TAMIL NADU BIODIVERSITY BOARD

Annual Report

2022-23

Tamil Nadu Biodiversity Board

Annual Report 2022-23

TBGP Campus- II floor,
Velachery - Tambaram Main Road,
Nanmangalam, Medavakkam Post,
Chennai – 600100

December 30, 2023

Editorial team

Chief Executive Editor

Dr. Shekhar Kumar Niraj, IFS

Principal Chief Conservator of Forests and Secretary, TNBB

Executive Editors

Ajeeth A. N.

Technical Executive, TNBB

Dineshkumar P

Technical Executive, TNBB

Mahesh Priya R

NBA-UNDP BSIP Intern, TNBB

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The Tamil Nadu Biodiversity Board was constituted vide G.O. (Ms) No. 38 Environment and Forests (FR-5) Department under Section 22 of the Biological Diversity Act, 2002 (Central Act 18 of 2003) by the Government of Tamil Nadu dated 29.04.2008. The Board comprises of Chairman, Secretary and five officio members and five non-officio members. The Tamil Nadu Biodiversity Board Secretariat functions at TBGP Building, Nanmangalam, Chennai 600100.

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FOREWORD

Tamil Nadu is a biodiversity rich state from a global standard as well, and is one of the richest biodiversity states in India, as it is home to precious terrestrial, including those of the Western Ghats and the Eastern Ghats, and the coastal and marine biodiversity including those of the popular Gulf of Mannar Biosphere Reserve.

However, biodiversity of the state faces ever increasing pressure due mainly to the habitat destruction, degradation, fragmentation, over exploitation of the renewable natural resources, invasion of alien species, pollution, and climate change among others. Climate change threatens to push a number of endemic species to the verge of extinction and seriously impact the ecosystem services which are vital to human existence and well-being. This signifies an urgent need to protect and conserve the biodiversity. In the process of doing this we must also ensure that the local communities which protect the local renewable biodiversity do also get the benefits from the use of such resources and from their value added forms in accordance with the principles as enshrined in the Biological Diversity Act, 2002. Thus, we would need to strive to optimally use the human, traditional, and the technological means available to us to conserve and sustain the biodiversity.

In order to conserve the biodiversity and to fulfil the commitments made in the ratification of the Convention on Biological Diversity (CBD). India enacted the Biological Diversity Act in 2002 and the Rules in 2004. In 2017, Tamil Nadu brought out the Tamil Nadu Biological Diversity Rules 2017. Since then, the Tamil Nadu Biodiversity Board has garnered pace in implementing its mandates with the co-ordination and involvement of various stakeholders in fulfilling the objectives of conservation and sustainable use of biodiversity and its equitable sharing of benefits.

I am happy to see that the Tamil Nadu Biodiversity Board has brought out its Annual Report 2022-23 which is illustrative and provides a good account of important activities undertaken by the Board throughout the year in the pursuit of meeting the above objectives. I hope and wish that these actions would go a long way in achieving the objectives of the Biological Diversity Act 2002 and its various cherished principles s and will ensure that the precious Tamil Nadu's biodiversity remains sustained for the present and posterity and contribute to welfare of the local communities sustainably and fairly. I also wish the Board the year 2024 a very fulfilling year in this regard.

Dr. M. Mathiventhan
Chairman, TNBB & Hon'ble Minister for Forests
Government of Tamil Nadu

PREFACE

Tamil Nadu Biodiversity Board (Board) has brought out its Annual Report for the year 2022-23. Publishing the annual report is also a legal requirement under the Biological Diversity Act (BDA) 2002 vide its sections 33-35. This exercise has been an arching one summarising and consolidating the account of its own actions and initiatives over the entire year that covered the full spectrum of the activities the Board has undertaken. This report begins with profiling its structure since its inception and talks about its various committees and their intervention areas. In the subsequent chapters the report describes about programmes, important activities such as the training programmes, Biodiversity Management Committees' (BMC) constitution and their activities, initiatives on the Biodiversity Heritage Sites (BHS) for their formation, the array of activities that the Board took up during the International Day of Biodiversity on May 22nd and in the days preceding that, and the awareness, outreach, and the education programmes the Board has prioritized and executed. We have included chapters on publications, briefs and strategies formed during 2022-23. The report presents a broad eye view on its various activities. However, it is amply clear that there are several major challenges that the Board continues to face in its journey ahead. Those include enhancing the communities' capacity to handle the plans and programmes under the ambit of BDA 2002, instilling the understanding of the provisions of the Act, updating and revalidating the Peoples' Biodiversity Registers (PBR) in order to make them realistic and truly participatory, conceiving the linkage between the market forces and usage of local biological resources, and creating a greater bond between the local communities and the PBRs. This has not happened in most of the instances and therefore the PBRs have remained short utilised until now. However, the task to make a turnaround is not going to be an easy one given their intricacies and a large number of BMCs in Tamil Nadu. Besides, vastness of the areas that needed newer assessments and biodiversity appraisal pose specific challenges. Equally ardent task is to get other stakeholders, such as the various government departments, educational and research institutions, civil society groups and the non-governmental organisations associated with the whole programme and in implementing various provisions of the BDA 2002. Despite the relentless efforts the primary stakeholders continue to respond to the BDA 2002 as per the "business as usual approach". The big challenge is to develop strategies and implementational plans for raising awareness among the primary and associated stakeholders on the BDA 2002, its various provisions, and the Rules. The other important challenge is to create new platform for knowledge through research and field investigations and sharing with the stakeholders for the overall benefits of

the communities through conservation practices. I am a big advocate for introducing biodiversity indigence systems that can get us significant information on the use and commercialisation of the local biodiversity resources. These inputs could be used to create effective links between communities and the phytomedicines based market systems. The current technical manpower of the Board remains to be meagre so does its own tactical capacity for making any significant accomplishment of the objectives and programmes. In the midst of these persistent problems, comes the "ready in the can for meeting with the air" amended Biological Diversity (Amendment) Act 2023, which has already been passed by the Parliament and is currently waiting for the union government's notification of the date of commencement for its implementation. The amended Act of 2023 is going to multiply the challenges manifolds as it brings in a large number of additional exemptions. In order to meet with the existing and the likely new challenges higher grades of preparedness and capacity would be required at all the levels of the structure that implements the BDA 2002. Nevertheless, it is also a fact that the BDA 2002 and its provisions could become one of the most effective tools for developing the green economy that the country, along with the rest of the world, aspires to accomplish. Therefore, resource mobilisation, developing internal and external capacity to implement various tasks under the Act 2002, drafting new programmes and projects, early and stronger initiatives on the above aspects are going to be the top priority for the present and in the immediate future. We hope the year 2024 could be marked as a year when the whole narrative of conservation, sustainable use and fair and equitable sharing of benefits of biodiversity could be rewritten for the overall benefit of the conservation sector and all its stakeholders including the present and future generations.

Dr. Shekhar Kumar Niraj, IFS
Secretary, TNBB & Principal
Chief Conservator of Forests (Biodiversity)
Government of Tamil Nadu

Acknowledgements

The Tamil Nadu Biodiversity Board would like to acknowledge the immense support of Government of Tamil Nadu and the National Biodiversity Authority in moving forward the mission of biodiversity conservation, sustainable use and fair and equitable sharing of the benefits with the local communities. The Chairman of the Board, Dr M. Mathiventhan, Hon'ble Minister for Forests of Tamil Nadu Government has always been a guiding force behind us and encouraged the small team that works at the secretariat which has been proactive in taking up any of the tasks of the Board. The authors owe special thanks to Ms Supriya Sahu, Additional Chief Secretary, department of Environment, Climate Change and Forests, Government of Tamil Nadu, for her keen interests in the Board's activities and its progress. She provided her constant support to the Board's secretariat throughout the year.

The TNBB's secretariat sincerely acknowledges the all-round support it received from the National Biodiversity Authority from time to time. Besides, the experts' committees, non-governmental organisation such as WWF, Vanam, and ATREE, amongst others, have extended critical support in planning and executing the field and developmental activities collaboratively. Officials from Tamil Nadu Forest Department, and from the Rural Development and Panchayati Raj, and Revenue Departments and have extended valuable assistance in organising all activities on the ground. The Board's secretariat conveys appreciation to all the BMCs in Tamil Nadu for their actions towards biodiversity conservation and involvement in various initiatives of the Board. All the above force multipliers have been instrumental in making this publication see the light of the day for which the authors owe sincere gratitude to each of them.

1. Introduction

i. Tamil Nadu Biodiversity Board- Introduction

Tamil Nadu is one of the most urbanized states with close to 50% of the population residing in urban settlements. It is also one of the highly industrialized states in the country. Despite having these distinctions, Tamil Nadu is endowed with a bounty of rich biodiversity right from coastal marine ecosystems in the Gulf of Mannar to terrestrial evergreen forests in the Western Ghats and dry evergreen forests in the Eastern Ghats. It also has the following unique aspects.

Poetic landscapes		Biodiversity hotspots (1 out of 4 present in India)	Biogeographic zones (3 out of 10 present in India)
Kurinji	: Mountainous	The Western Ghats	Western Ghats
Mullai	: Forests		
Marutham	: Cropland		Deccan Peninsula
Neithal	: Coastal		The Coasts
Palai	: Desert		

It is evident that genetic diversity in the biosphere entities at 9 planetary boundaries (e.g., climate change, novel entities, stratospheric ocean depletion, atmospheric aerosol loading, ocean acidification, biogeochemical flows, freshwater use, land-system change, biosphere integrity) has already crossed the ceiling limit. Biodiversity has been facing increasing threats as the days pass and it is critical to address these issues since biodiversity directly impacts climate change. In India, the larger biodiversity rich areas are usually conserved under the Forest Conservation Act 1980 or Wildlife Protection Act 1972. However, the smaller patches with rich biodiversity, which are considered to be important tools in tackling the issues of climate change lacks due protection and serious conservation efforts.

As it is well established the micro terrestrial ecosystems and the marine and coastal ecosystems are significant for carbon sequestration and climate regulation. Amidst rising global temperature and the climate change scenario, such ecosystems contribute significantly to climate change mitigation. Conservation of micro-ecosystems are also critical in achieving the global Sustainable Development Goals (SDG). Furthermore, their conservation not only benefits the nature & environment but also the communities by providing them livelihood opportunities through the sustainable utilization of biological resources and their services.

The Tamil Nadu Biodiversity Board has been striving in identifying, recognizing and notifying such areas as Biodiversity Heritage Sites. One such site is Arittapatti Biodiversity Heritage Sites (Madurai district) has been notified as the

first Biodiversity Heritage Sites of Tamil Nadu in November 2022. In addition TNBB has submitted four more proposals for notifications as BHSs under the section 37, BDA 2002. The Board has identified about 28 additional sites with potential for declaring them as BHSs. The TNBB also regulates the use of biological resources in the state of Tamil Nadu by not just conserving but also facilitating its sustainable use through Access Benefit Sharing mechanism.

Photo 1. Arittapatti BHS in October 2022, Arittapatti Village, Madurai district

ii. Tamil Nadu Biodiversity Board- Inception

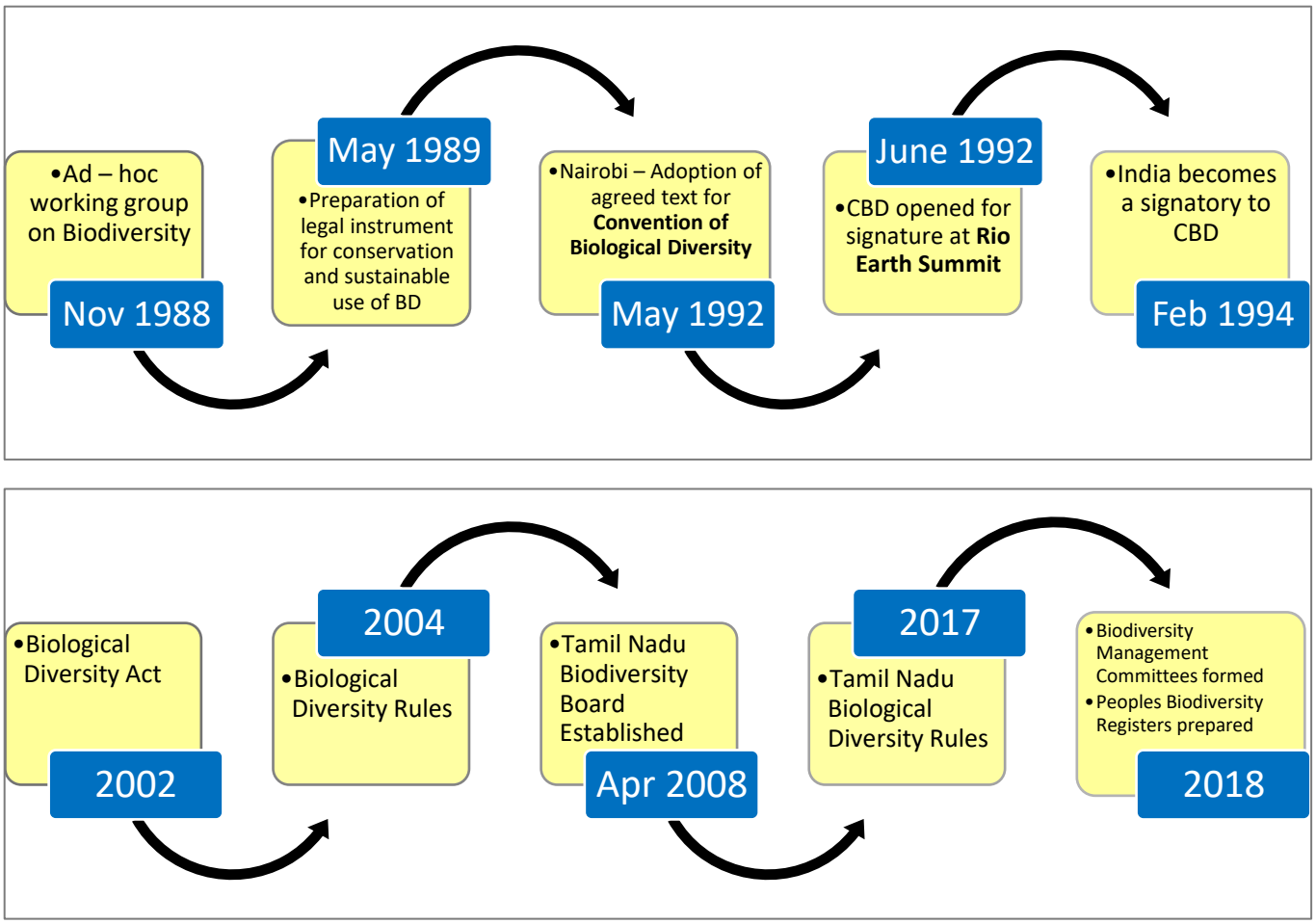


Fig 1. TNBB-inception and growth phases : The Tamil Nadu Biodiversity Board was constituted on 29th April 2008 vide G.O. (Ms) No. 38 Environment and Forests (FR-5) Department under Section 22 of the Biological Diversity Act, 2002, with the Hon'ble Minister for Forests as the Chairperson of the Board. Since its constitution, senior IFS officers have been appointed as the Secretaries to the Board.

The Tamil Nadu Biodiversity Rules were notified on 9 November 2017 through G.O. Ms. No. 137, Environment and Forests (FR-5). The Rules came into effect from 6 December 2017 after which the Board's activities gathered momentum to achieve new heights.

The Vision of the Board is the "conservation and sustainable use of India's rich biodiversity and associated knowledge with people's participation, ensuring the process of benefits sharing for the well-being of present and future generations." The Mission of the Board is to "ensure effective implementation of Biological Diversity Act, 2002, and the Biological Diversity Rules, 2004, for conservation of biodiversity, sustainable use of its components and fair and equitable sharing of benefits arising out of utilization of genetic resources."

iii. Functions

As enumerated in the Section 23 of the Biological Diversity Act, 2002, the functions of the State Biodiversity Board shall be to

2. Advise the State Government, subject to any guidelines issued by the Central Government, on matters relating to the conservation of biodiversity, sustainable use of its components and equitable sharing of the benefits arising out of the utilization of biological resources;
3. Regulate by granting of approvals or otherwise, requests for commercial utilization or bio-survey and bio-utilization of any biological resource by Indians;
4. Perform such other functions as may be necessary to carry out the provisions of the Act or as may be prescribed by the State Government.

As enumerated in the Rule 13 of the Tamil Nadu Biological Diversity Rules, 2017, the functions of the Tamil Nadu Biodiversity Board shall be to

1. Lay down the procedure and guidelines to regulate the activities provided under Section 7 of the Act;
2. Advise the Government, subject to any guidelines issued by the Central Government, on any matter concerning conservation of biodiversity, sustainable use of its components and fair and equitable sharing of benefits arising out of the use of biological resource and knowledge;
3. Provide livelihood support to those villagers, who have shifted or are in the process of shifting from unsustainable livelihoods to sustainable livelihoods or as Trekking Service Providers;
4. Promote and strengthen individuals and institutions who are already working towards conservation, sustainable use and equitable benefit sharing of biological resources;
5. Provide technical assistance and guidance to various departments of the Government in connection with implementation of provisions of the Act;
6. Regulate by granting of approvals or otherwise requests for commercial utilisation or bio-survey and bio-utilisation of any biological resources under the Act by Indians;
7. Facilitate updating and implementation of State Biodiversity Strategy and Action Plan;
8. Commission studies and sponsor investigations and research;
9. Engage consultants, for specific period, not exceeding three years, for providing technical assistance to the Board in the effective discharge of its functions;
10. Collect, compile and publish technical and statistical data, manuals, codes or guides relating to conservation of biological diversity, sustainable use of its

components and fair and equitable sharing of benefits arising out of the use of biological resource and knowledge;

11. Organize through mass media, a comprehensive programme regarding conservation of biological diversity, sustainable use of its components and fair and equitable sharing of benefits arising out of the use of biological resources and knowledge;
12. Plan and organise training of personnel engaged or likely to be engaged in programmes for the conservation of biological diversity and sustainable use of its components;
13. Prepare the annual budget of the Board incorporating its own receipts and also the funds or grants from the Central Government, State Government and National Biodiversity Authority:
    Provided that such allocation by the Central Government or State Government or National Biodiversity Authority shall be operated in accordance with the budget provisions approved by the Central Government or State Government or National Biodiversity Authority, as the case may be;
14. Approve the en-bloc sanction of the annual budget and work programme;
15. Recommend to the Government, for creation of posts of the officers and employees of the Board for effective discharge of the functions by the Board and to create such posts, provided that no such post whether permanent, temporary or of any nature, shall be created without prior approval of the Government;
16. Approve the method of recruitment to the officers and employees of the Board;
17. Take steps to build up database and to create information and documentation system for biological resources and associated traditional knowledge through biodiversity registers and electronic databases, to ensure effective management, promotion and sustainable use;
18. Give advice and directions to the local bodies, Biodiversity Management Committees in writing for effective implementation of the Act and to facilitate their meaningful participation in all measures relating to conservation, sustainable use and equitable benefit sharing;
19. Report to the Government about the functioning of the Board and implementation of the Act and the rules made thereunder;
20. Devise methods to ensure protection of rights including intellectual property rights over biological resources and associated knowledge including systems of maintaining confidentiality of such information as appropriate, including the protection of the information recorded in People's Biodiversity Registers;
21. Sanction grants-in-aid and grants to Biodiversity Management Committees for specific purposes;

22. Undertake physical inspection of any activity or work to check whether it is in accordance with the provisions of the Act;
23. Ensure that biodiversity and biodiversity-dependent livelihoods are integrated into all sectors of planning and management, and at all levels of planning from local to State, to enable such sectors and administrative levels to contribute effectively to conservation and sustainable use;
24. Award individually or as a group, or both for innovation and contribution in the biodiversity sector of the State;
25. Formulate guidelines to the settlement of disputes between the Biodiversity Management Committees and to evaluate the performance of the Biodiversity Management Committees and annually reward the best performing Biodiversity Management Committee at each level in the State;
26. Recommend in consultation with the local bodies for notifying the areas of biodiversity importance as biodiversity heritage sites under sub-section (1) of Section 37 of the Act and for the management and conservation of the heritage sites;
27. Perform such other functions as may be necessary to carry out the provisions of the Act or as may be assigned or directed by the Government from time to time.

Photo 2. Urban Biodiversity, Chennai, Tamil Nadu

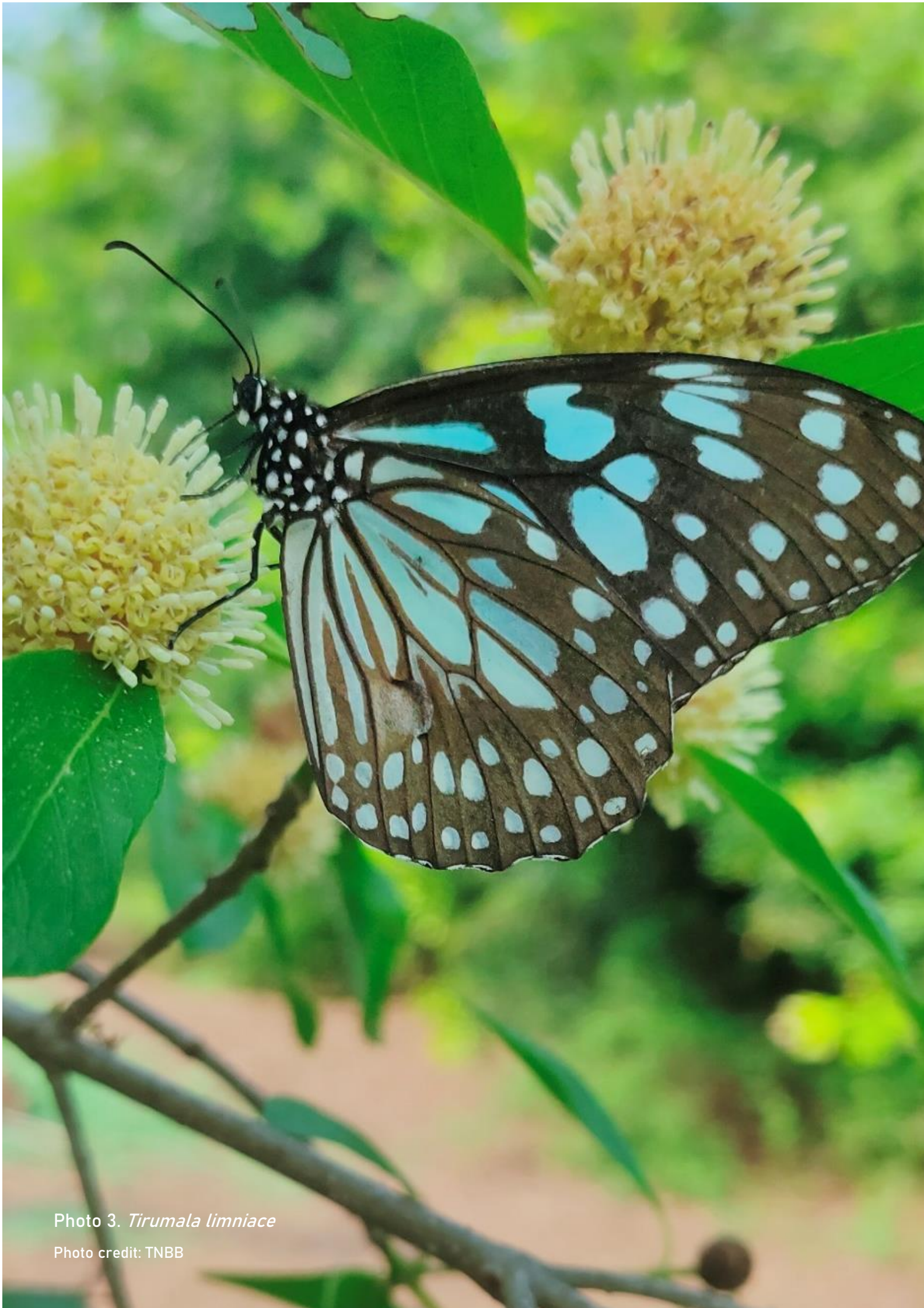


Photo 3. *Tirumala limniace*

Photo credit: TNBB

2. TNBB - Board members & Expert committees

i. Board Members

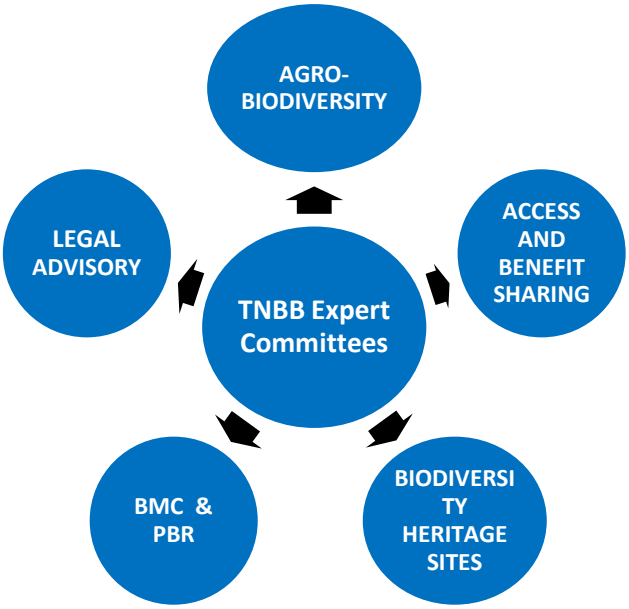
The Board was reconstituted as per G.O. (Ms) No. 08 Environment & Forests (FR-5) Department dated: 28.02.2020. As per the Rule 6 of the Tamil Nadu Biological Diversity Rules, the members of the Board shall hold the office for a term of three years. The Tamil Nadu Biodiversity Board was lastly constituted in February 2020 and consequent to its completion of its term, the reconstitution process is underway.

Table 1: The list of current Board members

Sl. No.	Name of Officer	Designation
1.	Hon'ble Minister for Forests	Chairperson
2.	Principal Secretary to Government, RD & PR Department	Ex-officio Member
3.	Principal Secretary to Government, Environment, Climate Change and Forest Department	Ex-officio Member
4.	Secretary to Government, Agriculture Department	Ex-officio Member
5.	Principal Chief Conservator of Forests (HoFF)	Ex-officio Member
6.	Principal Chief Conservator of Forests and Chief Wildlife Warden	Ex-officio Member
7.	Dr. D. Narasimhan, Associate Professor (Retd.), MCC, Tambaram.	Member
8.	Dr. N. Krishnakumar, IFS, (Retd.) Former PCCF (HOFF)	Member
9.	Dr. Sanjay Kumar Srivatsava, IFS, PCCF (Retd.)	Member
10.	Dr. C. P. Raj Kumar, Nalam Hospital, Theni	Member
11.	Dr. (Mrs). Jayashree Vencatesan, Care Earth Trust, Chennai	Member
12.	Additional Chief Secretary to Government, Animal Husbandry, Dairying and Fisheries Department	Permanent Special Invitee
13.	Principal Secretary to Government, Industries Department	Permanent Special Invitee
14.	The Member Secretary, Tamil Nadu Pollution Control Board	Permanent Special Invitee

ii. Expert Committees

As per Rule 12 of the Tamil Nadu Biological Diversity Rules, 2017, the Board may constitute any number of committees for such purposes as it may deem fit. In this regard, the Tamil Nadu Biodiversity Board has thus far constituted five Expert Committees to guide and advise the Board on different technical matters relating to the implementation of the Biological Diversity Act, 2002 and its underlying rules and guidelines.



Access and Benefit Sharing (ABS)	Review ABS applications & provide recommendations on matters related to benefit sharing
Agro-biodiversity	Mainstreaming conservation of agro-biodiversity, conserving agricultural practices and associated traditional knowledge as well as suggesting areas of agro-biodiversity that can be protected as Biodiversity Heritage Sites (BHS)
BMC Constitution and PBR Documentation	Establishment of BMCs, documentation of PBRs and capacity building
Legal Advisory	Advice to the Tamil Nadu Biodiversity Board on various provisions of the Act relevant to specific situations
Biodiversity Heritage Site (BHS)	Recommending sites to be proposed as Biodiversity Heritage Sites (BHS). Examine the proposals for BHS and shortlisting suitable sites for notification Advisory functions

Photo 4. *Loris tardigradus*

Photo Credit: TNBB

3. Programmes

i. International Day for Biological Diversity - 2022

On 22nd May 2022, the Ministry of Environment, Forests and Climate Change (MoEF&CC) and the National Biodiversity Authority (NBA) held national level celebrations commemorating the International Day for Biodiversity (IDB) 2022 at Kalaivanar Arangam, Chennai under the theme "Building a shared future for all life".

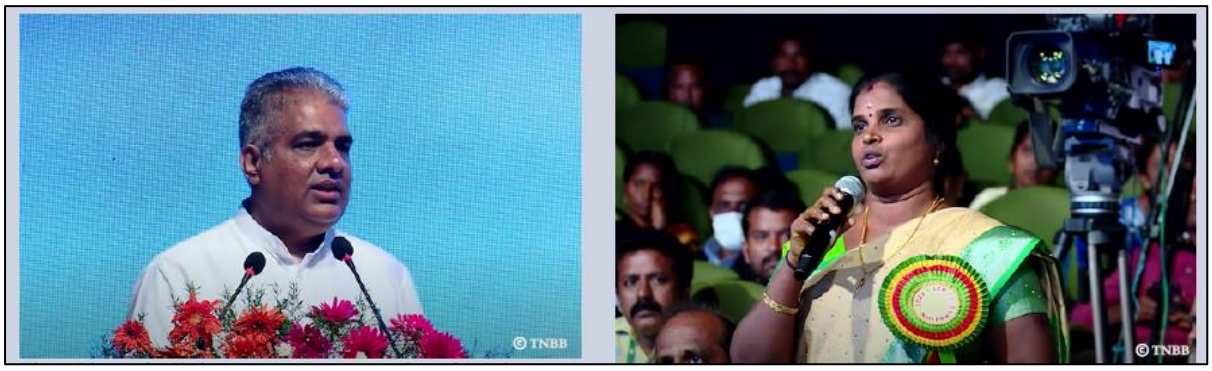


Photo 5. Thiru. Bhupender Yadav, Hon'ble Minister of MoEF&CC, Govt. of India, answering from the audience during the event and a BMC member from Thanjavur district asking question during the interactive session

From the state of Tamil Nadu, a total of 300 Biodiversity Management Committee (BMC) members attended the event and interacted with Thiru. Bhupender Yadav. Members were selected from across the state to ensure equal representation from all the 38 districts.

Photo 6. The gathering for IDB 2022 celebration at Kalaivanar Arangam, Chennai

The Tamil Nadu Biodiversity Board (TNBB) collaborated with R.K. Algae Project Centre and Keystone Foundation for a stall at the Biodiversity Exhibition during the national level celebration. The Board had sample PBRs on display as well as books, pamphlets, brochures, and posters about the biodiversity of Tamil Nadu, the activities of the Board and information related to the Biological Diversity Act, 2002. Thiru. M. Rajendrakumar, R.K. Algae Project Centre displayed seaweed species and a mini working model of how they are cultivated.

Kappaphycus alvarezii was the focus of display although native seaweed species such as *Gracilaria edulis*, *Hypnea musciformis* and *Sarconema filiforme* as well as products made out of seaweeds were also displayed. Keystone Foundation presented their work with the local community in the Nilgiris district. They also displayed an array of products including pure wild honey produced by the local community.

Photo 7. TNBB stall at IDB celebration 2022

Photo 8. Thiru. Ashok Upreti, IFS, PCCF & Secretary (i/c), TNBB and Thiru. Rabikumar, IFS, Former Secretary, NBA visited the TNBB stall at IDB celebration 2022

Photo 9. TNBB stall - Working model of seaweed cultivation demonstrated at IDB celebration 2022

ii. "Meet the BMCs"

During the year 2022-23, TNBB spearheaded a new programme "Meet the BMCs". The programme was headed by Dr. Shekhar Kumar Niraj, IFS, PCCF & Secretary, Tamil Nadu Biodiversity Board and the primary objective was to ground-truth the awareness and involvement levels of the BMCs under the BDA 2002 implementation plans and programmes. The teams from TNBB conducted the field based interactions with BMCs from different districts of the state with an aim to assess the BMCs on the aforesaid counts. During the "Meet the BMCs" programmes normally, short training sessions were also conducted during the field assessment. The team has reviewed 52 BMCs in 7 districts of the state. An evaluation criterion has been developed for this task. The following graph depicts the outcome of the assessment.

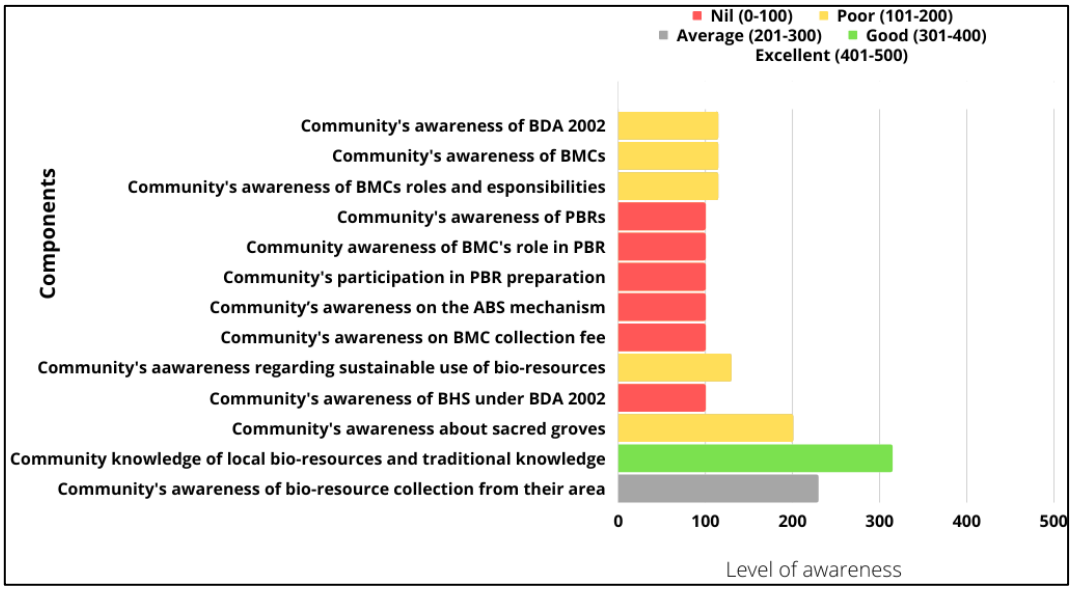


Fig 2. Field assessment outcomes on the analysis based on 13 variables of the BMCs with regard to their levels of awareness and involvement under the BDA 2002 conducted in target local bodies conducted by the TNBB during the year 2022.

Findings of the field assessment

- BMCs have been constituted, however remain ineffective in actions
- Near zero awareness of BDA, 2002, BMC among the officials, BMC members and communities
- BMC Members are not aware of their memberships

- Meetings are not conducted in any of the BMCs in most instances
- No timely reconstitution of the BMCs
- No direct communication channel between TNBB and BMCs (since local bodies are managed by respective departments – RD & PR, Municipal Administration etc.)
- No seed funding available for BMCs for its functioning
- Lack of technical support
- Role of Forests Department is very minimal in BMC functioning despite their significance in in biodiversity sectors

This programme would be continued during the year 2023-24 with a greater intensity and outreach.

iii. Assess the Biodiversity Heritage Sites (BHS) of Tamil Nadu

Arittapatti Biodiversity Heritage Site was the first Biodiversity Heritage Site in Tamil Nadu. The Arittapatti BHS is rich in Biological, Archaeological and Historical significance. Proposal for Kasampatti (Dindigul), Sendirakkilai Sacred Grove (Cuddalore), Idayapatti (Madurai), Kariyanapalli Forest block (Krishnagiri) BHS have been submitted to the State Government for approval and notification. The TNBB plans to submit additional 5-10 proposals for new Biodiversity Heritage Sites to Government in the year 2024

Photo 10. Field assessment of Arittapatti BHS and Interaction with local members in presence of Dr. Shekhar Kumar Niraj, PCCF & Secretary, TNBB, Forest Department officials and local BMC members on 29.06.2022

- Nevertheless, after notification a BHS has to be managed in accordance with Biological Diversity Act 2002 for improving and sustaining those BHS with proactive participation of local communities in accordance with a set of robust rules. Further actions taken in formulation of management plan for the notified Arittapatti BHS. A core committee to draft the management plan has been established and a preliminary stakeholder consultation meeting was held at District Collectors Office, Madurai on 16.03.2023.
- In accordance to Sub-section (2) of the Section 37 of BDA 2002, Draft Rules for the management and conservation of the heritage sites in Tamil Nadu' have been drafted and submitted to the Government and NBA for approval during July 2022

Photo 11. Stakeholder consultation meeting – Management plan for Arittapatti BHS held at Madurai district with the presence of Dr. Shekhar Kumar Niraj, IFS, PCCF & Secretary, TNBB, and Thiru. Aneesh Sekhar, IAS, Madurai District Collector and Thiru. Guru Swamy Dabbala, IFS, DFO- Madurai – on 16.03.2023. Several government department officials such as from Rural Development and Panchayat Raj Department, Revenue, Agriculture, Animal Husbandry, PWD - Water Resources, Archaeology Department, and Tourism participated in the preparatory meeting.

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RULES FOR MANAGEMENT AND CONSERVATION OF BIODIVERSITY HERITAGE SITES IN TAMIL NADU

DRAFT

In exercise of the powers conferred by sub-section (2) of Section 37 of the Biological Diversity Act, 2002, the Government of Tamil Nadu hereby makes the following rules:-

1. **Short title, extent and commencement.**

   (I) These rules may be called the "Rules for Management and Conservation of Biodiversity Heritage Sites (BHS) in the State of Tamil Nadu"
   (II) These rules shall extend to the whole of the State of Tamil Nadu
   (III) These rules shall come into force on the date of their publication in the *Tamil Nadu Government Gazette*

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

   (I) **"Act"** means the Biological Diversity Act, 2002;
   (II) **"Biodiversity Heritage Sites (BHS)"** means well-defined natural areas that are unique, biologically rich, ecologically fragile ecosystems – terrestrial, coastal and inland waters, and marine having rich biodiversity comprising of any one or more of the following components: richness of wild as well as domesticated species or intra-specific categories, high endemism, presence of rare and threatened species, keystone species, species of evolutionary significance, wild ancestors of domestic/cultivated species or their varieties, past pre-eminence of biological components represented by fossil beds and having significant cultural, ethical or aesthetic values and are important for the maintenance of cultural diversity, with or without a long history of human association with them;
   (III) **"Biodiversity Management Committee (BMC)"** means a Biodiversity Management Committee constituted by a local body under sub-section (1) of Section 41 of the Act;
   (Iv) **"Board"** means the Tamil Nadu Biodiversity Board established by the State Government under sub-section (1) of Section 22 of the Act;
   (v) **"Chairperson"** means the Chairperson of the Board;
   (vi) **"Secretary"** means the Secretary of the Board;
   (vii) **"Government"** means the Government of Tamil Nadu;
   (viii) **"Form"** means the form appended to these rules
   (Ix) **"Proposal"** means proposal in Form-II appended to these rules;
   (x) **"Member"** means a member of the Tamil Nadu Biodiversity Board and includes the Chairperson;
   (xi) **"Nodal Officer"** means the District Collector or the District Forest Officer; or as appointed by the Government
   (xii) **"Biodiversity Heritage Site - Management Committee (BHS-MC)"** means a committee established by the Board to manage the individual or group of biodiversity heritage sites
   (xiii) **"Heritage Site Monitoring Committee (HSMC)"** means a committee established by the Board to monitor the individual or group of biodiversity heritage sites

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Photo 12. Rules for Management and conservation of BHS in Tamil Nadu

- Sendirakillai BHS proposal was received from Cuddalore Forest Division, and was assessed on 06.12.2022 by a team from TNBB for its suitability for notification as a BHS. Subsequently, the proposal was submitted to the Government on 09.03.2023 along with the boundary details (in latitude and longitude points), and all necessary formats containing details on ecology and socio economic aspects.

Photo 13. Field inspection of proposed Sendirakillai BHS with the presence of Dr. Shekhar Kumar Niraj, IFS, PCCF & Secretary, TNBB, Forest Department and TNBB officials on 06.12.2022

- Field assessments undertaken in 20 proposed BH Sites across 11 districts to check for their suitability for declaration notification as a BHS.
- The Board is also pursuing about 25 proposals from various districts and is making effort to get the necessary details to complete the proposals for submission to Government for their approval and subsequent notification.

  A network of Biodiversity Heritage Sites in the state as much as any State f India will become a massive tool for conserving the biodiversity with the unique character and it will pave the ways for the local communities to participate in the process of conservation and creating opportunities for sustainable use with fair and equitable sharing. In the long run this initiative can be an important precursor to the sustainable development of various local regions.

Photo 14. Field assessment at Singanallur lake, Coimbatore by the team led by the PCCF & Secretary, TNBB, TNBB officials, and the Forest officials on 26.08.2022 and 27.02.2023

Photo 15. Field assessment at Bommiyarpalayam (Wild sesame plants), Villupuram by the team led by the PCCF & Secretary, TNBB, Forest Department and TNBB officials on 03.08.2022

The BHS site in Bommiyarpalayam village near Auroville beach, Villupuram district wherein there is natural growth of a specific wild sesame (Kaattu ell) plant (*Sesamum prostratum*) variety. It was found that earlier the plant was in large numbers but has gotten reduced mainly due to pollution. That the Board plans to conduct a genetic study maybe done with the assistance of AIWC or/and SFRI. The aim is to conserve and prevent from any further deterioration. It was determined that the area may have a large potential to be declared as BHS.

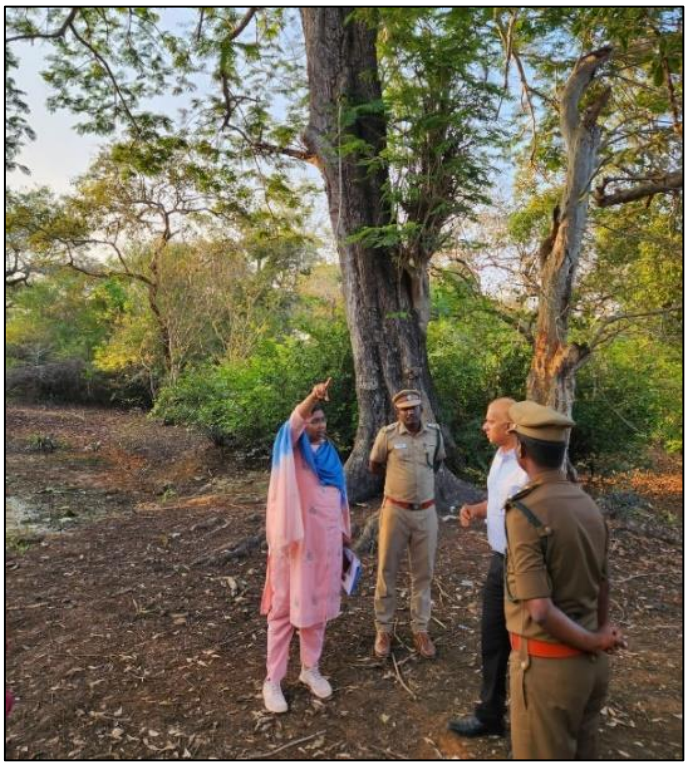


Photo 16. Field assessment of Sacred Groves (Potential BHS) in Sivaganga district Forest Department and on 14.02.2023. The district forest official explains the key biodiversity elements of the site

Photo 17. Field assessment at Vagaikulam BHS by the team from TNBB led by the PCCF and Secretary along with the officials from the Forest Department on 12.01.2023

Photo 18. Field assessment at TNAU, Coimbatore by the team from TNBB led by the PCCF and Secretary along with the officials from the Forest Department. The University faculty and officials explain about the biodiversity richness of the campus under a proposal for notifying the entire TNAU campus as a BHS on 25.08.2023

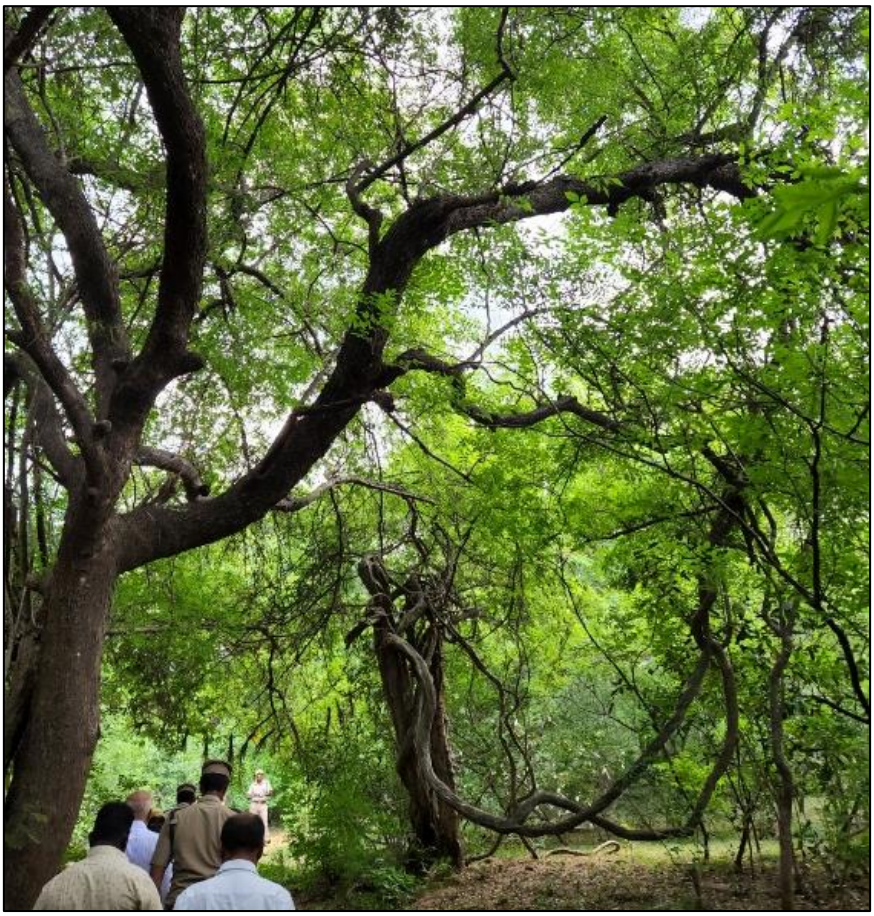


Photo 19. Field assessment at Kasampatty (Potential BHS), Dindigul by the team from TNBB led by the PCCF and Secretary along with the officials from the Forest Department and the local community members on 28.06.2022

Photo 20. Field assessment through trekking at Idayapatti (Potential BHS), Madurai by the team from TNBB led by the PCCF and Secretary along with the officials from the Forest Department and local panchayat members on 29.06.2022

Photo 21. The Kadamba Forest patch at Idayapatti

iv. Biodiversity Management Committees (BMCs)

- Online training provided to BMC Secretaries of 29 Districts (District, Block & Village) during March 2022.

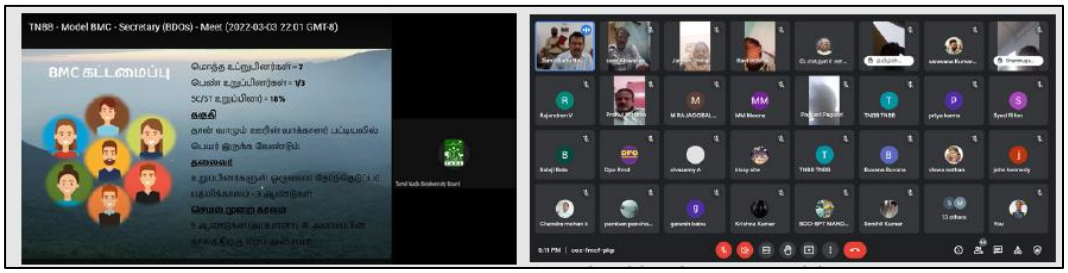


Photo 22. Online training provided to BMCs during March 2022

- On-site training provided to 142 BMC members of Block Panchayat and Village Panchayat level
- Innovative awareness creation methods adopted such as puppet shows, explaining the participants with practical examples of utilization of resources & ABS process etc.

Photo 23. BMC interaction meeting and training with local BMC members with the PCCF and Secretary- TNBB Dr Shekhar Kumar Niraj, , DFO- Theni, Thiru. J. R. Samartha, DFO, Madurai Thiru S. Anand , TNBB officials and other forest department officials at Theni through puppet show on 13.02.2023

Photo 24. Hands-on training programme by the team from TNBB led by the PCCF (Biodiversity) & Secretary, TNBB, Thiru. Kalaiarasan, in charge BMCs from TNBB explaining the aspects of ABS with actual bio-resources and its derived products at Sattur, Virudhunagar on 11.01.2023

Fig 25. Insects in the flowers of *Neolamarckia cadamba*

Photo credit: TNBB

v. Campaigns

A team headed by Dr. Shekhar Kumar Niraj, IFS, PCCF & Secretary, TNBB has been conducting training programme and meeting with the Biodiversity Management Committee during 2022-23.

Photo 26. BMC interaction meeting and training with local BMC members with the PCCF & Secretary- TNBB, TNBB officials and Forest Department officials and members of the local non-governmental organisations at Vanur, Villupuram on 03.08.2022

Photo 27. BMC interaction meeting and training with local BMC members with the PCCF & Secretary- TNBB, TNBB officials and Forest Department officials and members of the local non-governmental organisations at Sivaganga on 14.02.2023

Photo 28. BMC interaction meeting and training with local BMC members in presence of TNBB officials at Karamadai, Coimbatore on 26.08.2022

Photo 29. BMC interaction meeting and training with local BMC members by the team from TNBB in presence of the forest department officials at Koonimedu - Marakkanam, Villupuram on 05.12.2022

Photo 30. BMC interaction meeting and training with local BMC members by the team from TNBB in presence of the forest department officials, BDOs and with the Village Panchayat Secretaries at Parangipettai, Cuddalore on 06.12.2022

Photo 31. BMC interaction meeting and training with local BMC members by the team from TNBB at Theni on 13.02.2023

Photo 32. BMC interaction meeting and training of the local BMC members by the team of TNBB officials led by the PCCF & Secretary at Unisenatham, Krishnagiri on 11.06.2022

- Funds were requested from NBA for handholding the BMCs for their functioning. A proposal amount of Rs. 10,00,000 has been submitted on 25.01.2023
- Letters written to Municipal Administration Department, Commissionerate of Town Panchayat and RD & PR Department for reconstitution of BMCs consequent to the conduct of local body elections.
- Letter written to RD&PR Department on for inclusion of BMC aspect in the Gram Sabha meeting on 09.03.2023.

vi. People Biodiversity Register (PBR)

- PBRs are being digitized to e-PBR by uploading in BIOMIS portal (https://biomis.nic.in/). So far, PBRs of 165 BMCs have been uploaded in the portal.
- 2 Data Entry Operators (Technical) with Biology background have been engaged for this purpose of uploading the PBR data into BIOMIS portal.
- Efforts are underway to create a proper connect of the PBRs with the BMCs/communities and the industries so as to create market linkage and reap benefits out of sustainable utilization of biological resources.

Photo 33. BIOMIS Portal

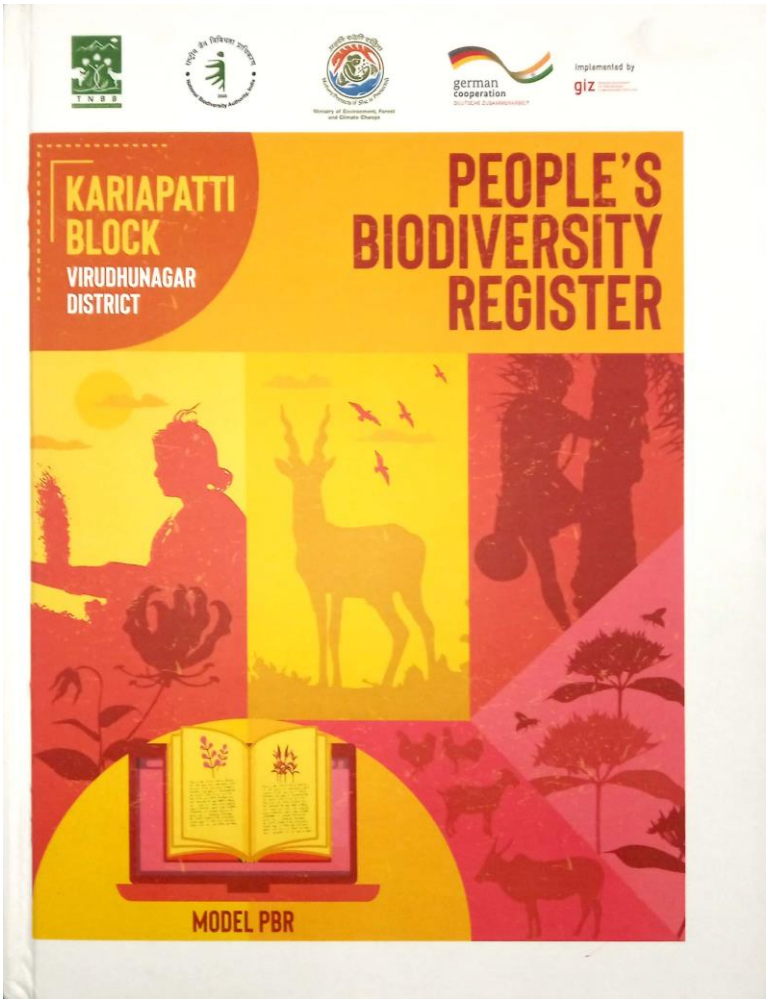


Photo 34. Model People Biodiversity Register (PBR) of Kariyapatti Block, Virudhunagar dst.

Photo 36. *Muscicapa dauurica*

Photo credit: Kanagaraj

vii. Actions pertinent to Access and Benefit Sharing (ABS)

- 325 notices issued to bio-resource utilizing companies to comply with BDA 2002
- 21 Form I applications received from April 2022 to March 2023
- 2 expert committee meetings for processing the ABS applications were held during which 53 applications received by TNBB (under Section 7 of BDA 2002) and 6 applications received from NBA (under Section 3 of BDA 2002) were processed.
- 6 agreements signed during the period April 2022 to March 2023
- A format for collecting requisite information from the users supplementing the Form I has been created to gather all necessary details for processing the applications.

Table 2: ABS amounts received and disbursed by TNBB to the BMCs during the year 2022-23

Source of ABS amount (Resource-user/Company)	ABS amount received
T. Staines and Company Limited	22,306
TTK	10,563
TTK	13,267
Kesari kuteeram Private Limited	21,608
Dr. Sunil Smore	15,000
Kannan	1,010
Avni Blotra	15,000
Kniss Laboratories Private Lmited.	12,556
Sai Mirra Innopharm Pvt. Ltd.	1,27,005
TOTAL	2,38,315

viii. UNDP- GEF- MoEFCC project in the Sathyamangalam landscape

The United Nations Development Programme – India (UNDP-India) along with the Ministry of Environment, Forest and Climate Change (MoEF&CC) and the National Biodiversity Authority (NBA), is developing a GEF (Global Environment Facility) supported project entitled "Strengthening Institutional Capacities for Securing Biodiversity Conservation Commitments". The primary objective of the project is to mainstream biodiversity conservation and its sustainable use and management into village level self-governance institutional planning and budgeting systems in two high biodiversity landscapes of Sathyamangalam in Tamil Nadu and Garo Hills in Meghalaya.

The Tamil Nadu Biodiversity Board, being one among the partners in developing and implementing the project, facilitated the UNDP team in selecting the area for implementation and also participated in the reconnaissance field visits and consequent landscape visits in facilitating the designing of the project. Thiru Ajeeth A N, Technical Executive visited the landscape along with a team of experts from UNDP, GEF and independent consultants from 22-23 April, 27 April – 1 May 2022. The team met the local communities & Biodiversity Management Committees (BMCs) in the landscape and various other stakeholders of biodiversity conservation such as the district & local administration, training and research institutes, NGOs, etc.

The team took cognizance of the ground reality pertaining to issues and scope in biodiversity conservation. Based on these inputs and findings from the field, the project is currently being developed with incorporation of inputs from various other sources and is set to be implemented from mid-2023.

Photo 36. Technical Executive, Thiru. Ajeeth A N, visited the landscape along with a team of experts from UNDP, GEF

Photo 37. BMC members and Local community people and stakeholders involved the Community interaction in Sathyamangalam landscape

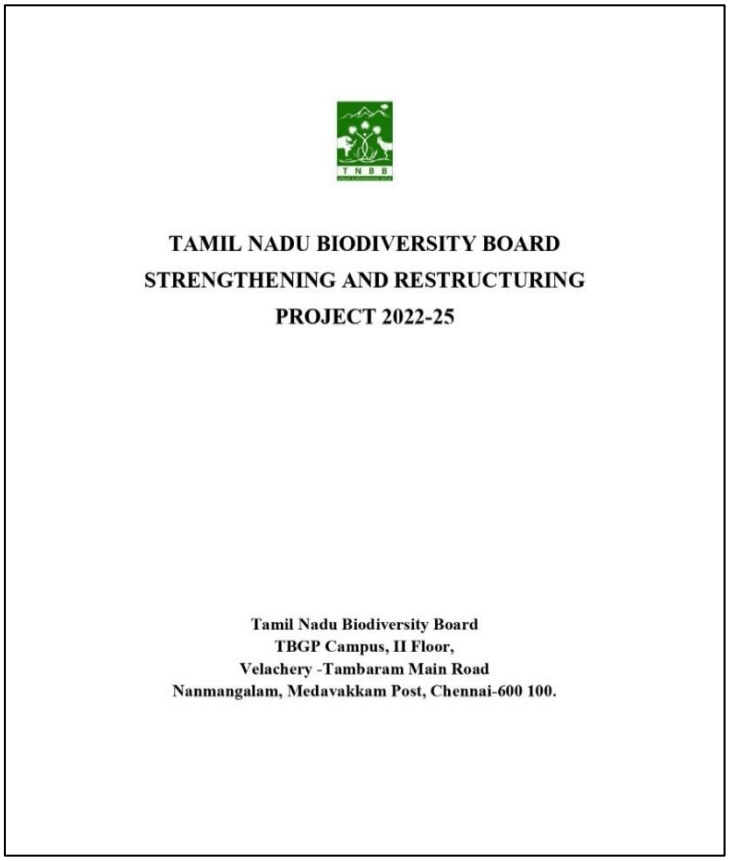
Under a joint planning by the UNDP and the TNBB secretariat and the potential areas suggested by the Secretary, TNBB, Dr Ruchi Pant from UNDP along with TNBB's Ajeeth undertook field visits to Erode and The Nilgiris Districts on 14th and 15th of December to conducted consultations with the stakeholders for selecting the villages/GPs for the project "Strengthening Institutional Capacities for Securing Biodiversity Commitments". The team held consultation meetings with DFO – Nilgiris, DFO – Sathyamangalam, Principal - RIRD campus, Bhavanisagar and Keystone Foundation. A report in this regard was submitted to TNBB and UNDP on 19th December, 2022.

Photo credit: BNHS

4. Strategies

i. Project proposal: 'Tamil Nadu Biodiversity Board- Strengthening and Restructuring Project 2022-25'

In order to overcome the challenges by focusing on improving capacities in all areas and necessitate effective implementation of the mandates, a project proposal titled 'Tamil Nadu Biodiversity Board: Strengthening and Restructuring Project 2022-25' amounting to ₹8.86 crores was submitted to the State Government on 12 April 2022 for institutional strengthening and capacity building. It will be placed before the Board for approval during the upcoming Board Meeting.



TAMIL NADU BIODIVERSITY BOARD
STRENGTHENING AND RESTRUCTURING
PROJECT 2022-25

Tamil Nadu Biodiversity Board
TBGP Campus, II Floor,
Velachery -Tambaram Main Road
Nanmangalam, Medavakkam Post, Chennai-600 100.

Photo 38. Project Proposal on TNBB Strengthening ad Restructuring 2022-25

ii. Exploring domain experts for partnering

In order seek technical support and guidance from various domain experts, people with expertise in subjects pertinent to biodiversity conservation and sustainable use working in the state of Tamil Nadu were listed out and their consent was sought. Of the 51 requests sent, 17 experts covering various domains expressed their interest in technically supporting the Board.

iii. Hand-holding approach

Tamil Nadu Biodiversity Board actively collaborated with several concerned departments, NGOs, academic institutions and other stakeholders to implement the Biological Diversity Act, 2002 in the Tamil Nadu. Optimisation of resources through a strong handholding was the tagline in this approach. It is expected that this approach will go a long way in enhancing biodiversity conservation, its sustainable utilization, and fair and equitable sharing of its benefits for an overall benefit to the society.

The Tamil Nadu Biodiversity Board has been making consistent efforts in partnering with various institutions to seek their support & assistance in accomplishing the objectives. The following are some of the institutions who have extended their hands in collaborating with the TNBB

M.S. Swaminathan Research Foundation, Chennai

- ATREE, Tirunelveli
- CPR Environmental Education Centre, Chennai
- World Wildlife Fund
- Care Earth Trust, Chennai
- Keystone Foundation, Kotagiri
- Centre for Urban Biodiversity Conservation and Education, Coimbatore
- Madurai Cultural Nature Forum, Madurai
- Forest College and Research Institute, Mettupalayam
- Sri Paramakalyani Centre for Excellence in Environmental Sciences, Manonmaniam Sundaranar University, Alwarkurichichi

Photo 39. Partnering Institutions of TNBB

iv. Arittapatti BHS management plan drafting committee

Tamil Nadu Biodiversity Board formed a special committee, namely, Arittapatti BHS management plan drafting committee to make plans for the long term governance and management of the Tamil Nadu's first Biodiversity Heritage Site -'Arittapatti BHS', and comprising of Dr. Badrinarayanan, Expert consultant, Dr. Priya Rajendran, Professor, LDC Madurai, Dr. Mathivanan from ATREE, Dr. Durga, Professor at LDC Madurai, Dr. Karthikeyan, Field expert. This committee will also aim at preparing a model implementation and governance plan which will after validation on the ground will create a yardstick for the management plans for other BHSs in Tamil Nadu as and when they are formed. An online meeting was conducted engaging the committee during January 2023, which was followed up by a physical stakeholders' consultation meeting for drafting the management plan on 16.03.2023 at the district collector's office at Madurai in which Dr. Shekhar Kumar Niraj, IFS, PCCF & Secretary, TNBB, Thiru. Aneesh Sekhar, IAS, Madurai District Collector, and Thiru. Guru Swamy Dabbala, IFS, DFO-Madurai participated along with the gram panchayat members, members of the academic institutions from Madurai and members of few reputed non-governmental organisations. Several government department officials such as from Rural Development and Panchayat Raj Department, Revenue, Agriculture, Animal Husbandry, PWD - Water Resources, Archaeology Department, and Tourism participated in the preparatory meeting.

Draft Rules for the management and conservation of the heritage sites in Tamil Nadu' have been drafted and submitted to the Government and NBA for approval during July 2022. The NBA has been studying the proposed rules from various critical angles.

Photo 40. Singanallur Lake (proposed BHS), Coimbatore district

Photo credit: TNBB

5. Outreach Activities

i. Online Photography Contest

The Board organized an online photography contest in March 2022 on the theme "EXPLORE-CAPTURE-SHARE: Tamil Nadu's Rich Biodiversity Heritage" in order to showcase the rich biodiversity of the state of Tamil Nadu and to create awareness among the general public regarding the same. 191 entries were submitted by the participants across 5 themes and the winners were provided with exciting prizes.

Photo 41. Results of the Photography Contests

ii. Website of TNBB

Dashboard in TNBB website - To provide an overview of activities mandated under the Biological Diversity Act 2002, the Board has created a Dashboard featuring components of ABS, status of BMCs and PBRs and notification of BHSs. The Dashboard is available on TNBB's website at the following link: https://tnbb.tn.gov.in/d6.php. The various publications such as brochures, newsletters and annual reports were uploaded in the website of TNBB for wider publicity.

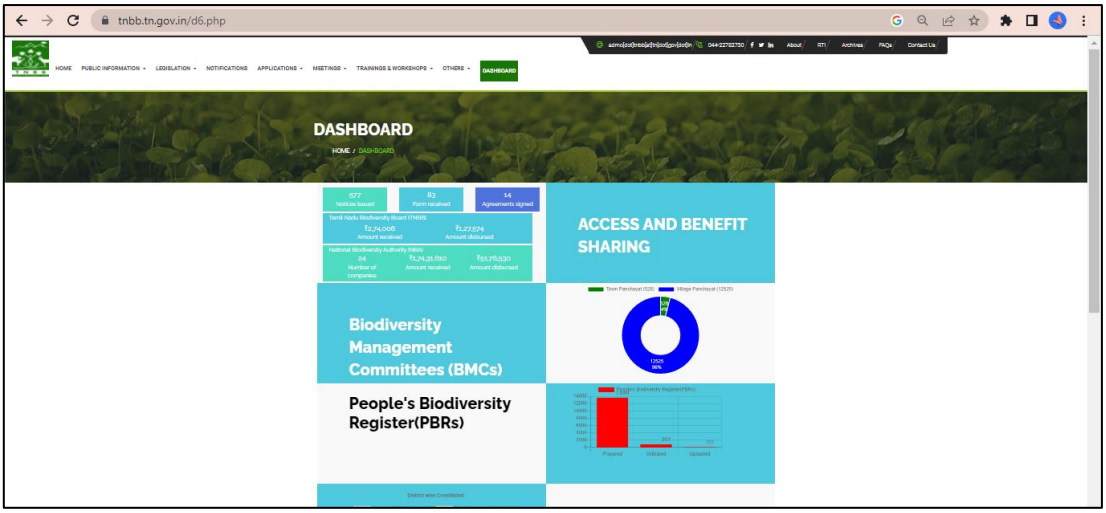


Photo 42. TNBB website – online portal (https://tnbb.tn.gov.in/d6.php)

iii. TNBB on Social Media Platforms

The Tamil Nadu Biodiversity Board established its presence on various social media platforms on 3 March 2022 in order to increase connectivity between the Board and the general public as well as to create publicity & awareness about biodiversity conservation. The handles are active in spreading various communications

Photo 43. A snapshot of social media posts created and published by TNBB

6. Publications

i. Articles published in 'Down to Earth' Magazine

a) Niraj, S. K., S. Varsha, and A. N. Ajeeth. 2022. World Earth Day 2022: Community-conserved biodiversity is key to sustenance and strong bioeconomy. Down to Earth, published 22 April 2022

b) Niraj, S. K., 2022. The hunt in Mudumalai missteps during 2021 tiger capture hold lessons. Down to Earth, June 10-30, 54-56 Life and Nature-Tiger.indd.

c) Niraj, S.K. 2022. How 2021 offered us a wall of opportunity to improve Tamil Nadu's environmental scene- Down to Earth

ii. Research Articles published in National/ International Journals

a) Huang, B., X. Tian, A. Maheshwari, S. K. Niraj, N. J. Roberts, and G. Jiang. 2022. The destiny of living animals imported into Chinese zoos. Diversity 2022 (14) 335:1-11. (http://doi.org/10.3390/d14050335)

b) Niraj, S. K. 2022. Rewilding the 'Wild Rivaldo': new lessons learnt in human-elephant conflict management. Pages 80-87 in editors Panda P. P., K. M. Selvan, P. Nigam, and B. Habib. 2022. Trumpet: 30 years of Project Elephant, special edition vol III (1-2). Project elephant, elephant cell, and Wildlife Institute of India

iii. Viewshed

a) Viewshed on Tamil Nadu Biodiversity Board

iv. Posters

a) Biodiversity Heritage Sites

b) Seaweed cultivation in Tamil Nadu

c) Biodiversity Significance of Tamil Nadu

v. Annual Report 2021-22

i. Articles

a) Niraj, S. K., S. Varsha, and A. N. Ajeeth. 2022. World Earth Day 2022: Community-conserved biodiversity is key to sustenance and strong bioeconomy. Down to Earth, published 22 April 2022. (https://www.downtoearth.org.in/test/blog/world-earth-day-2022-community-conserved-biodiversity-is-key-to-sustenance-and-strong-bioeconomy-82519)

ENVIRONMENT

World Earth Day 2022: Community-conserved biodiversity is key to sustenance and strong bioeconomy

Community participation is paramount in conserving biodiversity, especially since local communities directly benefit from using biological resources available in their surroundings

NEXT BLOG >

By Shekhar Niraj, S Varsha, Ajeeth A N
Published: Friday 22 April 2022

Arittapatti in Madurai district,Tamil Nadu, has been identified as a biodiversity heritage site. Photo: Tamil Nadu Biodiversity Board

On April 22, 1970, millions of people came out on the streets in the United States to protest the environmental destruction happening on planet Earth and the plunder of its resources. Thus began the first Earth Day.

Twenty years later, the Earth Day went global, with around a billion people from more than 190 countries mobilising for action to protect the environment. This culminated at the 'Earth Summit' in 1992 at Rio de Janeiro, Brazil where the Convention on Biological Diversity (CBD) was adopted.

CBD was an international agreement that aimed at conserving biodiversity sustainably for the benefit of present and future generations. It had three objectives:

- Conservation of biodiversity
- Sustainable use of the components of biodiversity
- Fair and equitable sharing of benefits arising out of the use of genetic resources

India enacted the Biological Diversity Act (BDA) in 2002, in consonance with CBD and its objectives.

Biodiversity is the variety and variability of all life forms on Earth and the complex ecological processes which they are part of and includes the diversity within and between species and of ecosystems.

It supports socio-economic systems by providing direct and indirect resources and benefits such as food, fodder, shelter, fuel, medicines, etc.

Biodiversity is integral to the well-being of the planet and its people. Many communities, especially indigenous communities, depend on biological resources in their surroundings for their livelihoods and sustenance.

Hence, community participation becomes paramount in conserving biodiversity, especially since local communities directly benefit from using biological resources available in their surroundings.

On the other hand, the principle of fair and equitable sharing of benefits arising out of the use of biological resources, commonly referred to as access and benefit sharing (ABS), provides that local communities from whose areas biological resources are accessed, must be fairly compensated in monetary and / or non-monetary terms.

Tamil Nadu's experience

These objectives have been achieved over the years by the Tamil Nadu Biodiversity Board (TNBB), an autonomous statutory body of the government of Tamil Nadu established under the BDA 2002.

Tamil Nadu has established 13,608 Biodiversity Management Committees (BMCs) at the urban and local body levels in order to profile biological resources and to ensure their conservation and sustainable use with the objective of ABS.

The BMCs at the village Panchayat level account for 92.04 per cent of the total number of BMCs in the state. The Board had provided in-person training and a sum of Rs 50,672 to 90 model BMCs in the state for their effective functioning. In addition, training was given to BMCs of 29 districts at the district, block and Panchayat levels in March 2022.

The Board has thus far received ABS funds of Rs 1.74 crore through the National Biodiversity Authority (NBA) and Rs 2.56 lakh from companies accessing biological resources. A total of Rs 53.04 lakh has been shared with the BMCs and benefit claimers from whose area the biological resources were accessed.

Further, legal notices were issued to 577 companies utilising biological resources in their business out of which 37 companies had responded with an application to the Board seeking approval for access.

BDA 2002 rules say that sites home to rich biodiversity may be declared as biodiversity heritage sites (BHS). This will help provide for the conservation of areas of biological significance outside forests and those that are within the jurisdiction of local communities.

Protecting these sites contributes to achieving biodiversity conservation as well as provide agency to local communities in managing them through traditional or established means.

In Tamil Nadu, 36 proposals for BHS were received, out of which, 10 were shortlisted for review. Three sites namely Arittapatti (Madurai), Vagaikulam (Tirunelveli) and Tamil Nadu Agricultural University (Coimbatore) have been selected after review and field visits by the BHS Expert Committee. The procedure to declare them as BHS is in progress.

Communities thus have the opportunity to partake in conserving biodiversity in their areas through BMCs at the grassroots level and managing important biodiversity areas through BHS.

The local community is also an important stakeholder in preparing People's Biodiversity Registers (PBR). A PBR is a document that contains information regarding the biological resources available in a region and associated knowledge held by local communities.

One of the first steps for conservation and sustainable use of the local biodiversity is to document and profile the local biological resources and the associated knowledge. A PBR is the document that accomplishes such documentation.

A participatory exercise with the local communities is important so as to incorporate the local traditional knowledge and practices. However, the information provided by the local people has to be cross-checked and validated and that is accomplished by a technical support group, which is constituted at the district level.

Besides its basic function as a register, a PBR helps in promoting the micro economy of a region. It makes local communities aware of the biological resources in their region as well as in monitoring the access and use of these resources by external entities.

In this way, communities can make informed decisions about resource use and access, paving the way for sustainability. Also, funds shared as part of ABS further enable these communities to protect and conserve the natural environment around them through various means besides helping them sustain their livelihoods.

Earth Day 2022 with the theme "Invest in our planet" provides further impetus to realise the objectives of CBD and BDA 2002.

We have taken and can further take the step to act (boldly) through legislations, innovate (broadly) through community participation in conservation and implement (equitably) through the fair and equitable sharing of benefits arising out of the use of biological resources found on the planet.

Shekhar Kumar Niraj is Principal Chief Conservator of Forests (Biodiversity Conservation), Government of Tamil Nadu

S Varsha and Ajeeth AN work with the Tamil Nadu Biodiversity Board

Views expressed are the authors' own and don't necessarily reflect those of Down To Earth

b) Niraj, S. K., 2022. The hunt in Mudumalai missteps during 2021 tiger capture hold lessons. Down to Earth, June 10-30, 54-56 Life and Nature-Tiger.indd. (https://www.downtoearth.org.in/news/wildlife-biodiversity/the-hunt-in-mudumalai-missteps-during-2021-tiger-capture-hold-lessons-83336).

DownToEarth | डाउन टू अर्थ

Wildlife & Biodiversity

The hunt in Mudumalai: Missteps during 2021 tiger capture hold lessons

The successful live capture of MDT23 was a daunting task marred by missteps and challenges. By recounting the operation, I hope to inspire development of a new standard operating procedure for wildlife management

By Shekhar Niraj

Published: Saturday 18 June 2022

The tiger MDT23 was captured near Masinagudi in the Mudumalai Tiger Reserve after a 21-day operation by officials from Tamil Nadu and Kerala (Photographs courtesy: Tamil Nadu forest department)

The search for the ailing MDT23, believed to be more than 12 years old, was initiated in August 2020 when it killed a woman in Singara, a tribal village in Gudalur block, Nilgiris district. Since then, the forest department kept a check on its movements through camera traps and direct sightings.

The mail tiger roamed 25 kilometres along the border shared by the Mudumalai Tiger reserve and Gudalur forest region. Images showed it was injured, likely due to territorial fights with other tigers. It also appeared to have lost its hunting ability due to advancing age.

Since MDT23 was not able to make a territory for itself, it had moved towards the forest fringe areas. From March to September 2021, the tiger killed as many as 22 cattle reared by forest dwelling communities in Mayfield and Devon estates in Gudalur forest areas and occasionally attacked people entering the peripheral forests for grazing cattle or collecting firewood.

In July, it was said to have killed a man from Mudukuzhi tribal village, and then another person from Devon two months later. Based on the reports that the animal had become dangerous to human life, on September 24, I issued a 'hunting order' for MDT23 under Section 11 of the Wildlife Protection Act, 1972 (WPA).

WPA defines "hunting" as capturing, immobilising or trapping the animal and specifies that wounding or killing should only occur if the animal cannot be contained, in compliance with the guidelines of the National Tiger Conservation Authority (NTCA) and other principles. My order, issued as per WPA provision, was thus to capture MDT23 alive in a cage or under anaesthesia. But it was misinterpreted by activists and the media as a "shoot and kill" order.

As the miscommunication spread, petitions were filed with different bodies, including NTCA. On October 4, the Madras High Court admitted four cases against the order, to which the forest department filed a counter affidavit. The court's scrutiny added to the pressure.

Coordination is key

On the field, the capture of MDT23 was difficult. Search efforts began in Devon and Mayfield estates, where the tiger was last spotted. While tracking the elusive MDT23, officers faced rough terrains, poor visibility due to thick bushes of weeds, unfavourable weather and risks to their lives. Though MDT23 was sighted on a few occasions during the initial six days of the operation near Mayfield and Devan estates, it could not be tranquilised. Soon, we heard it had moved from Gudalur towards Masinagudi forest, also on the fringe area of the tiger reserve.

By the end of the month, nearly 100 personnel had become involved in the search, including staff and anti-poaching watchers from the parts of the Gudalur area. The multiplicity of teams was bound to result in confusion.

First, no single team was in charge; everyone was directing each other. Neither had a proper control room been set up for coordination, nor was there any dynamic, day-to-day planning and documentation. On the ground, there was no serious attempt to use scientific principles and standardised norms to collect DNA samples; information was assessed on hearsay and personal judgement.

Even field kits, such as tape, markers, rope, torch, range finders or GPS devices, were not carried, let alone resources such as sniffer dogs, tranquilising guns, drones, camera traps or body armour. Teams on search trips made a lot of noise, scaring away animals. Moreover, there was no officer working with local communities or briefing the media.

Related Stories

- India's 52nd tiger reserve, Ramgarh Vishdhari notified
- India's leopard count jumps 63% in just 4 years
- Royal Bengal tiger that stoked panic in Bihar villages caught

An incident on October 1 brought more scrutiny on the operation. That afternoon, a cattle-grazer in Masinagudi was killed by a tiger identified as MDT23. It resulted in agitations among the local communities and politicians, with demand mounting for shooting the tiger. Given the socio-political situation, it was feared that people might poison the tiger.

A few individuals claiming themselves as sharp shooters and hunters of large carnivores had also arrived, citing recommendations of senior forest and police officials from several states. They criticised the operation after denied entry into the national park. Such was the pressure that I had to reissue my hunting order.

Stick to protocol

To ensure that the orders were not stretched to actually shoot the tiger, as was the case in separate operations to capture big cats in 2014-16, there was a need to reorganise the operation following scientific methodologies. After establishing the forest department's command, I deployed additional camera traps, high-resolution drones with thermal cameras, sniffer dog squads and three kumki elephants (trained Asian elephants) to guide us. Five-six veterinarians were on standby and a protocol was set: at 8 am each day images from camera traps were analysed and suspected areas were combed by teams and drones until 6 pm.

These measures brought us close to the tiger on two occasions. The first time, on October 4, it was near a water stream in the Singara forest, 7 km from Masinagudi. Eight days later, we received reports of a cow killed in Moyar, 10 km from Masinagudi, allegedly by MDT23. Though cameras were placed there for monitoring, no images of MDT23 were recorded on subsequent days. We scaled down the deployment of sniffer dogs as their barks were alerting the tiger.

On the evening of October 14, MDT23 was spotted as close as 5 km from Masinagudi. The team was to monitor its movements through the night. But in a bout of impatience, officers attempted to tranquilise it. This was against the order and NTCA guidelines; it risked losing track of the animal in the dark and opened officers to an attack.

On October 15, some 21 days after the operation began, MDT23 was tranquilised 3 km from the Masinagudi checkpost with the help of drones. News of the capture spread like wildfire. On the scene, even while veterinarians were examining and preparing to treat the tiger, several officers were roaming about and mediapersons and the public were trying to get a closer look.

This led to commotion and added to our detainee's distress. I had to intervene to ensure that the capture could be documented properly and the medical samples were collected.

Eventually, MDT23 was moved to the Chamundi Wild Animals Rescue and Rehabilitation Centre in Kurgally, Mysuru, Karnataka, for treatment. As of February this year, much of its health has been restored and its aggressive behaviour is in check.

The capture of MDT23 will be remembered in the Mudumalai Tiger Reserve's history. However, external pressures and scrutiny coupled with mistakes committed on the ground added to its complexities. This incident must serve as a reminder that a proper chain of command, inter- and intra-team coordination, set field protocols and due diligence are important in future such missions, both for the safety of the people involved as well as the wildlife.

Shekhar Kumar Niraj is Principal Chief Conservator of Forests and Secretary of Biodiversity Board, Tamil Nadu. At the time of MDT23's capture, he was the state's chief wildlife warden

This was first published in Down To Earth*'s print edition (dated 16-30 June, 2022)*

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c) Niraj, S.K. 2022. How 2021 offered us a wall of opportunity to improve Tamil Nadu's environmental scene- Down to Earth (https://www.downtoearth.org.in/blog/wildlife-and-biodiversity/how-2021-offered-us-a-wall-of-opportunity-to-improve-tamil-nadu-s-environmental-scene-82359).

DownToEarth | डाउन टू अर्थ

Wildlife & Biodiversity

How 2021 offered us a 'wall of opportunity' to improve Tamil Nadu's environmental scene

The Chief Wildlife Warden of Tamil Nadu enumerates what he and his team did to improve environmental affairs in the state in the midst of COVID-19

By Shekhar Niraj

Published: Tuesday 12 April 2022

The Western Ghats Landscape in SMTR. Photo: Shekhar Niraj

The first three months of 2022 are over. But the memories of 2021 are still fresh in our minds. Most of them are those of anguish given the havoc that COVID-19 created last year. But I also find reasons to hope in this year based on what I did as a forest officer in the year past.

The year 2021 did offer lots of environmental opportunities for me and my team. It was the year in which we crossed several environmental milestones. Le me recount some of them here.

The year started with the culmination of eight years of personal efforts as Tamil Nadu's fifth and India's 51st tiger reserve, Srivilliputhur- Meghamalai Tiger Reserve (SMTR) was successfully notified over 1,000 sq km.

This was done just before the assembly election in Tamil Nadu. I, my team of committed ecologists and members of a few non-profits, along with my Virudhunagar colleagues had drafted and submitted the SMTR proposal way back in 2012.

I had been pursuing it ever since. We reworked the proposal again in 2018 and rationalised the reserve's mapping and could get it notified while I was officiating as a special secretary at the environment and forest department of the Tamil Nadu government.

Today, SMTR has become the strongest hope for the protection of one of India's southernmost tiger populations. It will also offer a new strategy for conserving the water on which nearly 100 million people depend.

The formation of SMTR could be instrumental in the revival of the Vaigai river, whose catchments were encroached decade after decade, leading to its sure death as a river system. SMTR will be India's first 'tiger-water' reserve.

We were also able to effectively protect an important tiger corridor last year — Manikettan-Periyar — the very existence of which was threatened by the long-standing proposed neutrino (INO) project.

The first step I took after assuming my new charge of state chief wildlife warden in July 2021 was freeing Rivaldo — a 40-year-old healthy tusker, mistakenly considered physically challenged due to past injuries.

Asian elephant in SMTR. Photo: Shekhar Niraj

Rivaldo was captured and kraalled in April 2021 under tremendous political and local pressures. He was destined to be held in captivity for the rest of his life.

I drafted a scientific and meticulous plan of rewilding Rivaldo in his home range in the eastern part of the Mudumalai Tiger Reserve. It was a risk as the tusker could have come into intense conflict with local people.

But here, the scientific approach helped. Today, Rivaldo is happily living in the wild along with others of his kind, eating well and staying healthy and cheerful.

We were faced with the spectre of human-tiger conflict in September, posed by the tiger MDT23 in the Mudumalai-Gudalur forests area. An increasing number of cattle kills and human deaths were ascribed to MDT23.

There were several demands that it be shot. I issued a capture order on September 24 and a hunting order on October 1. After this, I took a personal resolve of capturing MDT23 alive and safe and save the tiger as well the humans from further conflict.

I led the operation personally in the field for over 15 days with a meticulously drafted capture plan that made use of modern tools and technology and standardised protocols.

Our strict resolution and matching hard work over a period of 23 days resulted in MDT23 being tranquilised safely and captured on October 15, 2021, the day of Dussehra.

A team of four trained and experienced veterinarians restored the tiger's health. We translocated it to a Mysuru wild animal rescue centre the same night, where it today lives a healthy and safe life.

A few days delay would have cost its life. A bench of the Madras High Court headed by the Chief justice expressed praise for the forest officials involved in the operation.

The year 2021 also provided an opportunity to save a tiger cub — about seven months old whose mother could never be traced. We resolved to raise and train the cub and rehabilitate it in the wilderness of the Analamai hills, rather than send it to a zoo.

The current government of Tamil Nadu, announced several orders from October-December 2021 on the basis of proposals that I had pursued over years.

These were:

- The establishment of a dugong conservation research in Palk Bay for consolidating the conservation of the critically endangered dugong
- The establishment of Tamil Nadu's fifth elephant reserve. The Agasthiyamalai elephant reserve was formed by linking the elephant habitats of Tirunelveli, Kanniyakumari and Tenkasi districts
- Setting up of Tamil Nadu's Forest and Wildlife Crime Bureau, which I had pursued since 2017
- Announcing the setting up of three new advanced rescue and rehabilitation centres for wildlife at Coimbatore, Trichy and Tirunelveli and up scaling the existing centre at Vandalur, to address the issues related to stressed wild animals and their rescue and rehabilitation

In addition, I also drafted schemes to set up a forest marine elite force to provide security to wildlife along the Tamil Nadu coast and to set up a network of trained forest and wildlife sniffer dog squads to strengthen wildlife crime detection and investigation.

In 2021, we also recorded the lowest number of tiger deaths in the past several years and the lowest number of human deaths in wildlife attacks.

The Kazhuvelli brackish water tank and lagoon, spread over 55 hectares in Tamil Nadu's Viluppuram district, was notified as Tamil Nadu's sixteenth bird sanctuary in November 2021, after nearly two decades of pursuance.

The year also ended with scientists from the Wildlife Institute of India sighting dugongs several times in Palk Bay and the Gulf of Mannar during 2021.

Finally, on December 25th, I sighted at least tens of thousands flamingos near Point Calimere bird and wildlife sanctuary. The birds had formed a wall — the 'Great Flamingo Wall' that ran into kilometres.

So the year 2021 wasn't so gloomy. Despite the full-blown threat by the SARS-CoV-2 virus and its variants, we made the pall of gloom give way to a wall of opportunities and entered 2022 with new hopes and optimism.

We hope that some of these initiatives will make 2022 safer and healthier for us and we will be at peace with our environment and surroundings.

Views expressed are the author's own and don't necessarily reflect those of Down To Earth

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ii. Research Articles

a) Huang, B., X. Tian, A. Maheshwari, S. K. Niraj, N. J. Roberts, and G. Jiang. 2022. The destiny of living animals imported into Chinese zoos. Diversity 2022 (14) 335:1-11. (http://doi.org/10.3390/d14050335)

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Article

The Destiny of Living Animals Imported into Chinese Zoos

Baoxiang Huang [1,2,†], Xiuhua Tian [2,†], Aishwarya Maheshwari [3], Shekhar Kumar Niraj [4], Nathan James Roberts [1,2] and Guangshun Jiang [1,2,*]

[1] Feline Research Center of Chinese State Forestry and Grassland Administration, Harbin 150040, China; huangbaoxiang@nefu.edu.cn (B.H.); nathan.roberts@nefu.edu.cn (N.J.R.)
[2] College of Wildlife and Protected Area, Northeast Forestry University, Harbin 150040, China; tianxiuhua@163.com
[3] Department of Wildlife, College of Forestry, Banda University of Agriculture and Technology, Banda 210001, India; aishwaryamaheshwari@gmail.com
[4] State Biodiversity Board, TBGP Building, Nanmangalam, Chennai 600100, India; shekhar.niraj@gmail.com
* Correspondence: jgshun@126.com; Tel.: +86-0451-82190279
† These authors contributed equally to this work.

Abstract: Ex situ conservation is one of the major ways to strengthen biodiversity conservation. In China, ex situ conservation institutions mainly include zoos, aquariums, and breeding centers. In 1996, China began to import living animals duty-free for conservation purposes. Here, we built a dataset of nearly 300 vertebrate species (mammals, birds, fish and reptiles) imported into China over this past 20 years by interviewing all 123 institutions importing animals duty-free during 1996–2015. We then analyzed the annual variation of the species composition and individual numbers of these imported species, and quantified the relative population growth rate of each imported species for the first time. We found that the number of living animals imported into China decreased significantly year by year. The number of imported bird species and reptile individuals decreased the most, but the population growth rate was increasing for about half of the imported threatened species. We recommend that conservation institutions should enhance communication and promote cooperative breeding among them. Scientific research and sustainability assessments of threatened species should also be enhanced, which will allocate trade licenses and quotas more effectively. We hope that the data presented in this paper will contribute to the development of conservation policies, leading to stronger management of these imported species in China.

Keywords: captive population; ex situ; wildlife trade; threatened species; China

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Citation: Huang, B.; Tian, X.; Maheshwari, A.; Niraj, S.K.; Roberts, N.J.; Jiang, G. The Destiny of Living Animals Imported into Chinese Zoos. *Diversity* **2022**, *14*, 335. https://doi.org/10.3390/d14050335

Academic Editors: Michael Wink, Guiming Wang and Fred L. Cunningham

Received: 28 March 2022
Accepted: 21 April 2022
Published: 25 April 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

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1. Introduction

Species conservation is a challenge of equal importance as poverty reduction in the 21st century [1]. At the core of the relationship between sustainable development and biodiversity conservation is wildlife trade [2], for which Asia is a geographical hotspot area [3–5]. However, there is a lack of rigorous analysis of trade data in the existing literature [6], and only the collection and appropriate analysis of trade data can ensure sustainable use of such wild animal populations [7].

China places great importance on wildlife trade work and began to approve wildlife licenses in 1976 [8]. China then became a Party to the Convention on International Trade in Endangered Species for Wild Fauna and Flora (CITES) in 1981. The Chinese Forestry and Grassland Administration (CFGA) is the main CITES management organization, responsible for CITES implementation and enforcement. China implemented the Wildlife Protection Law (WPL) to control wildlife trade in 1989, and this law was last revised in 2018. In the latter year, the list of key protected wild animals was published, last revised in 2021 [9]. In addition, China also joined the Convention on Biological Diversity in 1992, which aspires to ensure that China will make concerted efforts to conserve biodiversity.

Zoos have biodiversity conservation potential [10]. With zoo-reared animals being ambassadors of their species, captive breeding became the main justification for displaying animals to the public [11]. Although captive breeding may not be associated with conservation outcomes [12,13], it is important to master the experience and technology, which will help to provide support for the rescue or ex situ conservation of wild populations as required. Other benefits of captive breeding include reducing the number of wildlife imports and providing research opportunities which may often not be possible with wild animals [14]. Since the 20th century, zoos gradually shifted from entertainment to scientific research and conservation [15–17], and have become an important partner in the protection of threatened species [18]. Moreover, trade among aquariums can also have a unique and positive impact on the marine animal communities [19,20], including captive breeding programs for endangered animals [21] and public education on biodiversity and sustainability issues [22].

In order to enhance biodiversity conservation, and explore the potential value of biological species resources, China began to encourage institutions to breed wildlife in captivity (i.e., in captive institutions), such as zoos, aquariums, and breeding centers which import wildlife. Principally, this was through a duty-free exemption policy for the import of wildlife for non-profit purposes, implemented from the Ninth Five-Year Plan (1996~2000) and subsequently revised every five years. In addition, government agencies are required to issue an updated list of exempt wildlife goods every year, including living animals and specimens [23]. Our study focuses on the import of living animals, including mammals, birds, reptiles and fish.

In this paper, we analyzed the species diversity, volume, and annual variation of duty-free imported living animals from 1996 to 2015, assembling, for the first time, data on the long-term changes in the numbers of imported species and individuals. There are two objectives in this study: (1) to quantify the long-term changes in the numbers of imported species, and (2) to evaluate ex situ conservation outcomes in China.

2. Materials and Methods

2.1. Data Collection

The study relied primarily on data from the duty-free import (hereafter "import") wild animals list from the Endangered Species Import and Export Management Office of the Peoples Republic of China (CFGA-CITES) between 1996 and 2015. We conducted independent investigations with all 123 import institutions on the list, distributed across 27 provinces (Figure 1). We collected a total of 1287 valid cases from this list, including imported species diversity and volume (the number of individuals). Specifically, through field investigation and official telephone counseling in 2017, we supplemented more detailed information on births, deaths, present stocks, and transfers (refers to exchanges in and out of the institution), recorded as the number of individuals for each species. Third-party transfer source/destination and outcomes were not known in this research. Imported individuals during the period of investigation (2016–2017) were counted as transfers. In addition, prior to analysis, we removed records that were untrue, unmanaged, and had incorrect scientific names.

2.2. Data Analysis

We firstly counted some basic parameters, such as species diversity and volume in different taxonomic classes, and used the Kruskall–Wallis test to test for differences among classes. We also used linear regression to examine annual changes (note that the total number of individuals fit a normal distribution after log transformation) [24]. Next, we used the population growth index as a representative to quantify the annual variation of each imported species since 1996 [25]. We assumed that all captive institutions could cooperate in captive breeding, and thus each imported species is considered to exist as a meta-population within China. The captive population is assumed to be generally not constrained by conditions such as food and space, and thus it is suitable for the continuous

growth model with a constant growth rate [26]. The instantaneous rate of increase (r) of each species was firstly calculated and then converted into the finite rate of increase (λ), as:

$$r = \ln(N_t/N_0) \times t \quad (1)$$

$$\lambda = e^r \quad (2)$$

where "N" is the population size, and "t" is the time. In our data, "N_0" is the total imports per species (1996–2015), "N_t" is the number of existing individuals (present stock minus transfers), and "t" is the number of years (2017 minus first import year) (Supplementary Table S1). When $\lambda > 1$, the captive population is increasing; when $\lambda = 1$, the captive population is stable; when $\lambda < 1$, the captive population is decreasing; when $\lambda = 0$, the captive population has already disappeared, i.e., is considered extirpated.

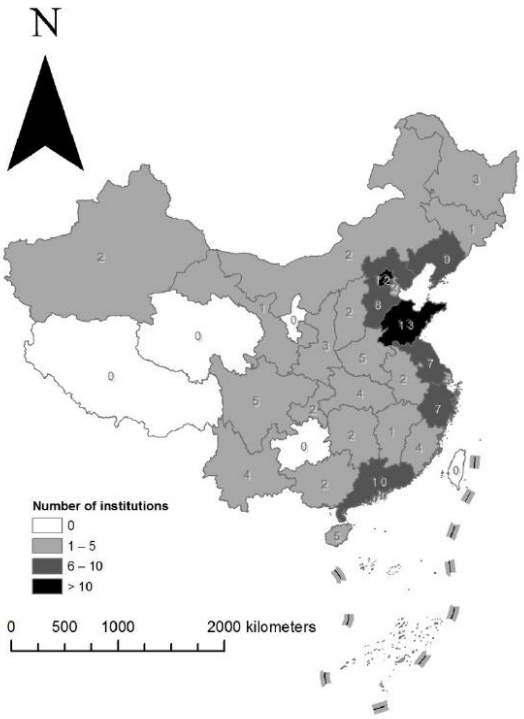

Figure 1. Provincial level distribution of duty-free import institutions in China in this study, according to the Endangered Species Import and Export Management Office of the Peoples Republic of China (CFGA-CITES) between 1996 and 2015 (n = 123, the numbers in the figure are the number of institutions in each province).

To investigate the results in relation to conservation status, both the scientific name and conservation status were retrieved from the International Union for Conservation of Nature (IUCN) Red List (www.iucnredlist.org, accessed on 21 September 2021). This study was specifically concerned about threatened species statuses, including Vulnerable (VU), Endangered (EN), Critically Endangered (CR), and Extinct in the Wild (EW). Data were analyzed using R v3.6.0 [27].

3. Results

3.1. Imported Animals

Between 1996 and 2015, China imported a total of 64,843 individuals, representing 278 species (Table 1). Most imported species were mammals (46.8%), most imported individuals were reptiles (74.3%), and the taxonomic class with both the least imported species (5.8%) and individuals (0.4%) was fish. A clear outlier with regards to the number of individuals imported per species is the Siamese crocodile (*Crocodylus siamensis*), a CR species for which 5 institutions imported a total of 43,465 juveniles (representing 67.0% of all individuals, and 90.3% of all reptile individuals) between 1997 and 2009, making this the species with the highest number of imported individuals.

Table 1. Total number of imported living animal species and individuals (1996–2015), births, and present stocks (2017) in China.

Class	Number of Species			Number of Individuals		
	Imports	Births	Stock	Imports	Births	Stock
Mammals	130	99	124	7440	6192	7663
Birds	114	46	75	8969	7360	9407
Fish	16	0	16	278	0	262
Reptiles	18	5	13	48,156	24,557	30,962
Total	278	150	228	64,843	38,109	48,294

From 1997 to 2000, the annual number of imported species and individuals increased to a first peak and declined sharply thereafter (Figure 2). Statistically, the total number of imported individuals decreased significantly year by year ($R^2 = 0.191$, $p = 0.035$). The peaks in the years 2000, 2003, and 2009 were due to the imports of large numbers of Siamese crocodiles. Since 2012, the number of imported species per year increased again, with the second peak occurring in 2014 (Figure 2); however, statistically, the number of species did not change significantly over time ($p > 0.05$). Furthermore, for most of the import period, mammal and bird species remained the dominant classes of imports (Figure 3), and the number of bird species imported decreased significantly from year to year ($R^2 = 0.208$, $p = 0.028$). No such relationships were observed for any other animal class investigated.

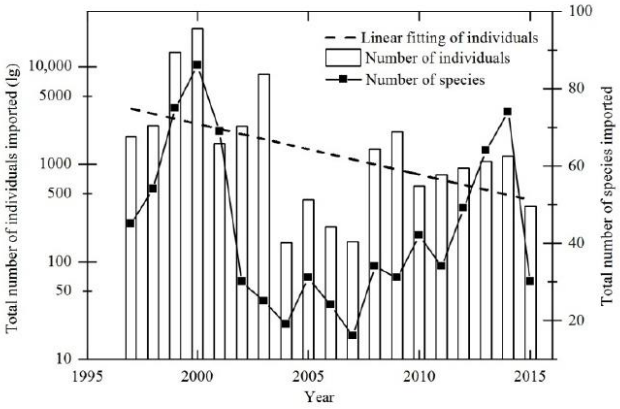

Figure 2. Annual variation in the number of imported species and individuals in China (1996–2015). Note the primary y axis scale.

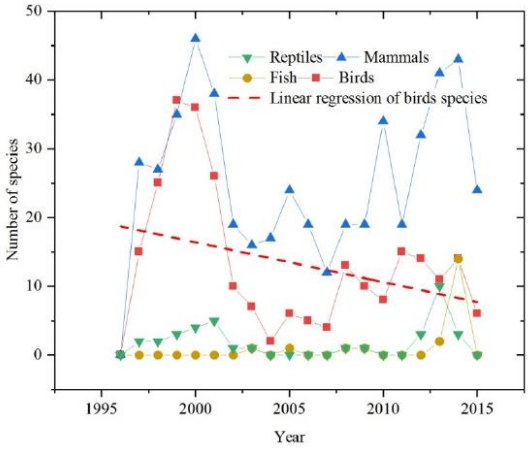

Figure 3. Annual variation in the number of imported species of different classes in China.

3.2. Captive Population

During the past 20 years, 82% of the imported species survived in captivity (Table 1). Bird species had the lowest rate of survival in captivity (65.8%; Table 1, Figure 4). In addition, comparing the total number of imported individual animals and present stock, there has evidently been a decrease of 25.5%. Fish and reptile individuals decreased by 5.8% and 35.7%, respectively; however, mammal and bird individuals increased by 3.0% and 1.5%, respectively.

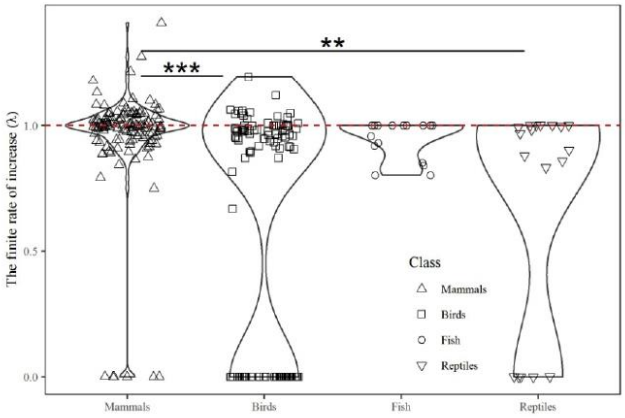

Figure 4. The finite rate of increase (λ) of each species imported into China, grouped by taxonomic class (*** $p < 0.001$; ** $p < 0.01$).

In terms of breeding in captivity, 54.0% of imported species bred in China. Among classes, mammalian species had the highest proportion of species which bred and produced offspring (76.2%), while fish had no captive breeding recorded in the dataset (Table 1).

In terms of population growth index (λ), 27.0% of the imported species showed population increases, 10.8% of the imported species had stable populations, 44.2% of populations declined, and 18.0% of the imported species failed in captivity (Table 1, Figure 4). Population growth of all species by class revealed that the population growth index (λ) of

mammal species was significantly higher than for birds ($p < 0.001$) and reptiles ($p = 0.002$), while the growth index of captive populations of fish species did not differ significantly ($p > 0.05$) from the other classes (Figure 4).

3.3. Threatened Species Conservation

China has made great efforts in terms of threatened species conservation in captivity. During the period of 1996 to 2015, China imported 47,096 individuals (72.6%) from 85 species (30.6%) which are globally threatened: 6 individuals from one EW species, 43,601 individuals from 13 CR species, 1357 individuals from 19 EN species, and 2180 individuals from 52 VU species (Table 2 and Supplementary Table S1). By 2017, in total, only eight threatened species failed to breed and survive in captivity in China (Table 2, $\lambda = 0$). One of these species was the EN Grevy's zebra (*Equus grevyi*), of which only a single individual was imported in 2001.

Table 2. Imported endangered species on the IUCN Red List (1996–2015) and present stocks (2017) in China, together with their respective finite rate of increase (λ). IUCN Red List of endangered species categories: endangered (EN), critically endangered (CR), and extinct in the wild (EW). Vulnerable (VU) species can be found in Supplementary Table S1.

Class	Species	Imports	Births	Stock	λ
	Extinct in the wild (EW)				
Mammals	Scimitar-horned oryx *Oryx dammah*	6	16	17	1.056
	Critically endangered (CR)				
Birds	Vietnam pheasant *Lophura edwardsi*	4	0	0	0
Fish	Sharpnose guitarfish *Glaucostegus granulatus*	2	0	4	1 [1]
Fish	Bowmouth guitarfish *Rhina ancylostoma*	1	0	2	1 [1]
Fish	Scalloped hammerhead *Sphyrna lewini*	27	0	27	1
Mammals	Black rhino *Diceros bicornis*	5	6	11	1.042
Mammals	Western gorilla *Gorilla gorilla*	2	0	0	1 [1]
Mammals	Celebes crested macaque *Macaca nigra*	8	2	9	1.009
Mammals	Bornean orangutan *Pongo pygmaeus*	22	11	25	1.008
Mammals	Cotton-headed tamarin *Saguinus oedipus*	10	12	22	1.218
Mammals	Saiga *Saiga tatarica*	12	300	90	1.101
Mammals	Red ruffed lemur *Varecia rubra*	4	1	5	1.046
Mammals	Black-and-white ruffed lemur *Varecia variegata*	39	19	51	1.055
Reptiles	Siamese crocodile *Crocodylus siamensis*	43,465	24,119	30,241	0.983
	Endangered (EN)				
Birds	Sun parakeet *Aratinga solstitialis*	60	0	32	0.967
Birds	Grey crowned crane *Balearica regulorum*	219	48	168	0.98
Birds	Saker falcon *Falco cherrug*	46	0	57	0.919
Birds	Asian crested ibis *Nipponia nippon*	15	210	242	1.197
Birds	Grey parrot *Psittacus erithacus*	90	0	111	0.976
Mammals	Brown-headed spider monkey *Ateles fusciceps*	1	7	3	1.132
Mammals	Black bearded saki *Chiropotes satanas*	20	6	5	0.997
Mammals	Pygmy hippopotamus *Choeropsis liberiensis*	2	9	12	1.089
Mammals	Asian elephant *Elephas maximus*	43	12	51	1.011
Mammals	Sea otter *Enhydra lutris*	2	1	1	0.955
Mammals	Grevy's zebra *Equus grevyi*	1	0	0	0
Mammals	Ring-tailed lemur *Lemur catta*	379	569	764	1.04
Mammals	Golden lion tamarin *Leontopithecus rosalia*	6	11	20	1.278
Mammals	African wild dog *Lycaon pictus*	36	18	27	0.984
Mammals	Lion-tailed macaque *Macaca silenus*	24	12	25	1.002
Mammals	Chimpanzee *Pan troglodytes*	123	25	109	0.989
Mammals	Tiger *Panthera tigris*	277	845	902	1.063
Mammals	Siamang *Symphalangus syndactylus*	4	2	6	1.024
Mammals	Malay tapir *Tapirus indicus*	9	4	10	1.006

[1] These populations had no change and stocks were the numbers after transfer.

On the contrary, more endangered populations achieved growth (Table 2). For example, 12 individual CR saiga (*Saiga tatarica*) were imported into the Wuwei Endangered Animal Research Center, Gansu Province, in 1997, and a population of 90 individuals was recorded at the end of 2017 ($\lambda = 1.1$). Similarly, for EW scimitar-horned oryx (*Oryx dammah*), six

individuals were imported to the Chime Long Safari Park, Guangdong Province, in 1999, and seventeen living individuals were recorded in 2017 (λ = 1.06). Besides, captive tiger (*Panthera tigris* spp.) populations grew steadily in recent years (Table A1), and thus China has not imported tigers again since 2005.

4. Discussion

Our population growth index is only a relative quantification of captive populations of imported species, which is different from the traditional finite rate of increase (λ). This is because the structure of our data describes annual imports rather than annual stocks, and thus, the traditional index and analyses of population trends were not appropriate. As a result, we first assumed that all individuals were imported in the first year, including multiple imports of the same species by the end of 2015. Next, we applied a meta-population growth index calculation on the basis that the same species can be imported by a number of different institutions. In addition, our data are verified reports of actual import records, and this may lead to a lower import size being analyzed than is true, though this was unavoidable in our investigation and should be interpreted as such.

4.1. Captive Imported Populations

Animals imported duty-free were used for non-profit purposes in China. With the significant decrease in the number of imported individuals over the past 20 years, China is changing from "enrich individuals" to "species conservation" [28]. For example, the CR cotton-headed tamarin (*Saguinus oedipus*), the EN golden lion tamarin (*Leontopithecus rosalia*), and almost all fish species were first imported after 2013.

We found that imported mammal captive populations grew significantly better than birds and reptiles during the 20-year period, and 51.8% of threatened species overall were successfully bred. This suggests that animal research and cooperative breeding should be actively developed to improve breeding success in China, especially birds and reptiles, which showed significant population decreases or losses. However, the unlimited increase in population size does not necessarily represent an improvement [29]. China must set the population target sizes for the conservation of different species as soon as possible. In practice, this means that China should have a more precise annual approval plan for imported animals and formulate population target sizes based on the conservation capabilities of each importing facility and local conditions.

There are some successful cases of captive breeding of endangered species internationally [30–33]. By 2017, more than half of the imported species had successfully bred in China (53.8%). However this is not easy, as many species not only have a high cost in captivity [34], but they may also require special care to survive, while breeding is more difficult [35,36]. A sustainable captive population will partly reduce the need for additional wild-caught animals to be imported into breeding programs. Thus, we cannot deny China's contribution in the conservation of endangered species which have been imported. We also believe that captive institutions' contributions to endangered species conservation should be heralded and encouraged [37].

In recent years, the Chinese aquarium industry has grown rapidly [38]. Aquariums have improved the feeding and management conditions, and partly slowed the decline of captive populations [39]. However, our existing data demonstrate that species diversity and individuals of imported fish are less and may lack representation in China. Fish trade is unsustainable compared with other animal classes [40]. Here, we found that species diversity and individuals of imported fish were the least, while this animal class is also less understood as well [41–43]. Therefore, we recommend that conservation studies on imported fish should be enhanced in China [44].

4.2. The Role of Institutions

More than half of the captive populations of imported species declined or disappeared in China, and some captive institutions will conceal the death cases and causes. This lack of

openness and sharing of information potentially puts other institutions in the same plight when importing these species, resulting in the needless death of individuals. If captive institutions do not communicate information and cooperate in breeding in a timely and effective manner, it will be difficult to maintain these captive populations and achieve biodiversity conservation goals in China. In addition, the pedigree of many imported animals is unclear, which can easily result in mismanaged breeding, including potential for inbreeding [45]. Therefore, it is important to strengthen cooperation and build an animal lineage cloud sharing platform among captive institutions, enabling sharing and updating data on imported animals [46]. Specifically, including the sharing of annual population dynamics and captive management experience could increase survival rates and breeding success. At present, the Chinese Association of Zoological Gardens (CAZG) is gradually improving cooperation systems at home and abroad (www.cazg.org.cn, accessed on 21 September 2021).

We found that the captive capabilities of institutions in different provinces were not balanced in China, in terms of distribution of institutions, import histories, and breeding success. Captive institutions do, however, as we produce the evidence here, also have great potential in the conservation of threatened species [47]. Space and funding available to captive institutions should be a priority factor to review when importing threatened species [34]. After all, there could be an opportunity to relieve the stress on the wild population if captive breeding is successful [48]. Institutional capacity is probably a major factor in breeding success.

Thus, we recommend that import institutions should accept qualification review, such as evaluation of living conditions and environment enrichment [14], publish annual reports to enhance surveillance, and encourage public involvement. In particular, special attention should also be given to preventing the flow of threatened species to illegal markets [49].

4.3. Outlook

Our study provided an assessment of the captive situation of imported animals in China, which has accumulated considerable experience in captive management in the past twenty years [14]. This will undoubtedly help to improve the reproduction of imported species and set the population target sizes in the future. Note that not all threatened species are suitable for ex situ breeding [10], but maintaining their sustainable populations remains an important way that captive institutions can help to preserve biodiversity [50,51]. Therefore, continuous assessment of the effectiveness of species management is key to improving the ability of captive institutions to serve as partners in biodiversity conservation [52].

China should, in a well-coordinated manner, construct the development plan of modern institutions breeding animals in captivity, such that modern zoos, aquariums, and breeding centers act as backup bases to National Parks and other nature reserves and protected areas [53]. In October 2021, President Xi delivered the establishment of the first National Parks in China at the 15th meeting of the Conference of the Parties to the Convention on Biological Diversity (COP15). As insurance for wildlife protection, it is also beneficial to increase the connection of zoo veterinarians with wildlife protection experts [14]. Besides improving their ability to support conservation efforts in situ, captive institutions should help preserve biodiversity through their public education, specialized training, scientific research, and fundraising activities to support conservation efforts in situ [54,55].

Finally, wildlife disease and zoonoses risks are critical factors in the management of wild animals in captive breeding institutions. During the outbreak of Severe Acute Respiratory Syndrome (SARS) in 2003 [56], the Chinese Forestry and Grassland Administration suspended the import and export trade of living wildlife in May 2003 [57]. We suspect that this is the reason for the decline in imports after 2003. Currently, affected by the 2019 novel Coronavirus (2019-nCoV, COVID-19) pandemic, the National People's Congress of the People's Republic of China, on 24 February 2020, announced a ban on the capture of all terrestrial wildlife for trade [58]. Although China's total ban on wildlife

trade may encounter many problems again [59], we believe that China has experience in strengthening the control of imported species, and must therefore ensure that it has the capacity to effectively manage captive animals as sustainable meta-populations, whilst continuing to strengthen protection and restoration of free-living populations in the wild.

Supplementary Materials: The following are available online at https://www.mdpi.com/article/10.3390/d14050335/s1, Figure S1: Percentage of threatened species imported into China (1996–2015), grouped by taxonomic class. IUCN Red List status: extinct in the wild (EW), critically endangered (CR), endangered (EN), vulnerable (VU), near threatened (NT), least concern (LC), data deficient (DD), and not evaluated (NE). Figure S2: Annual variation in the number of threatened species (a) and individuals (b) in China (1996–2015). Note the primary y axis scale in (b). Table S1: List of duty-free imported wild animals (1996–2015) in China.

Author Contributions: Conceived and designed, G.J. and X.T.; investigation, X.T. and B.H.; analyzed the data, B.H.; writing—original draft preparation, B.H.; writing—review and editing, G.J., A.M., S.K.N. and N.J.R.; chart visualization, B.H. All authors have read and agreed to the published version of the manuscript.

Funding: This study was funded by the National Natural Science Foundation of China (NSFC31872241).

Institutional Review Board Statement: Not applicable.

Data Availability Statement: The data presented in this study are available upon request from the corresponding author.

Acknowledgments: We are particularly grateful for the strong support of the Endangered Species Import and Export Management Office of P. R. China.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Imported EN tiger (*Panthera tigris*) from 1996 to 2015 and present stock (2017) in China, with their respective finite rates of increase (λ).

Species	Imports	Stock	λ
Bengal tiger (white) *Panthera tigris* ssp. *tigris (white)*	50	197	1.079
Amur tiger *Panthera tigris* ssp. *altaica*	221	254	1.067
Bengal tiger *Panthera tigris* ssp. *tigris*	157	434	1.060

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Rewilding the 'Wild Rivaldo': New Lessons Learnt in Human –Elephant Conflict Management

Shekhar Kumar Niraj
PCCF (Biodiversity Conservation),
Tamil Nadu

Introduction

The first assignment that fell in my hand as I took over as the new Chief Wildlife Warden of Tamil Nadu on July 6th, 2021 tended to be one of the most daunting ones, perhaps. Tough, not because it was the first task, but because it could be a real risky one. 'Rivaldo', a 38–40-year-old tusker, Asian elephant (Elephas maximus) weighing an estimated 4.5-5 metric tonnes, was captured on May 5th, 2021 under a March 2021 order of the state Chief Wildlife Warden, under section 11 (1) (a) of the Wildlife Protection Act 1972, and was then confined to a kraal (enclosure) especially constructed for housing it in an RF near the Vazhaithottam village forest check post inside the buffer zone of the Mudumalai Tiger Reserve (MTR) (Fig.1). The elephant was kept in captivity for treatment and training to ultimately live in permanent housing at Thepakadu Elephant Camp in MTR as a trained camp elephant. A Special Committee was also set up with the officials of MTR and the vets from Coimbatore and Thepakadu, MTR, to monitor the elephant's treatment and training in its confinement. Apparently, the order of capturing and bringing 'Rivaldo' into captivity was triggered off under pressures from the local public. The pressures were accentuated by the local administration as well as the local politicians who feared that habitual visits by 'Rivaldo' to the village houses in Vazhaithottam and nearby villages could lead to further conflicts resulting in loss of lives and damages to properties. 'Rivaldo' (Fig. 2) was habituated to visiting houses and getting fed with home cooked food and fruits in Vazhaithottam village and elsewhere.

In an isolated incident it had damaged properties when it was unsuccessful in receiving the food. Among the incidences of elephant-human conflicts in Mudumalai from 2018 to April 2021, six humans had been reported dead and no incidences were ascribed to 'Rivaldo', not even an injury. To the contrary, Desai et al. 2016 (unpublished report) had reported 'Rivaldo' to be a gentle animal with no known aggressive behaviour. I took note of a petition that was filed in Madras High Court during March, 2021 by an activist and the Honourable High Court too had raised concern and advised in its interim order for an expeditious return of the wild animal to its natural habitats. The events led to engaged public debate and media reports in subsequent months- environmental activists and non-governmental organisation argued against the capture of 'Rivaldo' and its confinement. Science was never discussed.

(Photo source: Mudumalai Tiger Reserve)
Fig. 1. Specially constructed kraal for housing and training the captured male tusker 'Rivaldo' during May-June 2021 in Vazhaithottam village in Mudumalai tiger reserve's buffer zone.

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2. *Changing the course*

On 10-11 July 2021, I visited 'Rivaldo' presently under confinement in a kraal in MTR, to assess its situation, study the kraal, its surroundings, the animal's health conditions and held intensive discussions with the vets and representatives from the 'Rivaldo' Committee constituted by the FD, MTR, ecologists, and members of the civil society groups. The order had taken the following grounds:

A

the finger of trunk along with a part of lower 1/3rd portion was missing due to an old injury which interfered with the normal body functioning, particularly browsing and grazing.

B

the external opening of the trunk was much narrow restricting the inflow and outflow of air during respiration.

C

the vision of right eye was severely impaired.

D

because of constricted opening of the trunk, it couldn't be sedated or forcefully restrained.

E

there was hint of a suggestion to treat the animal for its conditions in c and d.

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Fig.2. 'Rivaldo' a 38- 40-year-old tusker weighing 4.5-5 tonnes captured in May 2021 and confined to a kraal near Vazhaithottam village forest check post in the buffer zone of Mudumalai TR in Tamil Nadu.

In a first, I made the following quick observations:

i. Keeping a matured, healthy and hefty adult tusker in a rather small kraal and training could be torturous and defeating the science of elephant ecology.

ii. The permanent disabilities of 'Rivaldo', such as, opacity in its right eye, and amputated trunk at the tip might have occurred long back and was not treatable anymore. The elephant has learnt to live with these disabilities as many other elephants do with similar or other physical disabilities (Desai et al. 2016: unpublished report). 'Rivaldo' appeared an intelligent and docile animal.

iii. There was no solitary instance of 'Rivaldo' attacking humans or indulging in crop raid.

iv. The process of kraaling and training an adult elephant into captivity could be torturous, inhumane and ecologically damaging.

v. The elephant was in the last month of its musth (a biological in a male elephant) period. During its non-musth period it generally roamed around foot hills of Kallaty Ghats, Vazhaithottam, Chedapatti, Mavinhalla in the erstwhile Nilgiris North Forest Division. This tusker came into musth regularly during second week of May every year.

vi. Argument that the elephant was prone to getting poached because of its movements near human settlements didn't find weight as there were at least 5 other tuskers whose home ranges were around the same landscape.

vii. In the age group of 'Rivaldo' (i.e., 35-40 years) minimal number of tuskers is reported in the Nilgiris landscapes, hence retaining a tusker of this age group in the wild population could be significant for genetic dispersion.

viii. The Asian elephant in Tamil Nadu has shown signs of population decline to an alarming level (e.g. a decline of about 25% in the years 2000s-2010s).

ix. Compared to the costs that would be incurred in capturing, training and maintaining this elephant in captivity, managing it in the wild would be far less expensive and conservation friendly.

x. Professional and scientific management of elephant-human conflicts will desist sentimental approach to managing conflicts and therefore could pave the way for science-based protocols in conflict management.

Critical evaluation weighed in favour of rehabilitating 'Rivaldo' in the wild rather than continuing in the captivity. Although the question that would most likely haunt me in subsequent days was- what would happen if after the release in the wild, 'Rivaldo' went back to the villages, came in conflict with the humans, and in the worst scenario trampled a person? The risk was evident and heavy at odds. I decided to take on the challenge instinctively, however, based on an approach that was to be in tune with the scientific management of the Asian elephants. I apprised the Government of my decision and requested an endorsement, and finally obtained it on July 14th, 2021. There was, however, a need to develop a Standard Operating Procedure (SOP) for the release of the elephant based once again on scientific principles and best practices.

3. New Operating Procedures

By mid July 2021, 'Rivaldo' had lived in the kraal for the past 75 days, which would have been very stressful for the animal. Prior to this the animal was habituated to feeding by the humans in the villages. Keeping these in view I set out with developing a new set of Operating Procedures that would lay out the course of actions for the release and rehabilitation of 'Rivaldo'. The operation was to be an "experimental release" as we looked at this as an opportunity that could behold for us a new regime in the elephant-human conflict management. Probabilities of a successful rehabilitation in the wild or the reversal of the conflicts had the assumed ratio of 50:50. Therefore, the focus in the new Operating Procedures was maintained at the aspects of locating the home range, reversion of modified food habits, dealing with the issue of the reported constricted trunk and its impaired eye sights, modes of a smooth transportation that caused lesser stress, and a mitigation plan if at all the elephant found its way back to the village where it was fed routinely and reverently, and most importantly if it ended in reversed conflicts. Therefore, the next significant steps were formation of several teams to address the above issues of concern and further.

4. Strategic Action Plans

I constituted specific teams to take up the assigned tasks, e.g., a team of qualified vets for continuous health monitoring- pre and post release on daily basis, a team comprising of qualified ecologists and scientists for determining the release site, a team of vets and ecologists for transforming the food habit of the elephant from the current assisted feed to the natural feed that it would have access to after it was released in the wild, a team for setting up the GPS and wireless based monitoring network with installation and activation of base stations, a team for field level monitoring and anti-depredation activities that comprised of field trackers, anti-poaching watchers, frontline field officials and the members of the civil society, and finally a community work team composed of ecologists, members of civil society, and NGOs which were particularly assigned with conducting sensitization programmes for conflict management.

For each of the teams we selected the domain experts in elephant ecology and health management, e.g., ecologists from Indian Institute of Science, Bangalore, Wildlife Institute of India, Dehradun, World Wildlife Fund for Nature, and the Wild Trust India, New Delhi. We included highly experienced vets who had considerable experience of working with elephants in protected areas of Tamil Nadu and at

the national levels. We considered that assessing the health conditions and their monitoring in pre-release and post-release phases was going to be of critical importance. Besides, we also consulted vets and officials from Uttarakhand and Odisha who had similar experiences.

i. Selection of release site

After formation of the above teams and conducting few initial rounds of discussions with each of them, the next critical step was selection of the most suitable sites where the elephant would be released and rehabilitated. Recommendation was made by several ecologists for an initial soft release (i.e., inside a boma) and fenced with solar fencing (Neupane et al. 2018). Our field surveys were dropped as the boma release didn't meet up with the parameters of the long-term objective of complete and natural rehabilitation. I selected eight critical parameters for the selection of the sites where suitability was the highest and that was indexed:

a) Distance from the villages where 'Rivaldo' was known to depredate and get fed

b) Availability of natural fodder that 'Rivaldo' liked to forage the most

c) Height of the trees for the foraging access

d) Availability of plentiful sources of running and clean water

e) Distance from the kraal where the elephant was housed at present

f) Home range overlap of other known tuskers and clans from the selected sites

g) Aspects and ruggedness of the sites

h) Linkage with the current home range of the elephant

(Photo source: Mudumalai Tiger Reserve)
Fig.3. Selection of release site by the team led by the state Chief Wildlife Warden based on eight variables along with the use of drones and other devices.

Based on the above parameters we selected two most suitable sites respectively, at Abhayranyam in Kargudi range and Chikkallah (Fig. 3) in Mudumalai range of MTR core. After a rigorous field assessment led by me, the site at Chikkallah, which was a total distance of about 24 km from the present temporary camp at Vazhaithottam, made the higher score in above selected parameters to qualify for the final site of release.

ii. Communications

Monitoring of the elephant after release and tracking its movement patterns using wireless GPS systems, wireless walkie talkies and maintaining effective communication with all the monitoring teams was essential but typically challenging.

A) Setting up wireless network

The next critical step involved setting up a digital wireless repeater station at Thepakadu range base station and couple of field stations for relaying the communications. Until that time MTR had no wireless network and digital walkie talkies and at best had analogous systems that were not in use. In addition, we procured the elephant transporter lorries from Coimbatore, Hosur and Sathyamangalam Tiger Reserve and made several trial runs using camp elephants of matching weights of 'Rivaldo'. Field forest officials trained in drone-based monitoring were requisitioned from Coimbatore and Nilgiris divisions along with their drones. In order to make a DNA repository I introduced DNA sample collection protocol based on CCMB guidelines and we collected different samples from 'Rivaldo' for DNA fingerprinting. All-important health parameters of 'Rivaldo' such as blood pressure, temperature, blood sugar levels, liver function, kidney function and essential micronutrients were checked on daily basis until the day of release. Urine and stools tests were also conducted periodically. From July 18th a new food plan was commenced under the supervision of the vets with aim to increase the proportion of natural and wild food comprised of tree leaves and stems and gradually reducing the handmade food such as ragi, rice, jaggery and fruits.

B) Radio collaring

For signals from 'Rivaldo's movements we chose a satellite radio collar (e.g., Vertex plus elephant collar) made by Vectronics Aerospace Worldwide. The system consisted of an array of sensors-mortality sensor, accelerometer, thermometer, light sensor and a GPS. These were connected to a small processor, which controlled the data collected by the collar and monitored by the manager. The processor could be programmed to take the reading as required by the manager of the collar. According to the period chosen the collar would take readings from all the sensors and at a chosen time would send the data to a satellite modem, which conveyed the data to an iridium satellite, which in turn would send the data to a ground station. As per our setting, the collar would record all the sensor readings including the GPS every 15 minutes and then send this data to the satellite every hour. The GPS data were plotted on their website and the elephant could be located using Google maps within an hour. All the data could be downloaded any time and the movements of animal could be analysed for the time period of interest. 'Rivaldo' was radio collared on July 29th by the radio collar team led by the WWF field investigators. Test recordings were conducted.

C) Drones

Two teams each comprising of three trained forest personnel with the drones were deployed for recoding the operations.

D) Health monitoring

Since the elephant was restrained inside the kraal and partially trained by the mahouts, detailed clinical examination was not possible. The team of vets collected biological samples such as skin scrapings to study ecto-macro-parasites, whole blood, blood smear and serum to study blood and serological parameters, trunk wash to screen the sample against EEHV (Endotheliotrophic Elephant Herpes Virus) and tuberculosis and dung sample to screen against the ova of endoparaites. The findings and laboratory tests were tabulated and updated regularly until the time of the release. Based on the parameters, vet team cleared the release on 1st August, 2021. After loading the transporter, animal was sedated with 300mg of xylazine (Intramuscular). During the transport, animal showed deepened sedation and leaning on the side of the truck and respiration was shallow. Twenty mg of Yohimbine

HCl was administered in the ear vein directly to get partial reversal from the sedation. Full reversal from the sedation was achieved by administering another 20gmofYohimbineHClinthe vein at the time of release. In addition, the vets also administered supporting medication comprising of inj Eenrofloxacin- 2.5mg/ kg body weight I/M, inj Tribivet (Vitamin B1, B6 and B12) - 30 ml, and inj Dexamethasone – 50ml I/M. No health complications were recorded in the animal during the journey and the offloading of the animal.

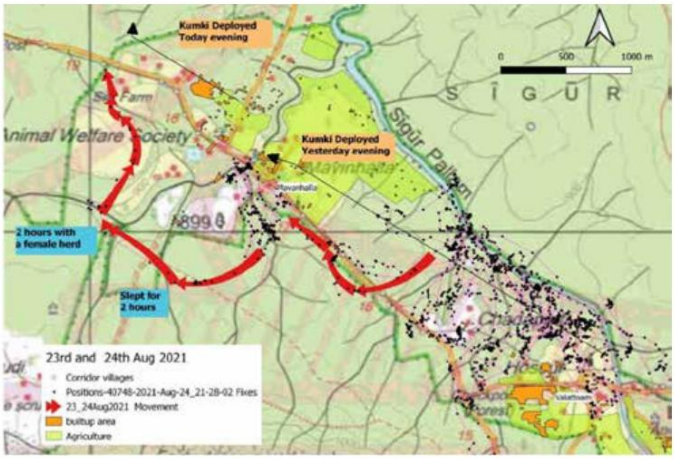

Fig. 5. Kumkis were deployed to block the identified leakage points. Human chains and other local measures such as the chilly robes were used during August-September 2021.

4. Release and post release monitoring

We released 'Rivaldo' with meticulous planning and preparation of about 20 days in the selected site on the night of 1-2 August 2021 under my direct command. However, much earlier than the expectation, within 24 hours of the release it returned to Masinagudi, near the community houses in Mavinallah close to the kraal where it was housed. We immediately geared up the protection mechanisms as planned and deployed two teams of about 30 personnel to track the elephant and surround the village to prevent any new conflicts.

Fig. 4. 'Rivaldo' kept trying to move around the village near the kraal site and was prevented by the deployed kumkis and other local measures such as the chilly robes during August 2021.

We deployed drones with thermal sensors and sniffer dogs around the villages. The house-owners were warned not to offer any food to the animal or attract it in any manner that was the practice here earlier. We used the tom toms to publicise on our measures and warn the people of the likelihood of negative interactions and asked them to stay indoors during the night hours. We moved three kumki elephants (trained camp elephants) from Theppakadu elephant camp and stationed them to block the movement of 'Rivaldo' that led into the villages and to drive it back into the forests whenever encountered. In subsequent days, we also used chilly robes (Sébastien et al. 2015) around the villages and cleared all garbage points and asked the villagers not to throw any food wastes outside on the streets. In collaboration with the local panchayats, we cleared left over garbage and introduced garbage management systems (Fig.4, Fig.5).

After a fortnight since the release, 'Rivaldo' was observed moving along with few other tuskers and elephant herd in the wild (Fig.6). It was noticed playing and interacting with other elephants. It slept mostly in day hours, mid of the day close to the human habitation and roamed around in the forest areas close to the human habitations. We continuously monitored the elephant using satellite linked repeater stations, wireless digital walkie talkies, and the radio collar. The early warning system that built up around the villages worked successfully. 'Rivaldo' started moving away from the villages into the Mavinallah and Sigur forests.

(Photo source: D. Boominathan, WWF India)
Fig.6. 'Rivaldo' was found in company with other tuskers and showed no signs of regression during August -September 2021.

We recorded that 'Rivaldo's home range in natural habitat in August 2021 formed about 7.11 sq. km, which had increased to about 10.12 sq. km during September-October 2021. This was expected to increase further after the north east monsoon set in during October-December months (Fig. 7, Fig. 8).

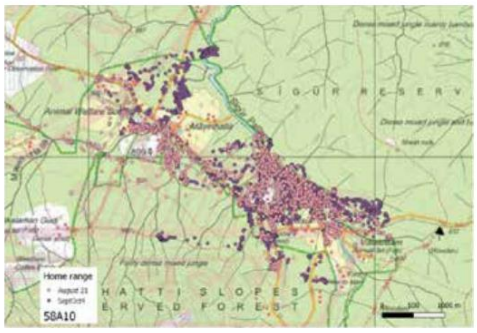

Fig. 7. Movement pattern of 'Rivaldo' since August 2021-September 2021 in Sigur plateau of Mudumalai tiger reserve and landscape (Analytics source: Mohanraj).

Discussions and conclusion

During September - March 2021 elephant depredations in Gudalur, Coimbatore and Hosur forest divisions in Tamil Nadu were managed effectively using the protocols that were used for 'Rivaldo' and in its post release monitoring and management. During this phase no wild elephant which was involved in conflicts with the humans had been captured and brought to the camp for confinement. In fact, during September 2021- March 2022 intense elephant movements and depredations were witnessed in Gudalur regions, but were managed effectively without any major incidents or damage to properties. Since the beginning of the release and rehabilitation of 'Rivaldo', doubts were raised about its success as 'Rivaldo' had spent more than 90 days at the time of the release and was reported having compromised health conditions leaving it unfit to independently feed on natural food and thus survive on its own. Almost a year later, 'Rivaldo' has been fully rehabilitated in the wild in its own home range. We noted that during May 2022 'Rivaldo' had crossed the Moyar region in MTR core and moved towards north west towards Bandipore in Karnataka when the

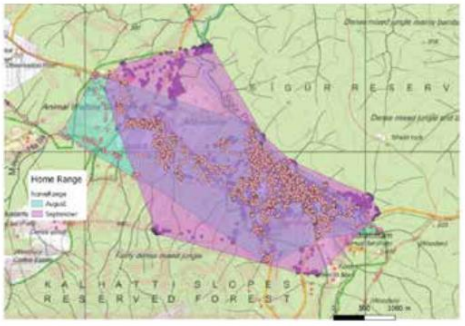

Fig. 8. Computed home range based on 'Rivaldo's' daily movement pattern since August 2021 until March 2022 in Sigur plateau of Mudumalai tiger reserve and landscape (Analytics source: Mohanraj).

elephant went into the musth period (Fig. 9). It was using its normal home range known and recorded by the scientists since early 2000-2010s. We observed that 'Rivaldo's' behaviour had attained complete normalcy and there wasn't any instinct to restrict itself to the vicinity of the human settlements. However, the need to study its behaviour to understand how its habituation became normal could be considered. This understanding would be helpful in applying these protocols to few other camp elephants for rewilding them as well. Just at the time I have completed this article, the High Court of Madras passed the final judgment upholding the efforts of release and rehabilitation of 'Rivaldo' and dismissing all petitions objecting to the release. The judgement has tagged judicial support to a scientifically designed protocol and can raise confidence levels in future decisions.

The elephant has shown the intent to survive in wild without human dependence and disturbance. The field monitoring teams continue to monitor 'Rivaldo' on a day-to-day basis (Fig. 10). The field officials and the trackers have developed profound interests in following and recording Rivaldo's behavioral pattern and the local ecologists in conducting spatial ecological analysis from the data they get from them and from the radio collar. A new protocol of field monitoring and systemic approaches were probably the best outcomes of 'Rivaldo's episode and is now in practice in managing the problem elephants in the Nilgiris, Coimbatore and Hosur landscapes. The year 2021-22 has witnessed significantly fewer deaths of humans due to the conflict and fewer deaths of elephants in elephant ranges in Tamil Nadu. Science has succeeded and assisted in minimizing the ecological losses. The challenge would be to keep it that way and improvise further.

Fig. 9. 'Rivaldo' was observed to have moved out of its non-musth home range of the Sigur plateau moving north west and crossing Moyar in MTR core during May 2022.

(Photo source: Mudumalai Tiger Reserve, the Nilgiris.)
Fig. 10. 'Rivaldo' moves freely post release in its home range in Sigur plateau in the Nilgiris in 2021-22

iii. Viewshed

TNBB published 'Viewshed Tamil Nadu Biodiversity Board' in December 2022. In the Viewshed, Major activities such as field assessments of BMCs. Training through online mode, ABS notices, ABS databases, Field assessment of potential BHS, Project proposals, Tamil Nadu State Biodiversity Strategy and Action Plan (TN-SBSAP), and major accomplishments were detailed.

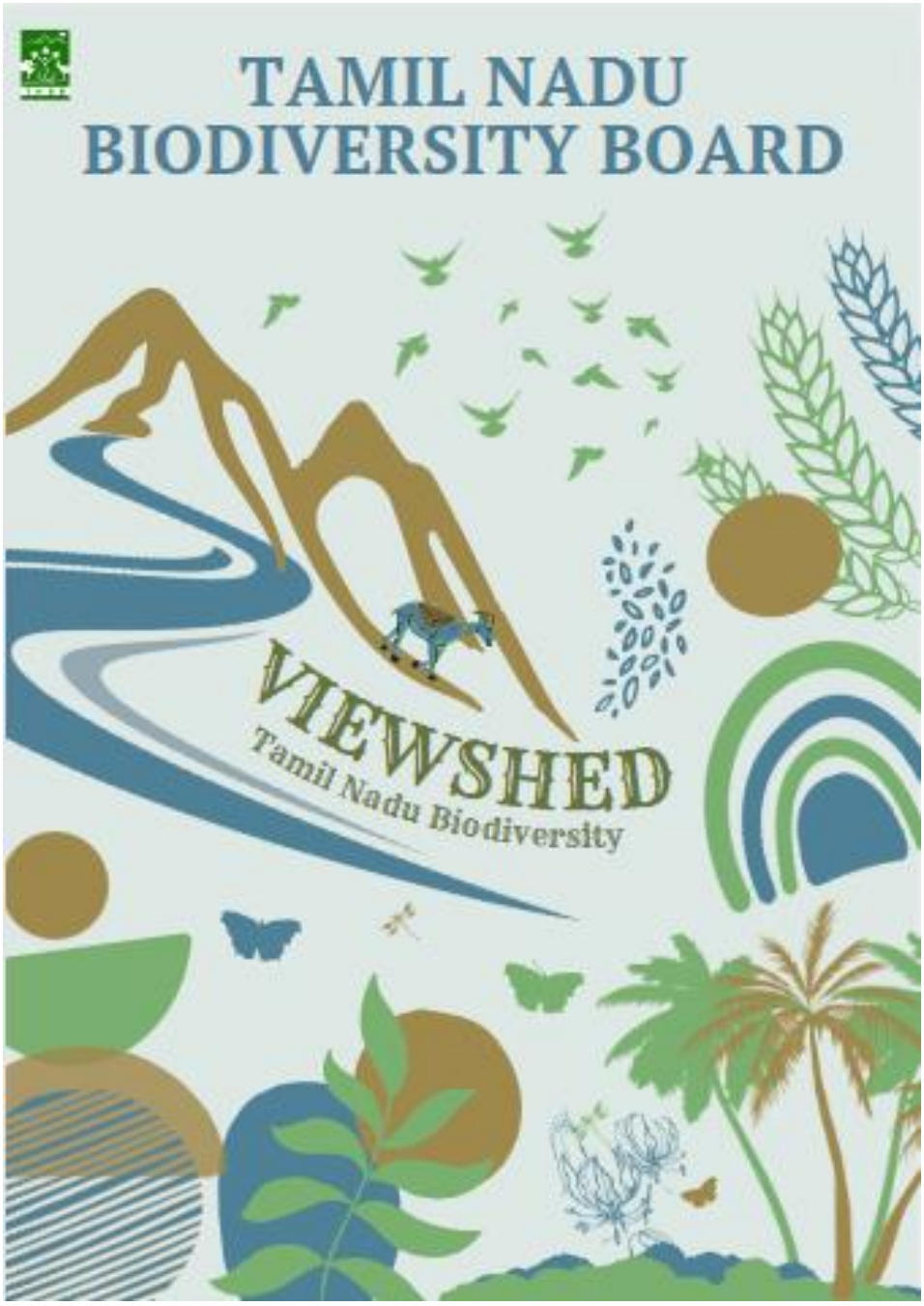

Photo 44. Tamil Nadu Biodiversity Board published Viewshed- TNBB in December 2021

iv. Posters published during 2022-23

a) Biodiversity Heritage Site

Biodiversity Heritage Site (BHS) are well defined areas that are unique, ecologically fragile ecosystems - terrestrial, coastal and inland waters and, marine having rich biodiversity comprising richness of wild as well as domesticated species, high endemism, presence of rare and threatened species, keystone species, species of evolutionary significance, wild ancestors of domestic/cultivated species or their varieties, having significant cultural, ethical or aesthetic values and are important for the maintenance of cultural diversity.

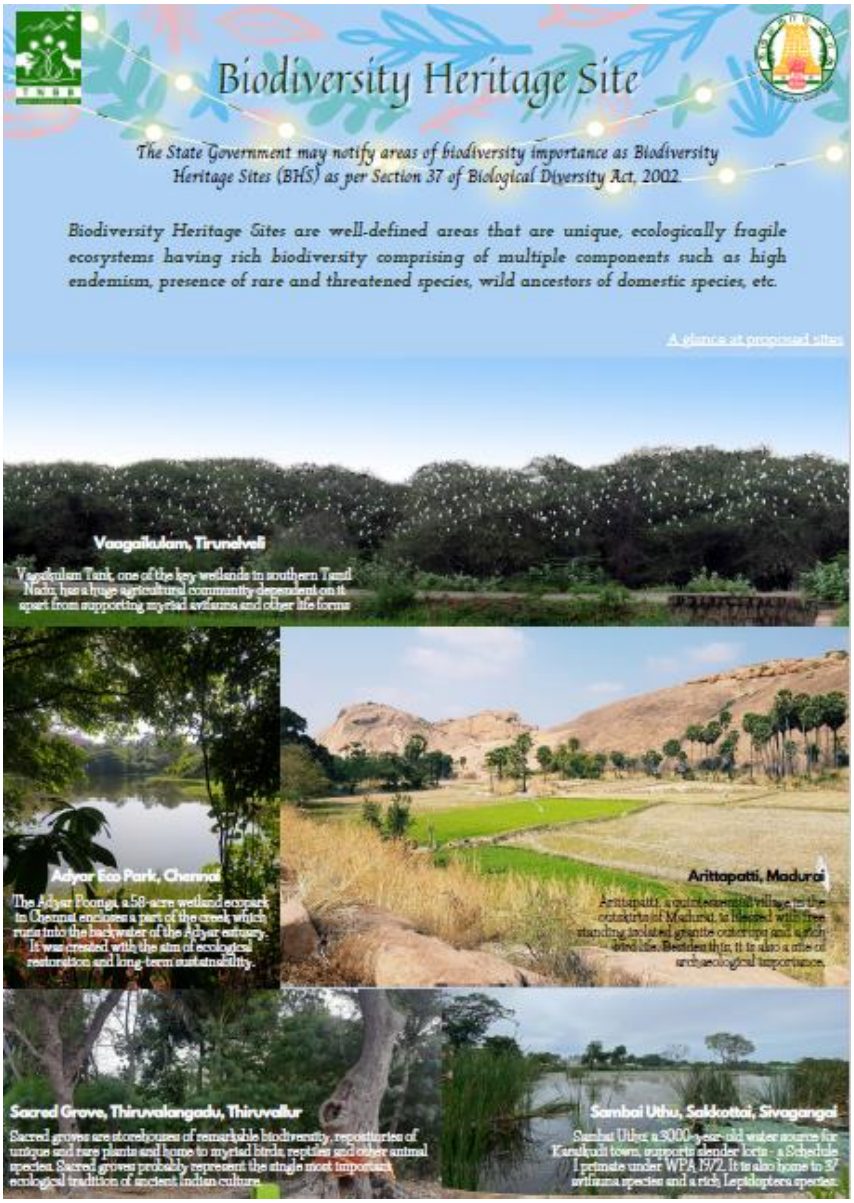

Photo 45. Important Biodiversity Heritage Sites in Tamil Nadu

b) Seaweed Cultivation in Tamil Nadu

Seaweeds are macroscopic algae growing in the marine and shallow coastal waters and brackish water habitats. Seaweeds (macro algae) are wonder plants of the sea, the new renewable source of food, energy, chemicals and medicines with manifold nutritional, industrial, biomedical, agriculture and personal care applications. Seaweeds are also termed as the 'Medical Food of the 21st Century' due to usage as laxatives, for making pharmaceutical capsules, in treatment of goiter, cancer, bone-replacement therapy and in cardiovascular surgeries.

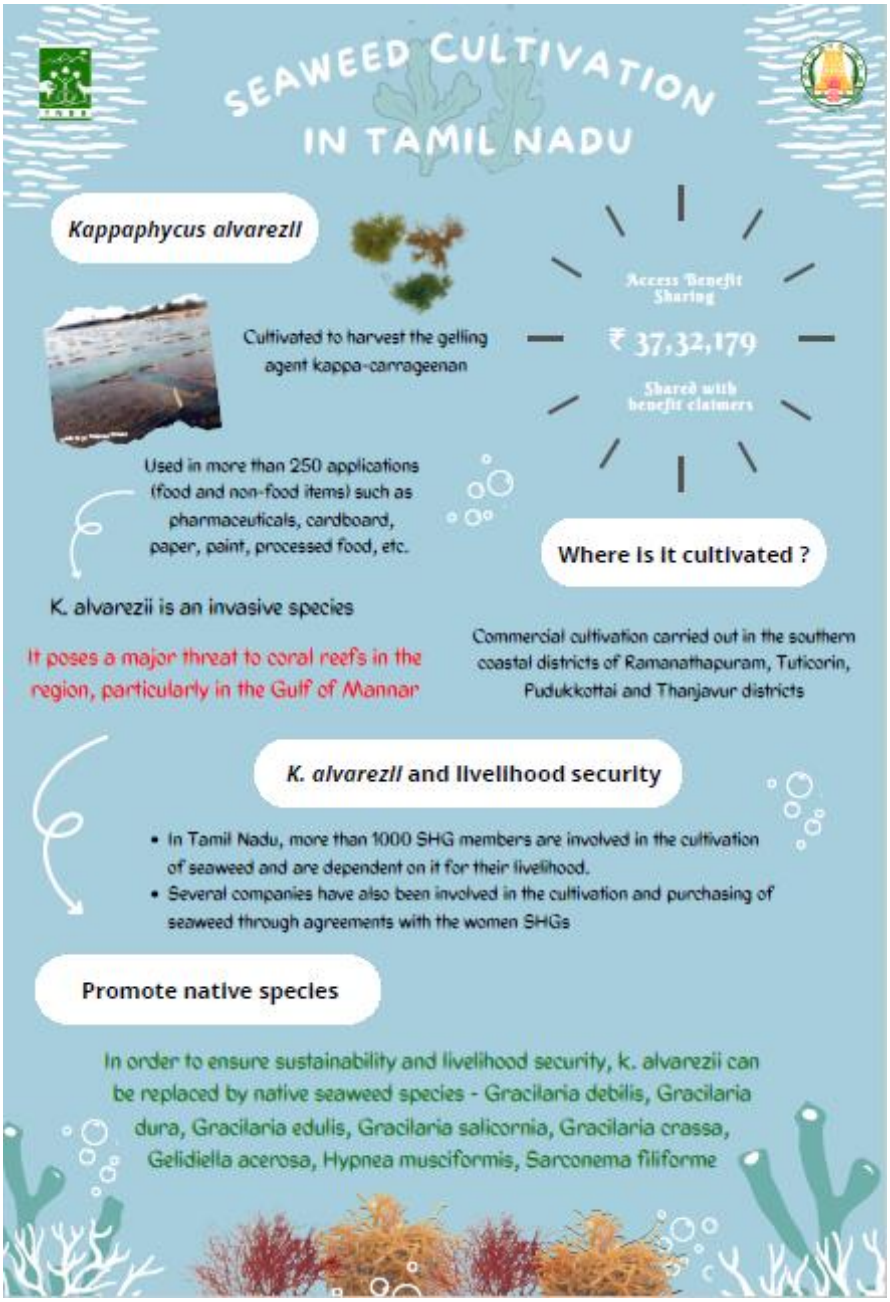

Photo 46. Descriptions of socio-economic impact of seaweed cultivation in Tamil Nadu

c) Biodiversity significance of Tamil Nadu

Tamil Nadu accounts for about 4% of the total area of India with a land mass of 1, 30,058 sq. kms. The state is bestowed with rich biodiversity due to factors such as geographical position, topography, climate and vegetation. Tamil Nadu encompasses three of the ten biogeographic zones: Western Ghats, Deccan Peninsula and the Coasts.

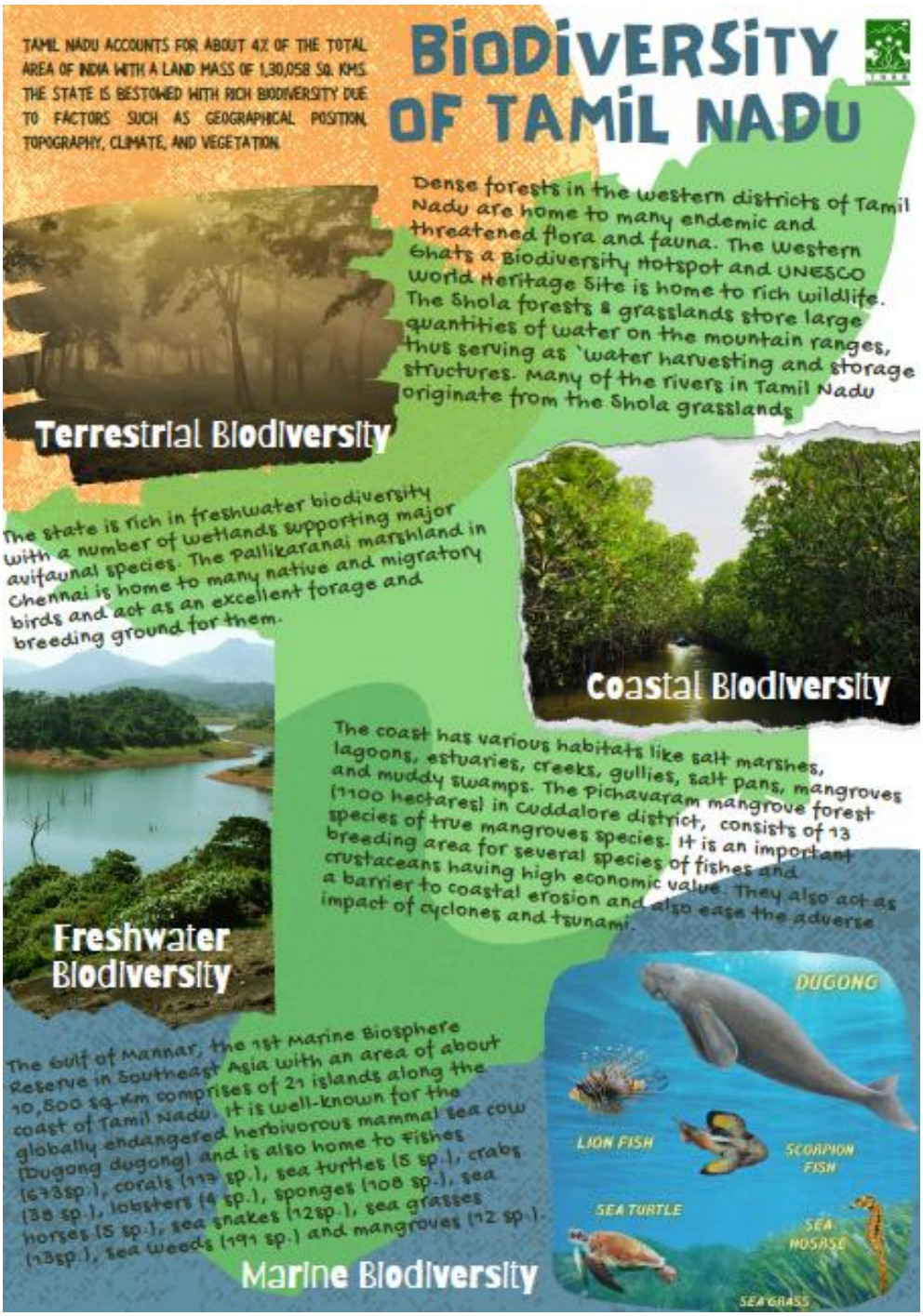

Photo 47. Biodiversity significance of Tamil Nadu

v. Annual report 2021-22

The annual report of Tamil Nadu Biodiversity Board for the FY 2021-22 was prepared with the accounts audited in accordance to the Sections 33, 34 & 35 of the BDA 2002 and the same was submitted on 21.12.2022.

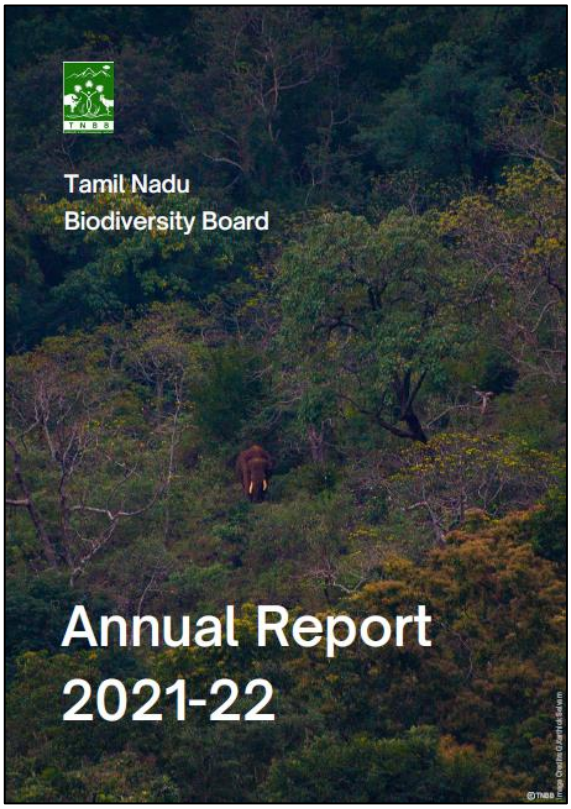

Photo 48. TNBB Annual Report 2021-22

Photo credit: BNHS

7. Brief Articles

a) Arittapatti Biodiversity Heritage Site in Madurai District

Arittapatti Biodiversity Heritage Site was the first Biodiversity Heritage Site in Tamil Nadu. The site covers survey no.379/1 (139.23.00 ha) and 379/2 (00.40.50 ha) of Arittapatti village and survey No. 137 (53.58.00 ha) of Meenakshipuram Bit 1 village. The Arittapatti BHS is rich in Biological, Archaeological and Historical significance. Arittapatti is located 20 km from Madurai, 4km off the Madurai-Tiruchirappalli National Highway. The hillocks are under the jurisdiction of Arittapatti Panchayat, Archaeological Survey of India and Tamil Nadu Minerals Ltd. These hillocks are stepped in history that is 2300 years old revealed in research by the archaeological department between 1966 and 2013. The north-eastern part of the hillocks has a rock cut Siva temple that belongs to Pandian era called Kudavarai Koil. The Siva Linga of this temple is carved out of a granite boulder and it is flanked by sculptures of Vinayaka and Lagulisa (avatar of Siva) on either side.

Photo. 49: Waterbodies of Arittapatti BHS

The 7 hillocks around Arittapatti are home to about 250 species of birds with a very good ratio of raptors among them, signifying a healthy avifaunal population diversity. These birds augment the agricultural wealth of the surrounding environ by enriching the water bodies with their droppings and also by keeping the marauding agricultural pests and insects under check.

Arittapatti BHS and their ecosystem services

i. Function as sole watersheds for about 1000 acres of the catchment areas.
ii. Support rich bird, butterfly and wildlife populations.
iii. Provide archaeological services in the form of old inscriptions and Jain beds.
iv. Provide spiritual services in the form of rock-cut temples.
v. Provide educational service for nature enthusiasts and students from across India.

Significance of Biological Diversity in Arittapatti BHS

The area beholds a rich avifaunal diversity and acts as the only southern home of Laggar falcon3 flagship Raptor species- Laggar falcon, Shaheen Falcon- Schedule 1 and Bonelli's Eagle, rich in butterfly and dragon fly diversity, and also presence of Schedule I wildlife species such as Indian Pangolin, Python, Slender Loris and Spotted Deer & Sambar Deer. The Arittapatti BHS also provides the significant habitat for the endemic flora and fauna. Trees species such as Banyan tree, Sacred fig, Reonja, Black sirissa, Neem, Palmyra palm, Pungan tree, Jamun tree, Pala, Umbrella thron are major flora found in Arittapatti Biodiversity Heritage Sites.

Significance of Irrigation and Water management in Arittapatti BHS

With a 2300 years old history, 200 natural springs, 52 rain shed water bodies, 16th century manmade tank. Arittapatti consists of a chain of seven barren granite hillocks. The unique rocky hill scape functions as a watershed and supports 72 lakes, 200 natural spring pools and 3 check dams. The hillocks form the only source of water for the entire region for domestic needs and irrigation for agriculture.

Archaeological Significance in Arittapatti BHS

The area is steeped in rich and unique archaeological importance. The site also features various megalithic structures, Tamil Brahmi inscriptions, Jain beds, and 2200 year old rock cut temples, lending it historical value.

Photo 50. Arittapatti BHS, Madurai district

b) Sacred Groves in Tamil Nadu

One of the significant outcomes of the interaction of people with nature is the extraordinary reverence towards landscape in general and nature in particular. Central among them are the sacred groves, dedicated to local deities and or ancestral spirits. Thousands of these groves have been documented as storehouses of remarkable biodiversity, repositories of unique and rare plants and home to myriad birds, reptiles and other animal species. Sacred groves probably represent the single most important ecological tradition of ancient Indian culture.

Some of the deities may not be associated with extensive forest cover, most are found intimately connected with at least a small grove of plants. These are the sacred groves dedicated to local deities or ancestral spirits. Most are linked to reservoirs, ponds, springs or streams and many are located in catchments near the origins of springs or streams.

Photo 51: Sendirakillai Sacred groves, Cuddalore district

Sacred groves are the last remnants of the native vegetation of that region. Many villages are still preserving them as regions of numerous native species of plants, animals, insects and micro-organisms. This indicates the efforts made by local communities to protect and preserve their natural forest tracts against the onslaught of the clearing of forests for cultivation and settlement. There are 14,000 sacred groves found all over India. Amirtahlingam (1998) has documented 448

sacred groves in Tamil Nadu. Recent study, however, suggests that the number of groves in Tamil Nadu aloe is over 1250.

Sacred groves in India can be classified into two groups- traditional protected groves and temple groves. The village deity is said to reside in a traditional protected grove, and is represented by an elementary symbol. A temple grove is created around a temple and conserved. Sometimes the groves are found around burial or cremation grounds, as the relatives of the deceased usually plant a tree in memory of the departed soul. Besides, many protected groves were also created due to environmental awareness of various communities.

Protected groves are more important from an ecological point of view. They help in conserving biodiversity. They are often the last refuge of endemic species in the geographical region. Well-conserved groves lead to the recharge of aquifers, namely, ponds, springs, and streams. Similarly, a grove ameliorates soil fertility, helps in soil conservation, and prevents erosion. Large protected groves regulate and support the climate of the vicinal region. Rich faunal wealth is always associated with rich plant diversity, since protected groves and dense forests provide a suitable habitat for wildlife as well. Although there is no clarity on the number of sacred groves in Tamil Nadu as different literature mention different numbers, the state may have more than 15000 sacred groves-some of them well identified and many of them not properly identified. Nevertheless, most of them harbour tremendous amount of the biodiversity- flora and fauna including diverse micro-organisms.

Table 3. Important Sacred groves in Tamil Nadu

Sl. No	Name of the sacred Groves	District
1	Aiyanar Grove	Villupuram
2	Aiyanar Grove	Kallakurichi
3	Karuppuswami Grove	Sivaganga
4	Banagudi Shola	The Nilgiris
5	Kurinji Velappar Koil	Theni

Sl. No	Name of the sacred Groves	District
6	Panchapandava Temple Sacred Grove	the Nilgiris
7	Masinagudi and Basavappa Temple Sacred Grove	the Nilgiris
8	Kandanur Vaigarai Karuppar Kovil & Kanmoi	Sivaganga
9	Solaiandavar Koil & Kurumi Kanmoi	Sivagangai
10	Sendirakkillai Sacred Grove	Cuddalore
11	Kasmpatty Sacred Grove	Dindigul
12	Hanumavilasam temple tamarind grove	Ramanathapuram
13	Keezhputhupet Sacred Groves	Villupuram

In Tamil Nadu, sacred groves are guarded by a number of folk deities and spirits (vanadevathai) such as Aiyanar and Sastha (guarding the village prople by patrolling it every night, mounted on his horses), Muneeswaran or Muniyandi or Muniyappa (a spirit, generally evil or mischievous, who has to be propitiated with blood sacrifices and alcoholic orgies), Karuppuswami (protects the poor, and ensures justice and self-discipline among his belivers), Veeran (Kaaval dheivam or protective deity), Andavar (a powerful wish-fulfilling deity), Semmalaiyappa, Sadaiyappah. Peritaswami, Puliyadiyan, Thandavarayan, Periyandavar and Vediyappan are some of the other male deities found in the sacred groves. Goddesses such as Kali (fierce protector of people), Ellaikali (protector of the village boundaries), Ellaipidari (guardian against evil spirits and epidemics).

References

1. Amairthalingam, M. "Sacred groves of Tamil Nadu and their Management." Forest Department, Government of Tamil Nadu, Chennai (2012).

c) Threatened plants and animals of Tamil Nadu

(i) Table 4. Threatened plant species of Tamil Nadu

Sl. No	Scientific name	Family	IUCN status
1.	*Acranthera grandiflora*	Ruiaceae	Endangered
2.	*Actinodaphne lanata*	Fabaceae	Endangered
3.	*Belosynapsis kewensis*	Commenlinaceae	Endangered/Possibly Extinct
4.	*Ceropegia fimbriifera*	Asclepiadaceae	Vulnerable
5.	*Ceropegia maculata*	Asclepiadaceae	Endangered/Possibly Extinct
6.	*Ceropegia spiralis*	Asclepiadaceae	Vulnerable
7.	*Ceropegia thwaitesii*	Asclepiadaceae	Vulnerable
8.	*Crotalaria fysonii*	Fabaceae	Endangered
9.	*Eriochrysis courtallense*	Poaceae	Presumed Extinct
10.	*Eugenia singampattiana*	Myrtaceae	Endangered/ Possibly Extinct
11.	*Euonymus angulatus*	Celastraceae	Endangered
12.	*Humboldtia boudilloni*	Fabaceae	Endangered
13.	*Hydnocarpus macrocarpa*	Flacourtiaceae	Endangered
14.	*Impatiens neo-barnesii*	Balsaminaceae	Endangered
15.	*Impatiens nilagirica*	Balsaminaceae	Endangered
16.	*Kingiodendron pinnatum*	Fabaceae	Rare
17.	*Melicope indica*	Rubiaceae	Vulnerable

Sl. No	class	Scientific name (Common name)	IUCN Status
18.	*Memecylon flavescens*	Melastomataceae	Endangered
19.	*Meteoromyrtus wynaadensis*	Myrteaceae	Endangered
20.	*Miliusa nilagirica*	Annonaceae	Vulnerable
21.	*Neuracanthus neesianus*	Acanthaceae	Endangered
22.	*Nothopegia aureo-fulva*	Anacardiaceae	Endangered
23.	*Plectranthus bishopianus*	Lamiaceae	Possibly Extinct
24.	*Popowia beddomeana*	Annonaceae	rare
25.	*Santapaua madurensis*	Acanthaceae	Endangered
26.	*Syzygium courtallense*	Myrtaceae	Endangered
27.	*Syzygium gambleanum*	Myrteaceae	Endangered
28.	*Utleria salicifolia*	Periplocaceae	Endangered
29.	*Vanda wightii*	Orchidaceae	Possibly Extinct
30.	*Wendlandia angustifolia*	Rubiaceae	Possibly Extinct

References

1. Nayar, M. P., and Addala Rama Krishna Sastry. "Red data book of Indian plants." (No Title) (1987).
2. Biodiversity India portal- Checklist of Threatened plants of India

Ceropegia spiralis

Vanda wightii

Kingiodendron pinnatum

Humboldtia boudilloni

Impatiens nilagirica

Hydnocarpus macrocarpa

Photo 52: Threatened plant species of Tamil Nadu

Photo source: www.google.com (downloaded on 28.12.2023)

(ii) Table 5. Threatened animals of Tamil Nadu

Sl. No	class	Scientific name (Common name)	IUCN Status	Family
1.	Reptiles	*Rhinophis travancoricus* (Tamil Nadu earth snake)	Endangered	Uropeltidae
2.	Reptiles	*Platyplectrurus madurensis* (Travancore Hills thorntail snake)	Endangered	Uropeltidae
3.	Reptiles	*Python molurus* (Indian Rock Phython)	Near Threatened	Pythonidae
4.	Reptiles	*Ahaetulla perroteti* (Perrotet's vine)	Endangered	Colubridae
5.	Mammals	*Macaca silenus* (Lion-tailed macaque)	Endangered	Cercopithecidae
6.	Mammals	*Cremnomys Elvira* (Elvira rat)	Critically Endangered	Muridae
7.	Mammals	*Latidens salimalii* (Salim Ali's fruit bat)	Endangered	Pteropodidae
8.	Mammals	*Hipposideros Pomona* (Pomona roundleaf bat)	Endangered	Hipposideridae
9.	Mammals	*Nilgiritragus hylocrius* (Nilgiri Tahr)	Endangered	Bovidae
10.	Mammals	*Ratufa macroura* (Grizzled giant squirrel)	Near Threatened	Sciuridae
11.	Mammals	*Rusa unicolor* (Sambar Deer)	Vulnerable	Cervidae
12.	Mammals	*Panthera tigris* (Tiger)	Endangered	Felidae
13.	Mammals	*Panthera pardus* (Leopard)	Vulnerable	Felidae
14.	Mammals	*Hyaena hyaena* (Striped hyaena)	Vulnerable	Hyaenidae
15.	Mammals	*Elephas maximus* (Asian Elephant)	Endangered	Elephantidae
16.	Pisces	*Pristis pristis* (Largetooth sawfish)	Critically Endangered	Pristidae
17.	Pisces	*Carcharhinus hemiodon* (Pondicherry shark)	Critically Endangered	Carcharhinidae

Sl. No	class	Scientific name (Common name)	IUCN Status	Family
18.	Amphibians	*Nyctibatrachus major* (Malabar Night frog)	Endangered	Nyctibatrachidae
19.	Amphibians	*Raorchestes signatus* (Star eyed bush frog)	Endangered	Rhacophoridae
20.	Amphibians	*Raorchestes tinniens* (Nilgiri bush frog)	Endangered	Rhacophoridae
21.	Amphibians	*Ghatixalus variabilis* (Green tree frog)	Endangered	Rhacophoridae
22.	Birds	*Aythya farina* (Common pochard)	Vulnerable	Anatidae
23.	Birds	*Sterna aurantia* (River tern)	Vulnerable	Laridae
24.	Birds	*Anhinga melanogaster* (Oriental darter)	Near Threatened	Anhingidae
25.	Birds	*Pelecanus philippensis* (spot-billed pelican)	Near Threatened	Pelecanidae
26.	Birds	*Threskiornis melanocephalus* (black-headed ibis)	Near Threatened	Threskiornithidae
27.	Birds	*Gyps bengalensis* (White-rumped vulture)	Critically Endangered	Accipitridae
28.	Birds	*Gyps indicus* (Indian Long billed Vulture)	Critically Endangered	Accipitridae
29.	Birds	*Calidris pygmaea* (Spoon-billed Sandpiper)	Critically Endangered	Scolopacidae
30.	Birds	*Sarcogyps calvus* (Red headed Vulture)	Critically Endangered	Accipitridae

References

1. Mogalekar, H. S., et al. "Marine and estuarine fish fauna of Tamil Nadu, India." Proceedings of the International Academy of Ecology and Environmental Sciences 8.4 (2018): 231-271.
2. Siva, T. "Sighting of threatened amphibians from the Avalanche Forest in Western Ghats, Nilgiris, Tamil Nadu." (2020).
3. Article on “Bird Survey in Tamil Nadu Finds Several Vulnerable and Nearly-Extinct Species; A Good Sign, Says TN Wildlife Department” published Tamil Nadu Forest Department (Wildlife)

Macaca silenus

Nilgiritragus hylocrius

Python molurus

Gyps indicus

Ghatixalus variabilis

Anhinga melanogaster

Photo 53: Threatened animal species of Tamil Nadu
Photo source: www.google.com (downloaded on 28.12.2023)

Photo 54. Pallikaranai Marshland (Ramsar Site), Chennai

Photo credit: TNBB

8. *Delegations to the TNBB during 2022-23*

i. Meeting with Japan International Corporation Agency (JICA) team

Delegates from Japan visited the TBGP campus as part of the JICA project on 31st August 2022 and 3rd September 2022. Dr Shekhar Kumar Niraj IFS, PCCF & Secretary, TNBB presented the current scenario of implementation of BDA 2002, in the state of Tamil Nadu and how the JICA project could be consider collaborating with TNBB in implementing the mandates of the Board.

Photo 55. Dr. Shekhar Kumar Niraj, IFS, PCCF& Secretary made a presentation on BDA, 2002 to JICA team

ii. Interaction and presentation to NBA interns

The National Biodiversity Authority (NBA), the Ministry of Environment, Forests and Climate Change (MoEFCC) and the United Nations Development Programme (UNDP) have been offering the Biodiversity Samrakshan Internship Program (BSIP) since 2020.

The interns of 2021-22 batch (3rd cycle) visited the Tamil Nadu Biodiversity Board on 19 July 2022 as part of their training program. Dr. Shekhar Kumar Niraj, IFS, PCCF and Secretary, TNBB gave a short presentation which was followed by an interactive session. Thiru. Sanjay Kumar Srivastava, IFS (Retd), Ex- PCCF and Board Member, TNBB and Thiru. Vigender Singh Malik IFS, PCCF and CPD, TBGP, also interacted with the interns.

Photo 56. BSIP Interns of NBA, 2021-22 batch (3rd cycle) visited the Tamil Nadu Biodiversity Board on 19 July 2022 for Training Programme

Photo 57. Dr. Shekhar Kumar Niraj, PCCF & Secretary, TNBB along with BSIP Interns of NBA, 2021-22 batch (3rd cycle) at Tamil Nadu Biodiversity Board, Chennai

9. Chairpersons and Secretaries of TNBB during 2022-23

Chairpersons

Thiru. K. Ramachandrrran

Chairman, TNBB & Hon'ble Minister for Forests

Dr. M. Mathiventhan

Chairman, TNBB & Hon'ble Minister for Forests

Secretaries

Name	From	To
Thiru. Debasis Jana, IFS Additional Principal Chief Conservator of Forests and Secretary, TNBB	18.08.2021	18.03.2022
Dr. Shekhar Kumar Niraj, IFS Principal Chief Conservator of Forests and Secretary, TNBB	18.03.2022	Present

Photo credit: BNHS

10. Audit Report and Financials

Table 6. Annual income- expenditures statement of TNBB during 2022-33

Tamil Nadu Biodiversity Board Annual Income- Expenditures Statement during 2022- 2023		
Head of Accounts	**Budget Allotment/ Amount credited**	**Total Expenditure**
G.O. (D) No.187 dated 10.08.2022 "2406 Forestry and Wildlife - 02 Environmental Forestry and Wild life - 800 Other Expenditure - State Expenditure - AC Assistance to Tamil Nadu Biodiversity Board - 309 Grants in Aid - 01 Grants for Current Expenditure (DPC: 2406-02-800-AC-30901)" Staff Salary and Non Salary	8631209	5867591
Grant In Aid received from NBA NBA No3/113/11-12/SSB/995 dated 7.6.2022 Rs500000/ NBA No3/113/11-12/SSB/304 dated 9.9.2022 Rs300000/ NBA No3/113/11-12/SSB/3702dated 26.12.2022 Rs532558/	1332558	722600
IDB Celebration 2023	550000	467932
Grant Received from Tamil Nadu Forest Department (PCCF)	12500000	-
Interest return to NBA		51841
Total	**23013767**	**7109964**

TAMILNADU BIODIVERSITY BOARD

2nd Floor, TBGP Campus, Tambaram - Velachery Main Road
Medavakkam, Chennai, Tamil Nadu - 600 100

BALANCE SHEET AS ON 31ST MAR 2023

	Particulars	Amount	Amount
I	**EQUITY AND LIABILITIES**	INR	INR
1	**Reserves and Surplus**		
	ACCOUNT OPENING FUND - 2009		1,000
	GENERAL RESERVE		
	Opening balance	1,10,15,017	
	Add : Excess of income over Expenditure	52,31,906	
	Add Unspent Amount Return	-	1,62,46,923
	GRANT IN AID - NATIONAL BIODIVERSITY AUTHORITY - BMC	31,96,912	
	Less: Amount Spent for BMC	-	31,96,912
	GRANT IN AID - NATIONAL BIODIVERSITY AUTHORITY - ABS	6,26,260	
	ADD: Received during the year 95%	70,58,966	
	Less: Amount Spent for ABS	19,000	76,66,226
	Fund From TIDEL- Short Filim		15,00,000
	T.N CAMPA FUND	1,25,00,000	1,25,00,000
	International Day Celebrations Fund		
	Received (including Reimbursements)	5,78,967	
	Spent during the year	4,27,272	1,51,695
3	**Non - Current Liabilities**		-
	Current Liabilities		-
	TOTAL EQUITY AND LIBILITIES		**4,12,62,756**
1	**ASSETS**		
	Non - Current Assets		
	Fixed Assets		8,29,032
2	**Current Assets**		
	Short Salary Deductions		1,54,630
	Cash and Cash Equivalents		4,02,79,094
	TOTAL ASSETS		**4,12,62,756**

Financials include Notes forming parts of accounts
Compiled from Information furnished

For **SLS ASSOCIATES**
Chartered Accountants Firm Reg. No : 05951S
LAKSHMISUBRAMANIAN
PARTNER
Membership No. : 028927
ICAI-UDIN- 23028927BGVWBF6301
Place:Chennai
Date: 29th Dec 2023

For on Behalf of theTamil Nadu Biodiversity Board

30.12.23
Dr **Shekhar Kumar Nitaj (IFS)**
PCCF & MEMBER SECRETARY

29/12/23
R. Murugadevan
Administrative Officer (i/c)

SLS ASSOCIATES ★ CHARTERED ACCOUNTANTS ★ Chennai-93

29 DEC 2023

TAMIL NADU BIODIVERSITY BOARD ★ CHENNAI - 100 ★

TAMILNADU BIODIVERSITY BOARD

2nd Floor, TBGP Campus, Tambaram - Velachery Main Road
Medavakkam, Chennai, Tamil Nadu - 600 100

Statement of Income and Expenditure for the year ended 31-Mar-2023

	Particulars	Amount
I	**Income**	**INR**
	GRANT IN AID - NATIONAL BIODIVERSITY AUTHORITY - Salary & Non Salary	34,63,767
	GRANT IN AID - Government of Tamil Nadu - Salary & Non Salary	65,00,000
	Sub - Total (I)	**99,63,767**
II	**Other Income**	
	Interest on Savings Ac	7,71,865
	ABS Sharing 2.5% & others	5,77,622
	Form - 1 Application Fees & ABS Amount	21,010
	NBA-Benfit Sharing -Income	9,83,662
	Sub - Total (II)	**23,54,159**
III	**TOTAL INCOME (I + II)**	**1,23,17,926**
IV	**EXPENSES**	
	BOOKS AND PUBLISHING EXPENSES	14,579
	BOARD MEETING EXPENSES	1,15,335
	RENT AND MAINTENANCE	7,66,702
	SALARIES AND WAGES - STAFF	46,56,798
	SALARIES AND WAGES - OTHERS	35,653
	ADMINISTRATIVE EXPENSES	13,25,510
	DEPRECIATION	1,71,443
	TOTAL EXPENSES	**70,86,020**
V	**Surplus - Excess of over income over Expenditure**	**52,31,906**

Financials include Notes forming parts of accounts
Compiled from Information furnished

For **SLS ASSOCIATES**
Chartered Accountants
Firm Reg. No : 05951S
LAKSHMISUBRAMANIAN
PARTNER
Membership No. : 028927
ICAI-UDIN- 23028927BGVWBF6301
Place: CHENNAI
Date: 29th Dec 2023

SLS ASSOCIATES Chennai-93 CHARTERED ACCOUNTANTS

29 DEC 2023

For on Behalf of the Tamil Nadu Biodiversity Board

30.12.23
Dr Shekhar Kumar Niraj (IFS)
PCCF & MEMBER SECRETARY

30/12/23
R.Murugadevan
Administrative Officer (i/c)

TAMIL NADU BIODIVERSITY BOARD CHENNAI-100

TAMILNADU BIODIVERSITY BOARD

2nd Floor, TBGP Campus, Tambaram - Velachery Main Road
Medavakkam, Chennai, Tamil Nadu - 600 100

Cash Flow Statement for the year ended 31-Mar-2023

	Particulars	Amount
I	**OPENING BALANCE**	INR
	BANK ACCOUNTS	1,53,81,549
	CASH	-
	Sub - Total (I)	**1,53,81,549**
II	**RECEIPTS**	
	GRANT IN AID - NATIONAL BIODIVERSITY AUTHORITY - ABS & Govt	34,63,767
	ABS Sharing 2.5% & others	5,77,622
	Interest on Savings Ac	7,71,865
	Form - 1 Application Fees & ABS Amount	21,010
	NBA-Benfit Sharing -Income	9,83,662
	NBA-ABS 95% Share	70,58,966
	Grant in Aid from Tamil Nadu - Sal & Non Sal	65,00,000
	T.N CAMPA	1,25,00,000
	International Celebrations Day - Bio Diveristy Board	5,78,967
	Festival Advance & other deductions recovery	16,000
	Sub - Total (II)	**3,24,71,859**
III	**PAYMENTS**	
	FIXED ASSETS	1,73,465
	GRANT IN AID - ABS SURRENDER	-
	BOOKS AND PUBLISHING EXPENSES	14,579
	BOARD MEETING EXPENSES	1,15,335
	RENT AND MAINTENANCE	7,66,702
	SALARIES AND WAGES - STAFF	46,56,798
	SALARIES AND WAGES - CONTRACT STAFF	35,653
	ADMINISTRATIVE EXPENSES	13,25,510
	District biodiversity - ABS	19,000
	international day celebrations	4,27,272
	Festival Advance	40,000
	Sub - Total (II)	**75,74,314**
IV	**CLOSING BALANCE**	
	BANK ACCOUNTS	4,02,79,094
	CASH	-
	Sub - Total (I)	**4,02,79,094**

Financials include Notes forming parts of accounts
Compiled from Information furnished

For **SLS ASSOCIATES**
Chartered Accountants
Firm Reg. No : 05951S
LAKSHMISUBRAMANIAN
PARTNER
Membership No. : 028927
ICAI-UDIN- 23028927BGVWBP6301
Place: CHENNAI
Date: 29th Dec 2023

29 DEC 2023

SLS ASSOCIATES Chennai-93 CHARTERED ACCOUNTANTS

For on Behalf of the Tamil Nadu BiodiversityBoard

30.12.23
Dr Shekhar Kumar Niraj (IFS)
PCCF & MEMBER SECRETARY

29/12/23
R. Murugadevan
Administrative Officer (i/c)

TAMIL NADU BIODIVERSITY BOARD CHENNAI-100

TAMILNADU BIODIVERSITY BOARD

As per Income Tax Act for FY 2022-23

Amt in INR

Particulars	WDV as on 31/03/2022	Addition		Deletion	Total	Rate as per	Depericati on	WDV as on 31/03/2023
		< 180 days	> 180 days					
Plant & Machiner	37,339		67,900		1,05,239	15%	10,693	94,546
Computer and Components	2,61,626	39,649			3,01,275	40%	1,04,650	1,96,625
Furniture and Fixture	5,28,045		65,916		5,93,961	10%	56,100	5,37,861
Total	**8,27,010**	**39,649**	**1,33,816**	**-**	**10,00,475**		**1,71,443**	**8,29,032**

29/12/23

Administrative Officer
Tamil Nadu Biodiversity Board
Chennai - 600 100.

30-12-23

PCCF & Secretary
Tamil Nadu Biodiversity Board
Chennai-600 100.

S.L.S ASSOCIATES ★ CHARTERED ACCOUNTANTS ★ Chennai-93

29 DEC 2023

TAMIL NADU BIODIVERSITY BOARD ★ CHENNAI-100 ★

Photo 58. Arittapatti Biodiversity Heritage Site, Madurai

Photo Credit: TNBB

Concept, design, and content writing by

Dr. Shekhar Kumar Niraj
P. Dineshkumar

with contributions from

Ajeeth A. N
S. Varsha

Arittapatti BHS has a rich biological, geological and historical significance with the presence of at least 100 bird species including 3 flagship raptor species- Laggar falcon, Shaheen falcon and Bonellis eagle and wild animals such as Indian Pangolin, Python and Slender Loris. It consists of granite inselbergs and supports 72 lakes, 200 natural spring pools and 3 check dams.

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Tamil Nadu Biodiversity Board
TBGP Campus, II Floor,
Velacherry- Tambaram Main Road,
Nanmangalam, Medavakkam Post,
Chennai-100
Tel: 044- 22782730
E-mail: secy.tnbb@tn.gov.in
Website: www.tnbb.tn.gov.in