Fostering Sustainable Fishing and Freshwater Biodiversity Conservation: A Community Outreach in Tuatunu Indah, Gerunggang, Pangkalpinang

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Abstract

Freshwater ecosystems in Bangka Island, Indonesia, are under threat from habitat loss, pollution, and unsustainable fishing practices, endangering endemic fish species such as *Betta burdigala*, *Betta chloropharynx*, *Betta schalleri*, *Parosphromenus deissneri*, *Parosphromenus juelinae*, *Encheloclarias tapeinopterus*, and *Sundadanio gargula*. In response, a community outreach program was conducted on June 28, 2024, in Tuatunu Indah Subdistrict, Gerunggang District, Pangkalpinang City, Bangka Belitung Islands Province, by the Natural Resource Conservation Study Program of Universitas Muhammadiyah Bangka Belitung and the Biology Department of Universitas Indo Global Mandiri. The program aimed to promote environmentally sustainable freshwater fishing practices through a three-stage approach: pretest, educational session, and posttest. Twelve participants engaged in interactive sessions emphasising traditional, low-impact fishing methods such as rod fishing, bubu (traps), and serok (scoop nets), while discouraging destructive practices like poisoning and electrocution. Comparative analysis of test results showed a significant increase in knowledge, with average scores rising from 52.50 to 81.67, indicating a 55.6% improvement. The success of this initiative demonstrates the effectiveness of community-based conservation education in enhancing awareness and promoting ethical fishing practices. It highlights the importance of integrating local knowledge with biodiversity protection strategies and supports the scalability of similar outreach efforts across other ecologically vulnerable regions in the Bangka Belitung Islands.

Keywords

Freshwater biodiversity conservation, sustainable fishing practices, community-based environmental education

Introduction

Freshwater ecosystems are among the most vulnerable habitats on Earth, particularly in island regions experiencing rapid land-use changes and ecological degradation. Bangka Island, located in the Bangka Belitung Islands Province of Indonesia, is widely recognized for its rich biodiversity. It is known as the "Island of a Thousand Pits" due to the numerous small lakes formed by tin mining. These freshwater environments support several endemic and threatened fish species, including *Betta burdigala* (Tempalak Mirah), *Betta chloropharynx* (Tempalak Budu), *Betta schalleri* (Tempalak Pungor), *Parosphromenus deissneri* (Gurami Paros), *Parosphromenus juelinae* (Tempalak Igik Labu), *Encheloclarias tapeinopterus* (Kelik Sulung), and *Sundadanio gargula* (Bebieu), which are categorized as threatened under the IUCN Red List (Syafutra, 2024b; Low, 2020; Low, 2019a; Low, 2019b; Low, 2019c; Lumbantobing, 2019; Ng, 2018).

However, the survival of these species is increasingly threatened by habitat loss, water pollution, unsustainable fishing practices, and climate change. The destruction of peat swamp forests and the conversion of land for agriculture and mining have severely degraded the natural habitats of freshwater fish (Giesen & Sari, 2018). In addition, destructive fishing methods such as electrocution, poisoning, and blasting harm individual species, disrupt the aquatic food web, and damage long-term ecological integrity (Carneiro & Martins, 2022).

The core problem is a widespread lack of awareness and education among local communities regarding sustainable and non-destructive fishing techniques. Despite the existence of regulations and conservation guidelines, the knowledge and adoption of ethical fishing practices remain limited in grassroots communities. Without direct outreach and culturally appropriate educational interventions, the continued use of harmful fishing methods will accelerate biodiversity decline.

While previous works in Indonesia have focused on cataloging endemic fish species and documenting habitat loss, few have actively integrated scientific outreach with grassroots education targeting local communities. This community outreach initiative distinguishes itself by combining conservation science with participatory learning. Rather than passive dissemination, this program actively engages participants through assessment-driven sessions (pretest–education–posttest) to ensure knowledge transfer and attitude change.

In response to these challenges, the Natural Resource Conservation Study Department of Universitas Muhammadiyah Bangka Belitung (Prodi KSDA Unmuh Babel) and the Biology Department of Universitas Indo Global Mandiri (Prodi Biologi UIGM) have initiated a community outreach effort to raise awareness about environmentally friendly fishing techniques. The outreach activity was held in Tuatunu Indah Subdistrict, Gerunggang District, Pangkalpinang City. This activity emphasized the importance of using sustainable fishing tools such as traditional traps (bubu), rod fishing, and scoop nets (serok), while discouraging the use of harmful methods. Participants were also encouraged to use natural baits and adopt a catch-and-release approach when not intending to consume the fish.

Through this community outreach, the program aimed not only to educate local communities about non-destructive fishing techniques but also to promote collective action in conserving freshwater biodiversity. The initiative aligns with broader conservation goals that combine *in situ* habitat protection and *ex situ* conservation strategies, recognizing the role of local communities as key stakeholders in environmental stewardship (Dawson *et al.*, 2021).

Method

This community outreach activity was conducted on June 28, 2024, at the Tuatunu Indah Subdistrict Office (GPS coordinates: 2°6'42.0"S, 106°4'37.5"E), located in Tuatunu Indah Subdistrict, Gerunggang District, Pangkalpinang City, Bangka Belitung Islands Province (Figure 1). The participants of this activity were 12 people.

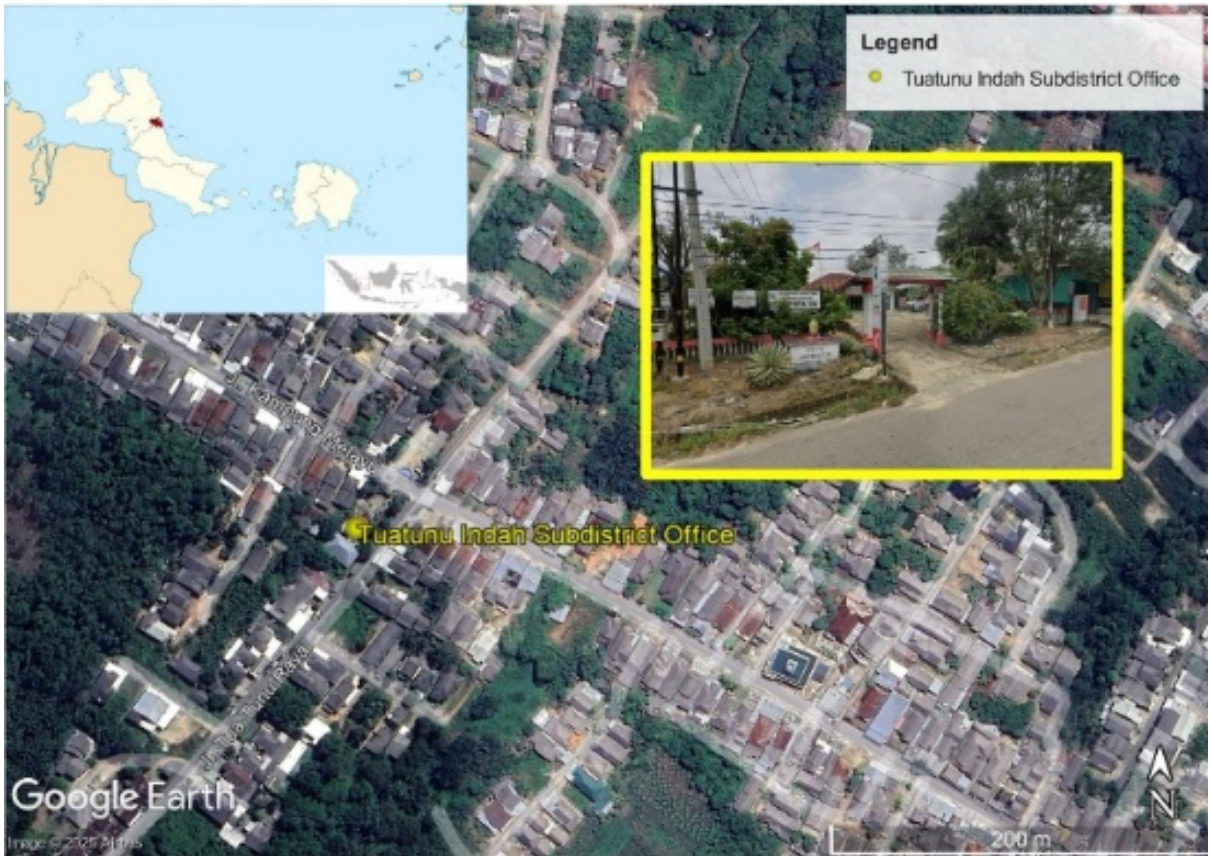


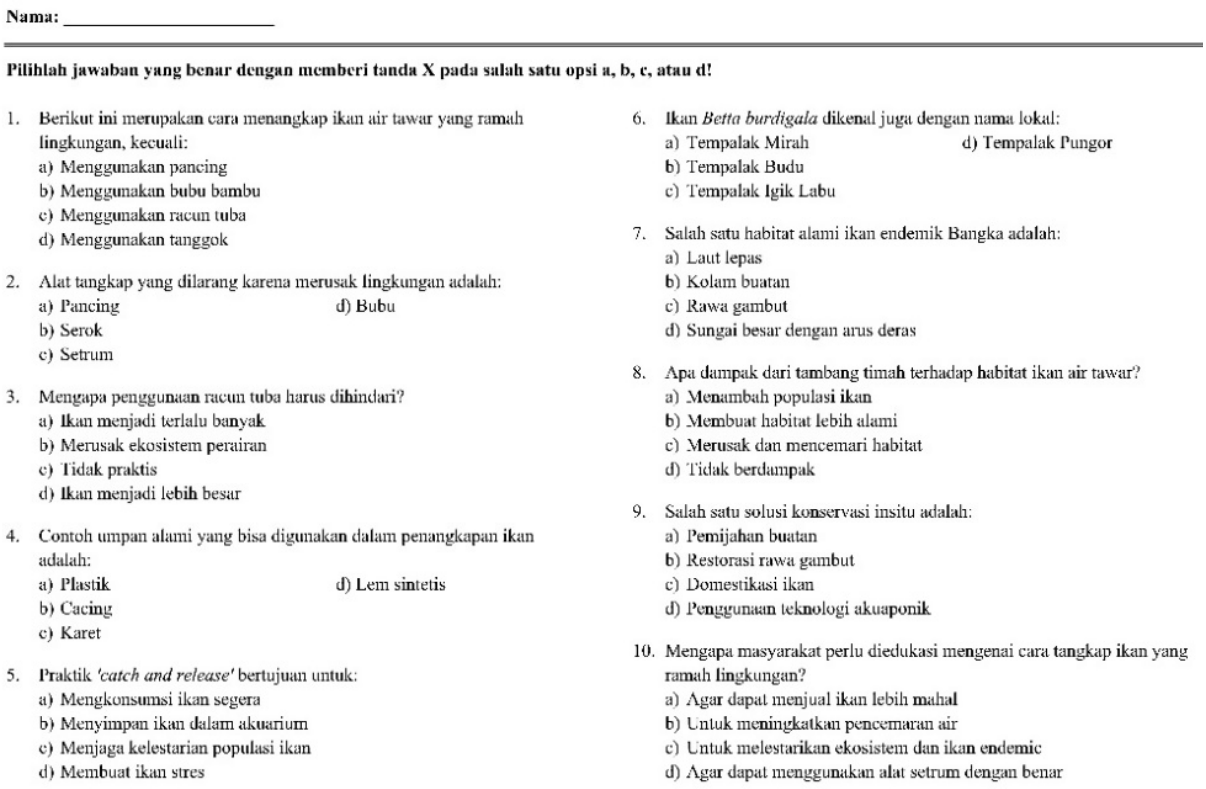
Figure 1. Location of the community outreach program at the Tuatunu Indah Subdistrict Office

The program was carried out in three stages: pretest, educational session, and posttest. The first stage was the pretest, in which participants were given a multiple-choice questionnaire to assess their baseline knowledge of the endemic freshwater fish of Bangka Island and related conservation practices. The test comprised 10 questions, with a total score of 100 points (each question worth 10 points). The pretest served to establish a foundational understanding before the educational intervention (Syafutra, 2024a; Syafutra, Pitriyana, *et al*., 2024; Syafutra & Bayu, 2024).

The second stage involved the delivery of educational content through an interactive presentation. During this session, participants received information about the endemic freshwater fish of Bangka Island and strategies for their conservation. The presentation utilized PowerPoint slides (Figure 2) incorporating engaging visuals and relevant facts to enhance understanding and maintain participants' interest. An interactive Q&A session followed the presentation to encourage active participation and to ensure comprehension of the material (Syafutra, 2024a; Syafutra, Pitriyana, *et al*., 2024; Syafutra & Bayu, 2024; Syafutra, Handayani, *et al*., 2024; Syafutra, Apriyani, Fatmawati, *et al*., 2023; Syafutra, Handayani, *et al*., 2023; Syafutra, Apriyani, Heri, *et al*., 2023).

Figure 2. A slide from the PowerPoint presentation used as an educational medium during the session

The third stage was the posttest. Similar to the pretest, participants completed a multiple-choice test to assess their knowledge after the educational session. The posttest aimed to evaluate the effectiveness of the educational program. It consisted of 10 questions formatted similarly to the pretest to ensure accurate comparisons (Figure 3). Posttest results were then compared with pretest results to measure the extent of knowledge improvement among participants (Syafutra, 2024a; Syafutra, Pitriyana, *et al*., 2024; Syafutra & Bayu, 2024).



Nama: _____

Pilihlah jawaban yang benar dengan memberi tanda X pada salah satu opsi a, b, c, atau d!

1. Berikut ini merupakan cara menangkap ikan air tawar yang ramah lingkungan, kecuali:
   a) Menggunakan pancing
   b) Menggunakan bubu bambu
   c) Menggunakan racun tuba
   d) Menggunakan tanggok

2. Alat tangkap yang dilarang karena merusak lingkungan adalah:
   a) Pancing
   b) Serok
   c) Setrum
   d) Bubu

3. Mengapa penggunaan racun tuba harus dihindari?
   a) Ikan menjadi terlalu banyak
   b) Merusak ekosistem perairan
   c) Tidak praktis
   d) Ikan menjadi lebih besar

4. Contoh umpan alami yang bisa digunakan dalam penangkapan ikan adalah:
   a) Plastik
   b) Cacing
   c) Karet
   d) Lem sintetis

5. Praktik *'catch and release'* bertujuan untuk:
   a) Mengkonsumsi ikan segera
   b) Menyimpan ikan dalam akuarium
   c) Menjaga kelestarian populasi ikan
   d) Membuat ikan stres

6. Ikan *Betta burdigala* dikenal juga dengan nama lokal:
   a) Tempalak Mirah
   b) Tempalak Budu
   c) Tempalak Igik Labu
   d) Tempalak Pungor

7. Salah satu habitat alami ikan endemik Bangka adalah:
   a) Laut lepas
   b) Kolam buatan
   c) Rawa gambut
   d) Sungai besar dengan arus deras

8. Apa dampak dari tambang timah terhadap habitat ikan air tawar?
   a) Menambah populasi ikan
   b) Membuat habitat lebih alami
   c) Merusak dan mencemari habitat
   d) Tidak berdampak

9. Salah satu solusi konservasi insitu adalah:
   a) Pemijahan buatan
   b) Restorasi rawa gambut
   c) Domestikasi ikan
   d) Penggunaan teknologi akuaponik

10. Mengapa masyarakat perlu diedukasi mengenai cara tangkap ikan yang ramah lingkungan?
    a) Agar dapat menjual ikan lebih mahal
    b) Untuk meningkatkan pencemaran air
    c) Untuk melestarikan ekosistem dan ikan endemic
    d) Agar dapat menggunakan alat setrum dengan benar

Figure 3. The set of ten pretest/posttest multiple-choice questions

Results and Discussion

The results of this community outreach program demonstrate a significant improvement in participants' understanding of environmentally sustainable freshwater fishing practices. Based on the comparison of pretest and posttest results (Table 1), the average pretest score among the 12 participants was 52.50, while the posttest average increased to 81.67. This increase indicates a 55.6% improvement in knowledge following the educational session.

The relatively low average pretest score can be attributed to several factors. First, most participants were from local communities with limited formal exposure to conservation science or freshwater biodiversity issues. While they may have practical fishing experience, their understanding of the ecological impacts of destructive fishing methods or the specific status of endemic species was minimal. Additionally, there has historically been a lack of accessible environmental education programs in Tuatunu Indah and similar subdistricts, leading to gaps in foundational knowledge. This situation reflects a broader challenge in many rural communities in Bangka Island, where conservation awareness has not yet been integrated into everyday practices or local governance

frameworks. The pretest results thus underscored the need for structured outreach interventions to bridge this knowledge gap.

Table 1. Pretest and posttest results of participants

Participant	Pretest Score	Posttest Score
Participant No. 1	60	100
Participant No. 2	40	70
Participant No. 3	50	70
Participant No. 4	30	60
Participant No. 5	20	60
Participant No. 6	70	100
Participant No. 7	70	100
Participant No. 8	50	70
Participant No. 9	50	60
Participant No. 10	60	100
Participant No. 11	70	100
Participant No. 12	60	90
Average Score	**52.50**	**81.67**

The data show that all participants experienced an increase in their scores, with the most notable gains seen in participants who initially had limited knowledge (e.g., Participant No. 5 improved from 20 to 60, and Participant No. 4 from 30 to 60). Several participants achieved perfect scores in the posttest, such as Participants No. 1, 6, 7, 10, and 11, indicating a strong grasp of the presented material.

This improvement can be attributed to the clarity of the educational materials, which employed visual aids and interactive discussions (Figure 4). The PowerPoint presentation provided visuals of freshwater fish species endemic to Bangka Island, including *Betta burdigala*, *Betta chloropharynx*, *Betta schalleri*, *Parosphromenus deissneri*, *Parosphromenus juelinae*, *Encheloclarias tapeinopterus*, and *Sundadanio gargula*, alongside maps and photos of their threatened habitats. Moreover, the inclusion of a Q&A segment allowed participants to clarify their understanding and engage with conservation issues directly (Syafutra, 2024a; Syafutra, Pitriyana, *et al*., 2024; Syafutra & Bayu, 2024; Syafutra, Handayani, *et al*., 2024; Syafutra, Apriyani, Fatmawati, *et al*., 2023; Syafutra, Handayani, *et al*., 2023; Syafutra, Apriyani, Heri, *et al*., 2023).

Figure 4. Students showing high enthusiasm during the educational session

The increase in awareness among local participants is significant, considering the ongoing environmental threats in Bangka Island, such as unsustainable land conversion, habitat loss, and destructive fishing practices. The use of tools like electrocution or poison, although sometimes seen as efficient, causes long-term ecological damage and threatens the survival of endemic and endangered fish species (Carneiro & Martins, 2022; Giesen & Sari, 2018).

The program's emphasis on traditional and low-impact fishing methods such as rod fishing, bubu (traditional traps), and serok (scoop nets), aligns with community-based conservation strategies that respect ecological integrity and local livelihoods. Encouraging practices like catch-and-release, especially for non-consumptive fishing, also represents a shift towards ethical and sustainable resource use.

Importantly, this outreach is not an isolated intervention but part of a broader framework of participatory conservation. Community members are not merely recipients of knowledge but active stakeholders in freshwater ecosystem stewardship. This aligns with global conservation principles that recognize the vital role of local communities in biodiversity protection (Dawson *et al.*, 2021; Armitage *et al.*, 2020).

The measurable improvement in knowledge among participants suggests that similar community outreach efforts can be scaled up in other vulnerable regions across the Bangka Belitung Islands. Furthermore, integrating traditional ecological knowledge with modern conservation science can create more resilient and inclusive strategies for freshwater biodiversity protection.

Conclusion

This community outreach program successfully increased local awareness and knowledge of sustainable freshwater fishing practices among participants in Tuatunu Indah, as evidenced by a 55.6% improvement in posttest scores. The initiative demonstrated that targeted education using interactive modules and culturally appropriate communication tools can positively influence community attitudes toward conservation. By promoting traditional, low-impact fishing methods and encouraging ethical practices such as catch-and-release, the program contributes meaningfully to the conservation of endemic and threatened freshwater fish species on Bangka Island. However, a notable limitation of this work is the small sample size (n=12), which may not fully represent the broader local population in the region. Future programs should aim to engage a larger and more diverse participant base, incorporate long-term monitoring, and explore behavioral changes beyond knowledge acquisition to evaluate the sustained impact of such interventions.

Acknowledgement

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