | <i>Psycnopsyche</i> |
| | | | Molonnaidae | <i>Molonna</i> |
| | | | Leptoceridae | <i>Leptocerus</i> |
| Glossosmatidae | <i>Agapetus</i> | | | |
| 6 | | Diptera | Culicidae | <i>Chaoborus</i> |
| | | | Ephydriidae | <i>Limnophora</i> |
| | | | Simuliidae | <i>Simulium</i> |
| | | | Chironomidae | <i>Chironomus</i> |
| | | | Tipulidae | <i>Antocha</i> |
| 7 | | Coleoptera | Psephenidae | <i>Psephenus</i> |
| | | | Elmidae | <i>Ampumixis</i> |
| | | | | <i>Heterlimnius</i> |
| | | | Limnichidae | <i>Lutrochus</i> |
| Dryopidae | <i>Zaitzevia</i> | | | |
| 8 | | Hemiptera | Hydrometidae | <i>Hesperocorixa</i> |
| 9 | | Plecoptera | Perlodidae | <i>Isoperla</i> |
| | | | Peltoperlidae | <i>Isocapnia</i> |
| <i>Megaleuctra</i> | | | | |

Plate I: Panoramic view of certain ephemeral streams



Fig. 1: Boginadi ghat



Fig. 2: Kana nadi



Fig. 3: R. Dirangchu



Fig. 4: R. Shu pabung



Fig 5: R. Awrah



Fig.6 :R. Nampho

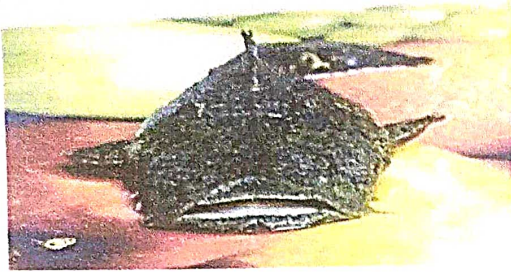


Fig 7: R. Gumpto

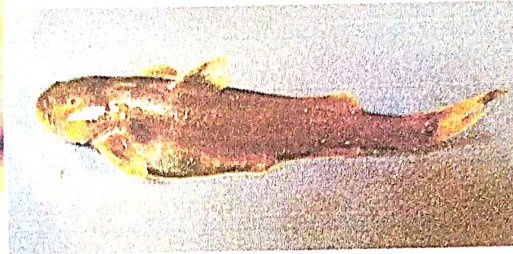


Fig.8: R. Shawin

Plate II: Some fish species of Ephemeral streams



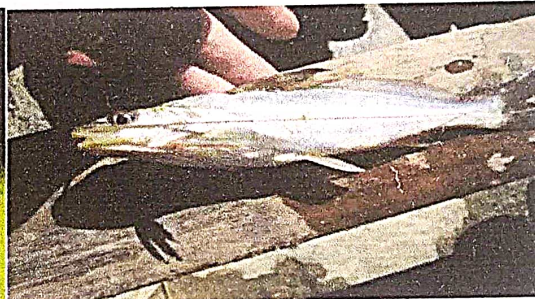
Chaca chaca



Glyptothorax sp



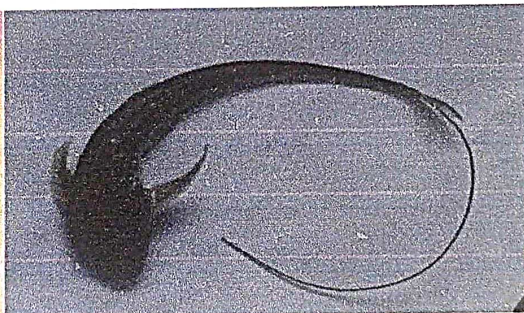
Osteobrama cotio



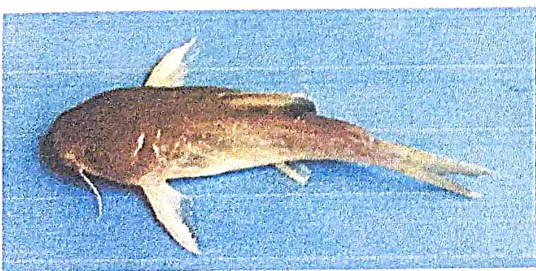
Mystus cavasius



Silurus sp



Sisor rabdophorus



Rita rita

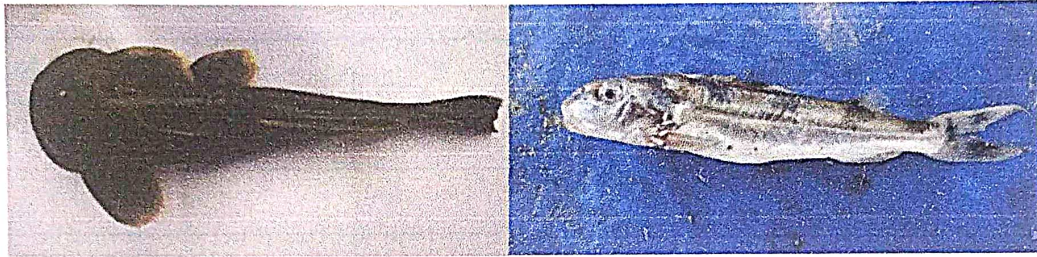


Leiodon cutcutia



Balitora brucei

Botia rostrata



Creteuchiloglanis kamengensis

Gagata cenia



Crossocheilus latius

Lepidocephalichthys guntea



Xenentodon cancila

Mastacembelus armatus


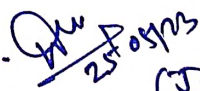
Final Report Assessment / Evaluation Certificate
(Two Members Expert Committee Not Belonging to the Institute of Principal
Investigator)
(to be submitted with the final report)

It is certified that the final report of Major Research Project entitled” ‘Distribution, ecology and fish community structure in relation to environmental variables of certain tropical streams of the Brahmaputra drainage system’ by **Prof. S.P. Biswas, Dept. of Life Sciences, Dibrugarh University (Assam)** has been assessed by the committee consisting the following members for final submission of the report to the UGC, New Delhi under the scheme of Major Research Project.

Comments/Suggestions of the Expert Committee:-

The report is satisfactory and form the basis of the ichthyofaunal diversity of lesser known streams of the N.E. region. More rivers/ streams of the Eastern Himalayas need to be investigated for assessment of aquatic diversity of the region.

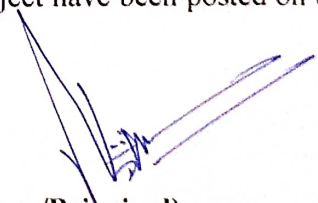
Name & Signatures of Experts with Date:-

| Name of Expert | University/College name | Signature with Date |
|--|-------------------------|---|
| 1. Prof. A.K. Patra, Retd Professor, Utkal Univ., Bhubaneswar | |  25.5.2023 C.A.K. Patra |
| 2. Dr. J. N. Das, Sibsagar College (Autonomous), Joysagar Assam: 785665 | |  25.5.2023 (J.N. Das) |

It is certified that the final report has been uploaded on UGC-MRP portal on

It is also certified that final report, Executive summary of the report, Research documents, monograph academic papers provided under Major Research Project have been posted on the website of the University/College.

(Registrar/Principal)


Registrar
Dibrugarh University