

「ツールシート事例紹介」は、ツールシート作成の元となった事例についてその概要を紹介しており、知恵と工夫、背景、知恵と工夫、実施プロセス、成果、課題、得られた教訓、参考資料等について簡潔にまとめたものである。日本語の後に英語訳を記載している。

The “Case Profile from the Tool Sheet” outlines the case example that informed the creation of the tool sheet, summarizing its background, innovative ideas and tips, implementation process, key achievements, challenges, lessons learned, and relevant references in a concise manner. The English version follows the Japanese text.

ツールシート事例紹介

2026年2月

ツール名	環境と人にやさしい貝殻魚礁 Eco- and user-friendly shell-based artificial reefs		ツール No.	A-5
国	セントルシア、グレナダ			
事例	JICA 技術協力プロジェクト「漁民と行政の共同による沿岸水産資源の保全管理強化プロジェクト (COAST FISH)」(2020年～2026年)			
要旨	セントルシア及びグレナダにおいて、廃棄されたコンク貝殻や廉価な資材を活用した人工魚礁を設置。重機不要で設置可能な貝殻魚礁は、地域漁業者の協力のもと作成され、設置後は魚類や甲殻類の蝟集が確認された。			
背景	カリブ海沿岸では、過去の乱獲や生息環境の劣化により漁業資源が減少している。従来の人工魚礁は高コスト・重機依存であり、地域主導の資源回復には不向きだった。セントルシア、グレナダでは、地域の漁業者が主体的に資源管理に関与する仕組みづくりを目指し、廃棄されるコンク貝殻や PVC 管などを活用し、漁業者自身が設置可能な貝殻魚礁の導入を試みた。			
知恵と工夫	<ul style="list-style-type: none"> ・ 廃棄資材（コンク貝殻・PVC管など）を活用し、漁業者自身が設置可能な構造とすることで、低コストかつ地域主導の資源管理を実現した。 ・ 設置作業を地域住民が担うことで、技能習得と雇用創出を促進し、資源管理への主体的な関与と協働体制を強化した。 ・ 小型設計・浅海域設置によりモニタリングの容易性を高め、漁業者・行政・研究機関による継続的な観察と制度化への基盤を整えた。 			
実施プロセス	<ol style="list-style-type: none"> 1. 設置場所の選定と設計：サンゴ礁や岩礁の間隙にある砂礫底を選定。海洋管理区のレンジャーや地元潜水サービス業者と協議し、PVC管と金網を用いたプロトタイプを設計した。 2. 資材の調達と製作：地元で入手可能なコンク貝殻を活用。アルミ製フレームやPVC VP管を活用し、フェンス用ワイヤーを使わない構造にし、地域住民参加の元で製作を行った。作成費用は1基あたり約250ドルと安価だった。費用の半分以上が溶接工賃であるため、漁業者の中でアーク溶接を行える人間がいれば、費用はさらに安くなると考えられる。 3. 設置作業：船外機漁船とスキューバダイバー2～3名で設置。重機不要で、地元漁業者の協力により低コストで設置が完了した。 4. モニタリングと観察：ダイビングインストラクターや海洋管理区のスタッフと潜水調査を実施。破損や埋没はなく、ブラックバーソルジャーフィッシュやイエローゴートフィッシュ、ロボスターなどの蝟集を確認した。(参考資料1) 			
考察	発展途上国の漁村・沿岸コミュニティでの導入を想定した場合の一般的な人工魚礁と貝殻魚礁の比較を下表に示す。(○：優れている、×：劣っている、△：条件次第)			
	分類	観点	一般的な人工魚礁	貝殻魚礁
	経済性	初期投資額	× 高額な資材・重機・専門業者が必要	○ 地元資材・手作業で構築可能、低コスト
		資材の入手可能性	△ 輸入依存や高コスト資材が多いが、制度支援があれば安定	△ 地元で調達可能だが、貝殻の供給安定性に課題も
地域展開のしやすさ		× 大型構造で輸送・展開に制約あり	○ 軽量・分解可能で展開が容易	
地域参加	地域参加・オーナーシ	× 行政主導になりがち	○ 地域住民の関与・所有感を促進	

		ツブ		
		地域雇用の機会	× 限定的。多くは外部業者に委託される	○ 地域住民による雇用創出と技能習得の可能性が高い
技術		技術・設備要件	× 専門技術・特殊船舶・重機（クレーン船、作業バージ等）・施工業者が必要	○ 漁業者や地域住民による設置が可能
		耐久性・安定性	○ 長期耐久性あり（10年以上）	× 劣化しやすく定期補修が必要
		維持管理の負担	△ 修繕に専門技術が必要だが、長期安定性あり	△ 地元での補修・再構築が可能だが、頻度が高い可能性あり
		運用性	設置場所の柔軟性	× 重量・構造上、設置場所に制限あり
		モニタリングの容易さ	× 深場・大型構造で観察が困難な場合あり	○ 浅場・小型構造で観察が容易
制度		制度との整合性	○ 国家制度・補助金制度との親和性が高い	× 制度化には工夫が必要
環境		水産資源への即効性	○ 魚類の蛸集効果が高い	× 生物定着に時間がかかる場合もある
		環境負荷・資源循環	× 資材製造・輸送に環境負荷あり	○ 廃棄物（貝殻）を再利用し循環促進
<p>基本的に、従来型人工魚礁は「堅牢性・制度的安定性・長期運用」に強みがあり、貝殻魚礁は「柔軟性・地域参加・環境配慮」に優れるという特徴を持つ。両人工魚礁は目的や制度環境に応じて補完的に活用可能である。</p>				
成果	<p>貝殻を利用した人工魚礁は設置後も安定して定着し、魚類や甲殻類の蛸集が見られた。特に若齢ロブスターが魚礁内に集まり、良好な隠れ場所として機能していることが示唆された。また、設置作業を地元漁業者が担うことで、資源管理への関心と主体性が高まり、地域内での協働体制が強化された。従来の重機依存型人工魚礁と比較して、コスト面・運用面での優位性が明確となった。</p>			
課題	<p>コンク貝が地元で調達できない場合には、他地域からの輸送が必要で、安定供給が課題となる。また、フレーム作成には溶接技術が必要であり、技術者の確保がコスト削減の鍵となる。さらに、高い魚類蛸集効果が得られる設置場所の選定や周辺環境との関係性を踏まえた設計が求められるほか、コンクリートブロックを用いた従来型的人工魚礁と比べて耐久性が劣ることから維持管理体制の整備が必要である。啓発活動を継続的に行いながら長期的なモニタリング体制を構築していく必要がある。漁業者、水産局、大学等の研究機関、ダイバー等と連携し、継続的な観察と評価を行う必要がある。なお、一部地域では「コンク貝の貝殻は海に戻してはいけない」という言い伝えがあり、地元住民が貝殻を用いた魚礁を海に沈めることに対して抵抗感を示した事例があった。科学的根拠に基づいた丁寧な説明が求められる。</p>			
教訓	<ul style="list-style-type: none"> 人工魚礁の設計・設置を漁業者自身が担うことで、資源管理への理解と参加意欲が高まる。 廃棄物を活用した構造は、環境負荷の低減と地域資源の循環利用を促進する。 設置後のモニタリングを通じて、漁業者が科学的知見を得る機会となり、共同管理の基盤が強化される。 設置場所の選定基準や魚礁の構造改良、漁業者による簡易モニタリング手法の開発や維持管理体制の構築などを通じて、長期にわたる共同管理モデルの構築を行っていく必要がある。 			
参考資料	<p>1.YouTube video (2023) <i>Artificial Reef activities of COAST FISH project in Laborie, Saint Lucia</i> (https://www.youtube.com/watch?v=4KyQ2qAa2KI)</p>			

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Case Profile from the Tool Sheet

February 2026

Tool Title	Eco- and user-friendly shell-based artificial reefs			Tool No.	A-5
Country	Saint Lucia and Grenada				
Case	JICA Technical Cooperation Project “The Project for Strengthening Sustainable Use and Management of Coastal Fisheries Resource in the CARICOM Countries (COAST FISH)” (2020-2026)				
Summary	In Saint Lucia and Grenada, artificial reefs were installed using discarded conch shells and low-cost materials. These shell-based reefs, which can be deployed without heavy machinery, were constructed with the cooperation of local fishers. Following installation, an aggregation of fish and crustaceans was observed.				
Background	Along the Caribbean coast, fisheries resources have declined due to historical overfishing and habitat degradation. Conventional artificial reefs, which are costly and reliant on heavy machinery, have been unpractical for community-led resource restoration. In Saint Lucia and Grenada, efforts have been made to establish mechanisms that enable local fishers to take an active role in resource management. As part of this initiative, discarded conch shells and PVC pipes were repurposed to create shell-based reefs that fishers themselves can install.				
Innovative ideas and tips	<ul style="list-style-type: none"> • By using discarded conch shells, PVC pipes, and other locally available materials, fishers were able to construct and install reef structures themselves, enabling low-cost, community-led resource management. • Involving local residents in fabrication and deployment promoted skill development and job creation, while strengthening ownership and collaborative engagement in resource stewardship. • The small-scale, shallow-water design allowed for easy monitoring, laying the groundwork for ongoing observation and institutional collaboration among fishers, authorities, and research institutions. 				
Implementation Process	<ol style="list-style-type: none"> 1. Site Selection and Design: Flat sandy gravel bottoms located between coral and rocky reefs were selected as installation sites. In consultation with marine management area rangers and local dive service providers, a prototype was designed using PVC pipes and wire mesh. 2. Material Procurement and Construction: Locally available conch shells were utilized. Aluminum frames and PVC VP pipes were incorporated into a structure that avoided the use of fencing wire. Construction was carried out with participation from community members. The cost per unit was approximately USD 250, making it highly affordable. Since more than half of the cost was attributed to welding labor, it is expected that costs could be further reduced if any fishers are capable of arc welding. 3. Installation Work: Deployment was conducted using small outboard fishing vessels and 2 - 3 scuba divers. No heavy machinery was required, and the installation was completed at low cost through the cooperation of local fishers. 4. Monitoring and Observation: Underwater surveys were conducted with diving instructors and marine management area staff. No damage or burial of the structures was observed, and aggregations of species such as blackbar soldierfish, yellow goatfish, and lobsters were confirmed. <p>(Reference 1)</p>				
Analysis	The table below presents a comparison between conventional artificial reefs and shell-based reefs, assuming implementation in fishing villages and coastal communities in developing countries. (✓✓✓ = Highly suitable ✓✓ = Moderately suitable ✓ = Limited suitability)				
	Category	Criterion	Conventional Artificial Reefs	Shell-based Artificial Reefs	
	Economic	Initial investment cost	✓ High cost due to industrial materials, heavy equipment, and specialized contractors	✓✓✓ Low-cost construction using locally available materials and manual labor	
		Material availability	✓✓ Often reliant on imported or costly materials, but stable if supported by government programs	✓✓ Locally sourced, though shell supply may be inconsistent	
Scalability		✓ Large structures limit transport and scalability	✓✓✓ Lightweight and modular, allowing flexible deployment		

				across sites
Community Engagement	Local ownership and participation	✓ Often top-down, with limited community involvement	✓✓✓ High community engagement and sense of ownership	
	Local employment opportunities	✓ Limited, often outsourced to contractors	✓✓✓ High potential for community-based job creation and skill development	
Technical	Technical and equipment requirements	✓ Requires skilled welding, Specialized vessels and heavy equipment (such as crane ships and work barges), and specialized contractors	✓✓✓ Can be built and deployed by fishers and community members	
	Durability and structural stability	✓✓✓ Long-lasting (10+ years), minimal degradation	✓ Prone to natural wear, requires periodic maintenance	
	Maintenance burden	✓✓ Requires specialized repair but less frequent	✓✓ Community-led maintenance possible, but may be more frequent	
Operational Flexibility	Site adaptability	✓ Heavy and rigid, limiting placement options	✓✓✓ Easily adapted to local bathymetry and fishing zones	
	Monitoring accessibility	✓ Deep-water and large-scale structures hinder visual monitoring	✓✓✓ Shallow and small-scale, enabling diver-based observation	
Institutional	Policy and institutional alignment	✓✓✓ Well-integrated into existing national fisheries programs and subsidy schemes	✓ Requires tailored policy support and local recognition	
Environmental	Immediate impact on fisheries resources	✓✓✓ Strong fish aggregation effect	✓ May require time for ecological colonization	
	Environmental footprint and resource circularity	✓ Industrial production and transport entail environmental costs	✓✓✓ Promotes circular use of shell waste and low-impact materials	
	Generally, conventional artificial reefs offer strengths in structural durability, institutional stability, and long-term operation, while shell-based reefs excel in flexibility, community participation, and environmental sustainability. These two reef types can be complementarily utilized depending on the specific objectives and institutional context.			
Key Achievements	Shell-based artificial reefs have demonstrated stable settlement after deployment, attracting a range of fish and crustacean species. Notably, juvenile lobsters were observed to aggregate within the reef structures, suggesting their function as effective shelter and feeding habitats. Furthermore, involving local fishers in the installation process enhanced their interest and ownership in resource management, reinforcing collaborative frameworks within the community. Compared to conventional, heavy machinery-dependent artificial reefs, the shell-based approach showed clear advantages in terms of cost-efficiency and operational feasibility.			
Challenges	If conch shells cannot be sourced locally, transportation from other regions becomes necessary, posing challenges for stable supply. Additionally, welding skills are required for frame construction, and securing qualified technicians is key to reducing costs. In addition to selecting appropriate deployment sites that yield high fish aggregation effects and designing with consideration for the surrounding environment, it is necessary to establish a maintenance and management system, as the durability of these structures tends to be lower than that of conventional artificial reefs made with concrete blocks. It is essential to establish a long-term monitoring system while continuing awareness-raising activities, in collaboration with fishers, the fisheries office, academic institutions, divers, and other relevant stakeholders to ensure ongoing observation and evaluation. In certain communities, there is a local belief that “conch shells must not be returned to the sea,” and there have been cases where community members expressed concern about submerging conch shells as artificial reefs. This underscores the importance of providing clear, science-based explanations in a culturally sensitive manner.			
Lessons Learned	<ul style="list-style-type: none"> When fishers themselves take the lead in designing and installing artificial reefs, their understanding of resource management and willingness to participate are significantly enhanced. Structures utilizing waste bio-materials contribute to reducing environmental impact and 			

	<p>promote the circular use of local resources.</p> <ul style="list-style-type: none"> • Post-installation monitoring provides fishers with opportunities to gain scientific insights, thereby strengthening the foundation for co-management. • It is essential to establish a long-term co-management model through the development of site selection criteria, structural improvements of the reefs, simplified monitoring methods and operation and maintenance systems that can be implemented by fishers themselves.
References	<p>1. YouTube video (2023) <i>Artificial Reef activities of COAST FISH project in Laborie, Saint Lucia</i> (https://www.youtube.com/watch?v=4KyQ2qAa2KI)</p>

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