SHELLBANK

MARINE TURTLE TRACEABILITY TOOL

Progress and Impact Report 2023/24

A WWF-Coral Triangle Programme production.

SHELLBANK Global Marine Turtle Genetic Database

WWF

NOAA FISHERIES

AUSTRALIAN MUSEUM

TRACE the wildlife forensics network

About the ShellBank Project
ShellBank is a global program dedicated to enhancing marine turtle conservation through genetic traceability. By using DNA analysis, ShellBank helps identify the origins of turtles and turtle products to identify which turtle populations are most at risk and those that require greatest protection, supporting efforts to address key threats like the illegal turtle trade and improve conservation management. As the world's first marine turtle genetic traceability tool, ShellBank provides critical data to researchers, law enforcement agencies, and policymakers to protect threatened turtle populations.

The success of ShellBank is made possible through the collaboration of key partners, including WWF, NOAA's Southwest Fisheries Science Center, the Australian Museum, and TRACE Wildlife Forensics Network. These organizations contribute their expertise in marine conservation, wildlife forensics, and genetic research, ensuring that ShellBank remains at the forefront of innovation in marine turtle conservation, management and protection.

WWF
WWF is an independent conservation organisation, with a global network active in over 100 countries. WWF's mission is to stop the degradation of the Earth's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

WWF directs and coordinates ShellBank.

Southwest Fisheries Science Centre/NOAA Fisheries
The SWFSC is the research arm of NOAA's National Marine Fisheries Service in the Southwest Region. As the NOAA-Fisheries' National Sea Turtle Genetics Lab, the SWFSC Marine Turtle Genetics Program (MTGP) has the lead responsibility for generating, analysing and interpreting genetic data to address the scientific and management needs of the agency.

A priority for NOAA/SWFSC is to implement Recovery Plans for sea turtles under the U.S. Endangered Species Act (ESA) which includes engaging with international partners (such as WWF), to further the science of conservation of sea turtles throughout their range and life cycle.

Australian Museum
The Australian Museum (AM) was founded in 1827 and is the nation's first museum. With more than 21.9 million objects and specimens and the Australian Museum Research Institute (AMRI), the AM is not only a dynamic source of reliable scientific information on some of the most pressing environmental and social challenges facing our region but also an important site of cultural exchange and learning.

Within AMRI, the Australian Centre for Wildlife Genomics (ACWG) is a key example of the scientific and research infrastructure underpinning AMRI research and houses the genomic laboratories and a frozen tissue collection. The research carried out by ACWG and AMRI scientists focuses on species discovery, evolution, practical conservation applications for Australia's threatened species, and improved wildlife forensics testing capacity for species caught in the illegal wildlife trade.

TRACE Wildlife Forensics Network
TRACE Wildlife Forensics Network (TRACE) was established in 2006 as a non-profit organisation dedicated to the promotion of forensic science in wildlife conservation and law enforcement. TRACE's mission is to reduce illegal trafficking and persecution of fauna and flora through the coordinated application of scientific techniques in support of wildlife crime investigation.

The projects TRACE is involved with across 17 countries focus on building capacity in proper managing of wildlife crime scenes to promoting quality assurance in forensic laboratory practices to advising the legal profession in wildlife forensics.

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FOREWORD

Welcome to the ShellBank Progress and Impact Report (2023-2024). I reflect with great pride and excitement on the incredible progress we've made over the past two years. ShellBank has now grown into a global multi-turtle species conservation programme of significant importance.


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DR CHRISTINE MADDEN
Global Marine Turtle Lead,
WWF Coral Triangle

Since its inception, ShellBank has been dedicated to preserving marine turtles by utilising genetic tools to trace and track these majestic creatures and to detect where greater efforts are needed. Our work began across the Asia-Pacific with hawksbill turtles, a critically endangered species heavily targeted by the illegal trade. Since its official launch in November 2022, through the tireless efforts of our global network of partners, we have made significant advances in identifying critical gaps, supporting the analysis of hundreds of genetic samples, and providing training workshops to more than 150 conservation researchers and law enforcers across 4 countries. But our mission didn't stop there.

In 2023, we proudly expanded our database to include green turtles, marking a critical milestone in our journey. This integration enhances our ability to address the threats facing this critical and globally distributed species.

One of the most exciting developments in 2024 has been the launch of our publically accessible online database. This platform represents the culmination of decades of work by the marine turtle community, whose dedication has made this centralised repository of genetic data possible. For the first time, researchers, conservationists, communities, decision-makers, and law enforcement agencies around the globe can access and contribute to this growing resource, enabling more effective conservation, protection and enforcement efforts. This is a monumental step forward in our mission to safeguard marine turtles, and we are thrilled to share it with you.

This year's report is a little different from our last. It's not just an overview of our progress; it's a celebration of the remarkable work being done worldwide using ShellBank. From our collaborations with law enforcement agencies like those in the UK, Hong Kong, and the Philippines to the important research conducted by local scientists in many countries, and those that are just starting with us such as Tanzania, Malaysia, and Fiji; this report highlights the collective power of our global network.

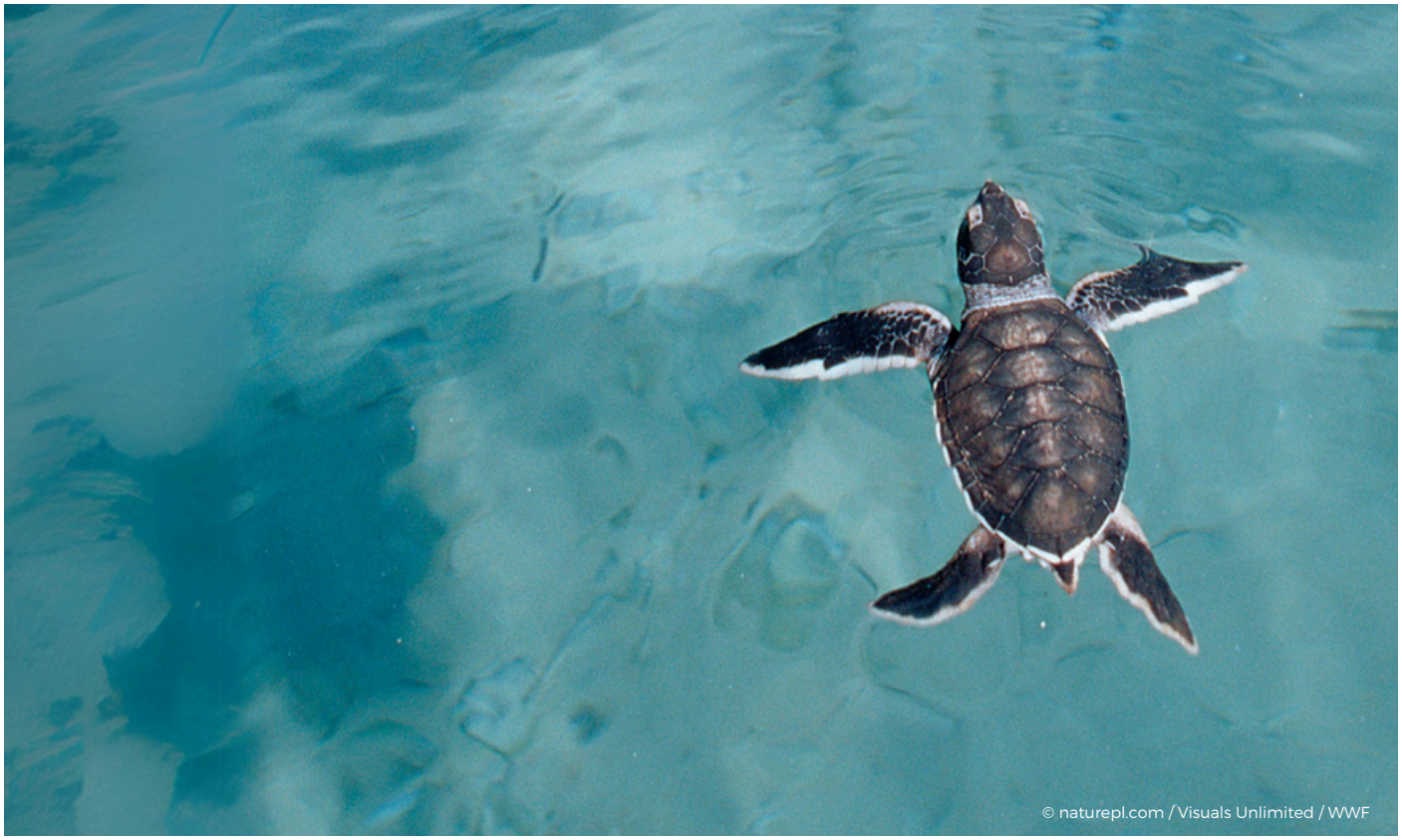
For instance, in Indonesia, we've seen the first-ever study of hawksbill genetics, filling critical gaps in our understanding of this species. In Papua New Guinea, new genetic insights are helping us better understand turtle populations and their migrations. These local efforts are vital, not just for the regions involved, but to help plug information gaps for accurate traceability of marine turtles and their parts or products.

As we look ahead, our vision for ShellBank is clear. We will continue to expand our database, enhance our collaborations, and refine our tools to arm conservationists, law enforcement and lawmakers with the best information possible. Our impact is to make turtles traceable and for turtles to have a 'seat at the table' and be their voice to ensure their species' survival is safeguarded into the future. The journey is far from over, but with the unwavering support of our partners and the passion that drives this project, I am confident that we will continue to make significant strides.

Thank you for your continued support and commitment to marine turtle conservation. Together, we are making a difference.
Build ShellBank. Save Turtles.

© Stijn Dijkstra / Pexels

"SHELLBANK IS A GAMECHANGER: PIONEERING MARINE TURTLE DNA-BASED TRACEABILITY ON A GLOBAL SCALE"



ABOUT THIS REPORT

The biennial ShellBank Progress and Impact Report (2023-2024; herein, the ShellBank report, 2024) highlights the significant progress made over the past two years in advancing marine turtle conservation through genetic traceability. This report serves as an overview of the project's achievements, key developments, and future priorities.

ShellBank is a global program dedicated to enhancing the conservation of marine turtles by using genetic tools to trace the origins of turtles or turtle products, thereby supporting wildlife crime enforcement and conservation management. Launched as a collaborative effort among WWF, the Australian Museum, NOAA, TRACE and other key partners, ShellBank is an important resource for addressing the illegal trade of marine turtle products and strengthening conservation strategies worldwide.

As ShellBank continues to evolve, this report reflects the growing impact of the program. Major milestones include the expansion of the genetic database to include green turtles, the launch of the ShellBank Online Database, and the strengthening of partnerships with conservation organizations, law enforcement, and academic institutions worldwide. These efforts collectively enhance our capacity to trace the origins of marine turtles, their parts and/or products, inform conservation strategies, help support sustainable fisheries management, and support wildlife crime enforcement.

The report also features three case studies that showcase how genetic data is being applied in real-world scenarios, from addressing illegal turtle trade to supporting targeted conservation actions. These stories highlight the power of genetic traceability to bridge critical knowledge gaps and improve conservation outcomes for marine turtles.

Looking ahead, ShellBank aims to build on this success by further expanding species coverage, enhancing data quality, and increasing collaboration with stakeholders. This report provides readers with a clear understanding of the project's scope, impact, and vision for the future. You can find out more by visiting www.shellbankproject.org or contacting the ShellBank team at shellbank@wwfint.org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2023 - 2024 HIGHLIGHTS

Expansion to Include Green Turtles

Strengthening Conservation Research Through Genetic Traceability

Launch of the ShellBank Online Database

Revamped ShellBank Website for Greater Accessibility

Capacity Building Through Training & Workshops

New Partnerships & Collaborations

BUILDING ON SUCCESS: SHELLBANKS 2023/24 ACHIEVEMENTS

The past two years have seen remarkable progress and achievement for the ShellBank project. As we continue to expand our reach and impact, these highlights showcase the strides we've made in marine turtle conservation. From integrating green turtles into our genetic database to the launch of our online platform, each milestone reflects the dedication and collaboration of our global community. This section captures the key moments and advancements that have defined 2023/2024, illustrating how ShellBank facilitates conservation and sets the stage for future success.

GREEN SEA TURTLE
(*Chelonia mydas*)

EXPANSION TO INCLUDE GREEN TURTLES

In 2023, ShellBank expanded its genetic database to include green turtles, the most abundant and widely studied marine turtle species. This enhances ShellBank's ability to address key threats such as overexploitation, illegal trade, habitat degradation, climate change, and fisheries bycatch.

By integrating more than 10,000 samples from 149 locations worldwide, we have strengthened the capacity to monitor and protect these populations. This extensive genetic data enables decision-makers to assess the impact of harvest and bycatch more effectively while helping researchers understand population connectivity between in-water habitats and nesting sites.

STRENGTHENING CONSERVATION RESEARCH THROUGH GENETICS TRACEABILITY

ShellBank has evolved beyond its pilot phase into an indispensable resource for global conservation research. Providing up-to-date genetic data enables researchers to analyze population structure, define conservation units, and establish critical baselines for mixed-stock analysis - key to understanding population connectivity and guiding conservation strategies worldwide,

Unlike GenBank, ShellBank serves as a one-stop shop, offering instant access to all studies, locations, and frequency data for each haplotype—saving time and resources while ensuring the most accurate results.

LAUNCH OF THE SHELLBANK ONLINE DATABASE

On World Sea Turtle Day, June 16, 2024, ShellBank reached a major milestone with the launch of its online database, providing open access to genetic data for marine turtle conservation and management. Developed in collaboration with WWF-International's GTDS (Global Technology and Data Solutions) team, the platform empowers researchers, conservationists, fisheries managers, and law enforcement to track marine turtles, analyze population structures and connectivity, identify at-risk populations and combat illegal turtle trade more effectively.

With a user-friendly design, the database serves as a centralized hub for accessing, analyzing, and contributing genetic data - fostering global collaboration and data-driven conservation efforts. Explore this powerful tool now on the ShellBank website!

REVAMPED SHELLBANK WEBSITE FOR GREATER ACCESSIBILITY

In 2024, the ShellBank website underwent a major relaunch, featuring a fresh, modern design to better serve the global marine turtle community. The revamped platform is now more user-friendly, visually engaging, and packed with essential resources, including publications, reports, and conservation tools to support research, conservation and law enforcement efforts.

The biggest upgrade? A seamless open-access, publically available online database, making it easier than ever for users to access, contribute, and utilize genetic data for conservation and enforcement purposes. Visit the new ShellBank website today and explore a comprehensive hub designed for researchers, conservationists, and policymakers worldwide!

Visit the database at

www.shellbankproject.org

SCAN HERE

SHELLBANK

WORKSHOPS AND TRAINING: BUILDING CAPACITY FOR CONSERVATION AND ENFORCEMENT

During 2023 and 2024, ShellBank expanded its training efforts, equipping researchers, conservationists, and law enforcement with the skills to apply genetic traceability in marine turtle conservation. Through online and in-person workshops, participants learned species identification, genetic sampling, forensic analysis, evidencial handling, and database management to enhance wildlife crime investigations, conservation decision making and future management strategies.

Collaborations with numerous key partners supported enforcement agencies in using DNA evidence to combat illegal turtle trade. Training also helped scientists and conservation managers, particularly in underrepresented regions, to fill data gaps and improve population monitoring. With over 75 researchers and 120 law enforcement officers trained in the application of the ShellBank toolkit, it continues to build global capacity for marine turtle protection.

NEW PARTNERSHIPS AND COLLABORATIONS

In 2024, ShellBank strengthened its global impact by forging key partnerships with international conservation organizations, academic institutions, community groups and government agencies. These collaborations have expanded research capabilities, increased fieldwork efforts, and enhanced data collection—particularly in underrepresented regions.

By working with local communities and conservationists, we've filled critical data gaps and gained insights into nesting and foraging connectivity. We've also worked with law enforcers on seizure cases, helping showcase the importance of genetic data in wildlife crime investigations, for use as a line of evidence and as intelligence, improving forensic capabilities.


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PROJECT IMPACT: 2023-2024 IN NUMBERS

ShellBank continues to expand its reach and impact, strengthening global efforts to track, trace, and protect marine turtles. Over the past two years, we have grown our database, engaged with new partners, and provided critical tools for conservation, research, and law enforcement. Here's a look at our progress in numbers.

28 Countries engaged

7 project locations

>120 people trained

3 NEW ShellBank Supported Research Projects

Online DNA database **Release**

5 Reports & Science Publications

TWELVE Conference Presentations

FIVE workshops & Training Sessions

>120 database **Users**

2019

ONE species

≈ 70 Locations

≈ 1,510 Samples

2024

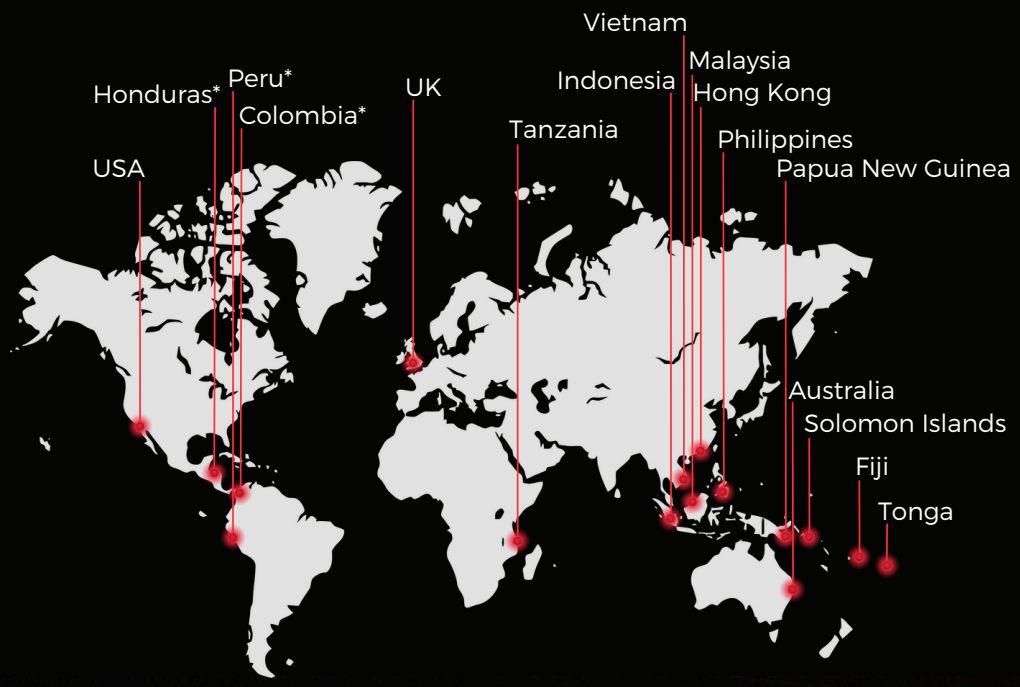
TWO species

293 Locations

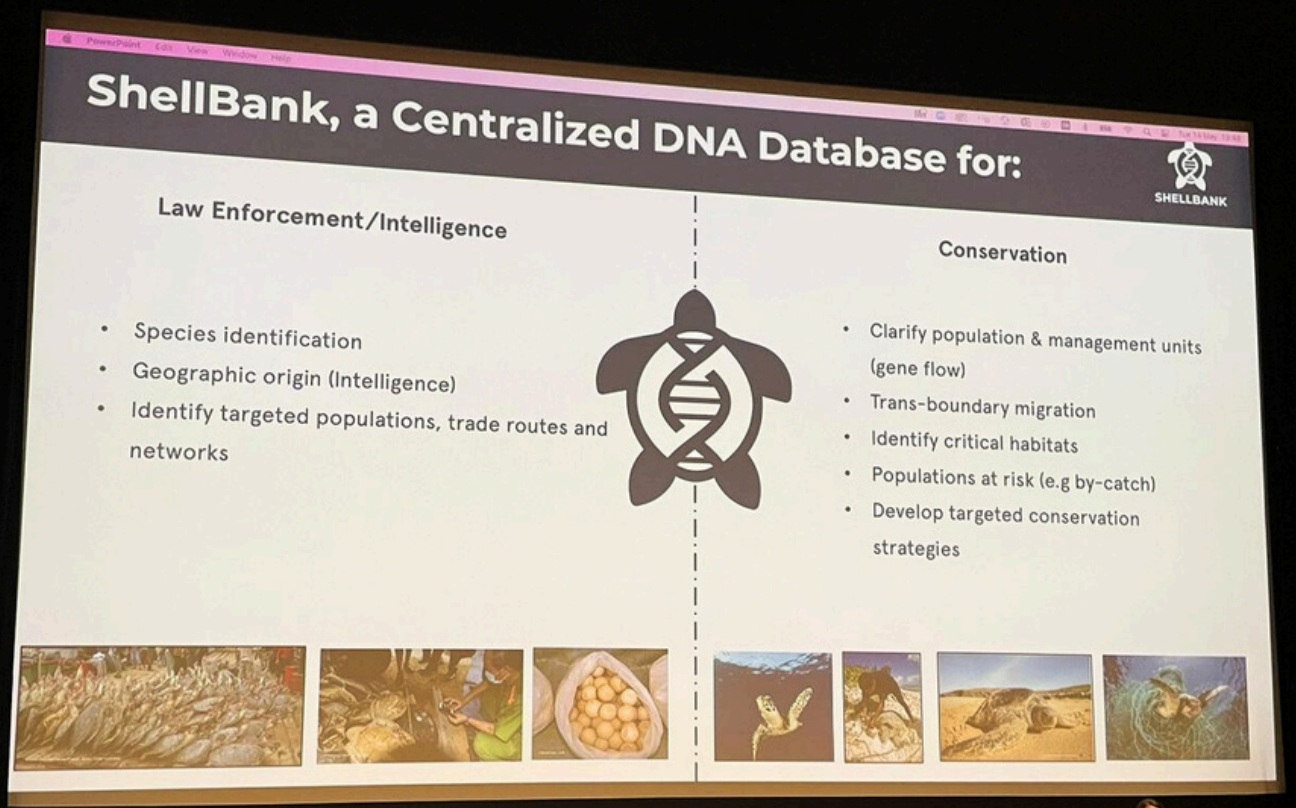
>15,000 Samples

WHERE WE WORK

ShellBank Collaborations and case studies



*Subject to successful funding applications

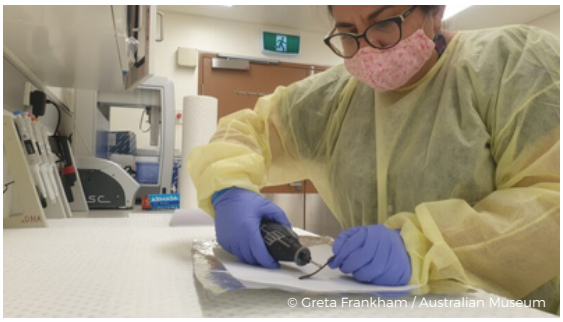


NEW TO SHELLBANK?

THE SCIENCE BEHIND SHELLBANK

A game-changer to track and trace marine turtle populations globally

ShellBank is an innovative traceability toolkit and a global database of marine turtle DNA. Launched in late 2022 after a successful pilot phase, it provides comprehensive genetic profiles from marine turtle populations worldwide, crucial for tracing the origins of turtles, turtle parts and products back to the turtle populations impacted by threats, such as overexploitation, bycatch, and trade. By extracting DNA from any turtle, turtle part or product, we can compare them against the genetic profiles in the ShellBank database. This enhances our ability to identify how turtles are connected, which populations are most at-risk and those that require greatest protection, informing conservation management and law enforcement, ultimately strengthening management measures to recover turtle populations.



Dr Greta Frankham from the Australian Museum drilling a tortoiseshell sample for DNA extraction.

"ShellBank reveals turtle origins, supporting conservation and law enforcement."

In a nutshell, how does shellBank work?

Tacking and Tracing Turtles to Source

1. Sample turtle part or product

Tissue and shell samples are taken from live or dead turtles

2. Extract DNA

DNA is extracted from collected samples.

3. Sequence DNA

DNA is amplified and sequenced from extracted sample.

4. Crop DNA Fragment

The DNA sequence or “haplotype” of each sample tested is added to the ShellBank databases.

5. Analyze DNA

Identifies if there’s a new genetically distinct population (“genetic stock”). A match in the reference database helps determine likely population origin (or source).

6. Data Analysis

The ShellBank database enables the identification of the most at-risk populations and those requiring greatest protection.

ShellBank uses DNA. Its 'banks' of data are a rapidly evolving global repository for marine turtle DNA. Comprising three main components (**Nesting, In-Water and Trade**). ShellBank stores and uses data from many international partnerships to enable effective traceability. It is constantly being updated and contributed to by many collaborators. Data, primarily mined from published material, is verified by the ShellBank team and stored in the database. It is open source for the reference data (Nesting and In-Water), and privacy-protected for the Trade data, bolstering accessibility to users around the world.

With a complete database, we can finally understand what genetically distinct turtle populations we have, how they are interconnected, and which populations are most at-risk, such as those being unsustainably harvested, traded or incidentally caught in fisheries. By comparing across databases it will be possible to accurately trace the population origin, enhance a country's enforcement efforts against illegal activity, and advance marine turtle conservation at national, regional and global levels. ShellBank's intent and purpose has been refined over time, with a clear vision for growth.

WHAT DOES SHELLBANK OFFER

Material & Resources: ShellBank provides tools for fieldwork and genetic analysis, including Genetic Sampling Kits for DNA collection, Sample Collection Guidelines for consistent sampling, and Laboratory Guidelines for quality DNA processing.

Capacity Building & Support: ShellBank offers capacity-building through training, technical advice, and tailored support. Offering tailored programs for law enforcement to inform better fisheries management, or combat illegal turtle trade and support conservation scientists with tools and expertise to advance genetic research and sample collection.

Scientific Development: ShellBank partners with institutions like **NOAA Southwest Fisheries Science Centre**, the **Australian Museum**, and **TRACE** to advance turtle traceability. For example, testing whole mitochondrial genome sequencing to improve population assignments. These innovations enhance accuracy, help address key threats to turtle populations, and inform conservation strategies.

DNA Database: The ShellBank online database is a key resource for marine turtle conservation, offering standardised genetic data to understand populations, support law enforcement, and guide conservation strategies, ensuring the sustainability of marine turtle populations.

HOW CAN SHELL

LAW ENFORCEMENT

Determine Geographic Origin:

Our database enables quick genetic matching to determine the origin of confiscated or seized turtles, turtle parts or products.

Intelligence Gathering

Serve as a critical tool for intelligence, providing insights that can help build a strong foundation for investigations and potential legal action.

Tracking Trade Routes

By understanding where the turtles come from, we can help law enforcement see the bigger picture of trade networks.

BANK BE USED?

CONSERVATION RESEARCH

Population Mapping & Management Units

Identify distinct populations and Management Units using genetic data for better conservation and management.

Connectivity & Nesting Origins

Trace turtles back to their nesting areas, whether from foraging areas or bycatch or those harvested, , to understand habitat connectivity and inform transnational strategies.

Informed Conservation Strategies

Utilize genetic linkages to develop informed, adaptive conservation tactics that protect turtles across their migratory paths and international borders.

INTRODUCING THE ONLINE SHELLBANK DATABASE

The ShellBank database is a collaborative initiative designed to aggregate and make accessible genetic data on marine turtles from around the world. Hosted and maintained by the ***ShellBank core team*** *in collaboration with leading research institutions, the ShellBank database contains thousands of genetic records, sourced primarily from published literature and generously contributed by ShellBank members worldwide. This includes mitochondrial DNA (mtDNA) providing comprehensive insights into species distributions, boundaries, and more. By centralizing this data, we aim to support and enhance marine turtle conservation efforts through the sharing of high-quality genetic information.*

COMPREHENSIVE GENETIC DATABASE

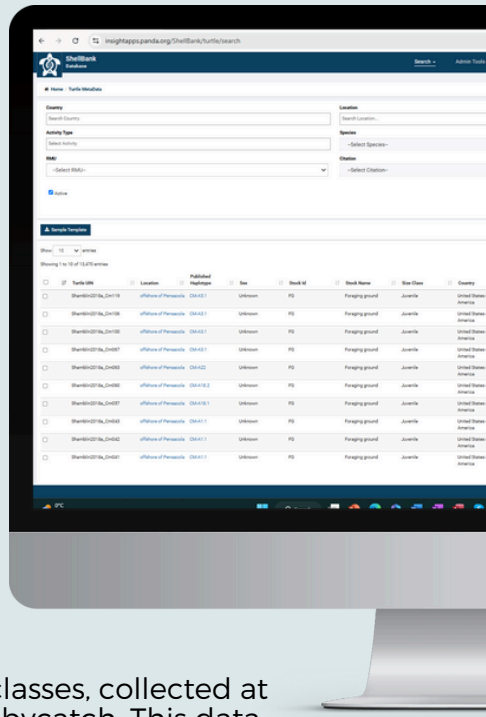
The ShellBank database compiles global genetic data to support conservation, law enforcement and management efforts at all levels. The data can be used to create detailed genetic maps and reports made available online through the interactive platform. This publicly available database is continuously updated and can be used by researchers, conservationists, students and teachers, communities and government officials. ShellBank's database is one of the most comprehensive resources for marine turtle conservation, containing mitochondrial DNA (mtDNA) data from over 15,000 individual turtles so far. This includes vital genetic information on green and hawksbill turtles.

GENETIC DATA FOR TWO SPECIES

Hawksbill Turtles
(*Eretmochelys imbricata*)

Green Turtles
(*Chelonia mydas*)

OVER 15.000 DATA ENTRIES AND COUNTING



SHELLBANK DATA CATEGORIES

The ShellBank database organizes genetic data into key categories to support conservation, research, and enforcement. These datasets help identify nesting origins, assess population connectivity, and trace the illegal trade of marine turtles.

NESTING DATA

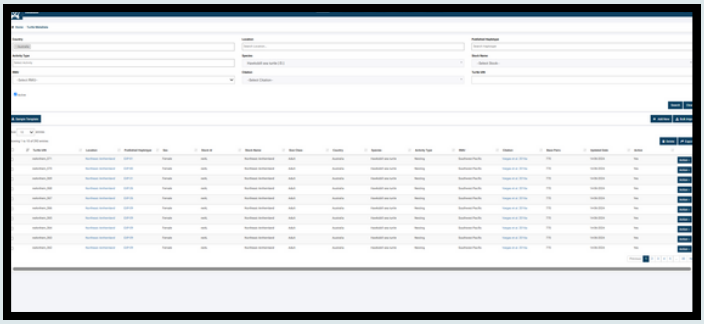
Samples collected from wild nesting turtles, hatchlings or embryos / eggs. This data serves as the reference baseline for tracing back origin.

IN-Water DATA

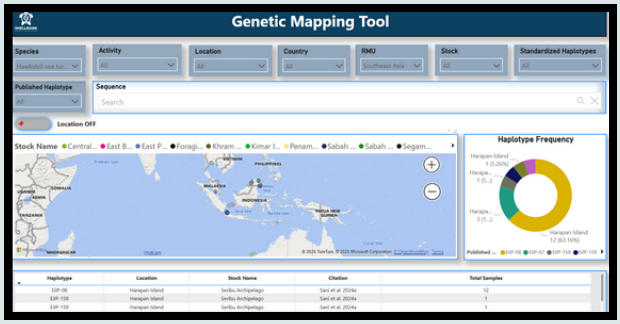
Samples collected from wild turtles, including all size classes, collected at foraging sites, from stranded individuals, or as fisheries bycatch. This data helps define stock boundaries and assess population connectivity.

TRADE DATA

Comprises genetic information from confiscated turtle products, including shells, meat, and eggs. Used to trace illegal trade routes, identify poaching hotspots, and support law enforcement efforts.



Search, Filter & Export Genetic Records

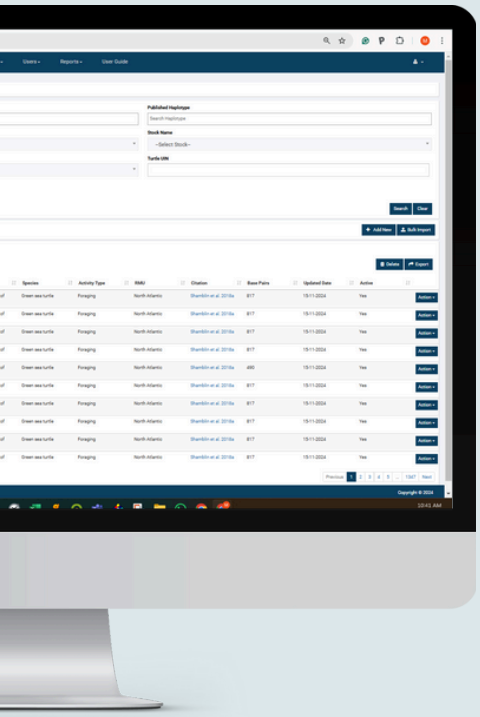


Interactive Filtering and Mapping

KEY FEATURES OF THE SHELLBANK DATABASE

The ShellBank database is designed to streamline marine turtle conservation, research, and enforcement by providing standardized, accessible, and comprehensive genetic data. With powerful search, mapping, and data export tools, it enhances cross-study comparisons, accelerates connectivity analyses, and strengthens global conservation efforts.

"THE SHELLBANK ONLINE DATABASE IS NOW LIVE AND ACCESSIBLE VIA OUR WEBSITE."



Standardisation of Haplotypes

Ensures genetic consistency across different sequence lengths and nomenclature, enabling seamless cross-study comparisons.

Comprehensive Search Tools

Users can filter data by species, region, genetic stock, activity, and more—allowing for targeted queries.

Sequence Search

Enables users to input genetic sequences to identify matching haplotypes, and rapidly identify where identical haplotypes have been previously found.

Visualising Haplotype Location & Mapping

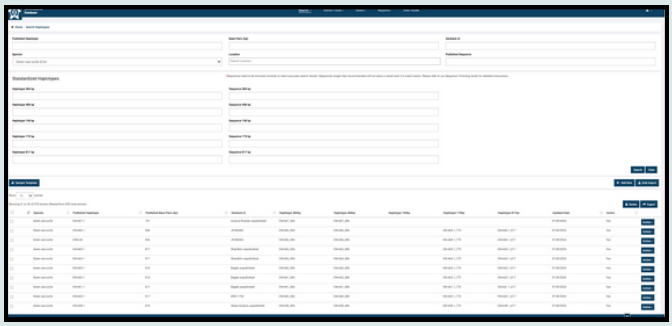
Provides interactive mapping tools to visualise sampling location and genetic stocks and to map haplotype distributions.

Exportable Data & Haplotype Frequency Tables

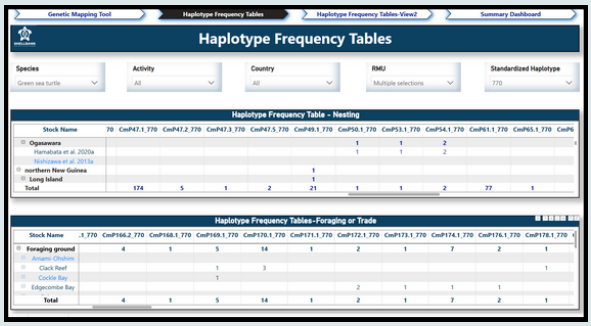
Allows users to filter data and export population summaries, including haplotype frequency tables, to support downstream analysis such as mixed stock analysis (MSA).

Open-Access, User-Friendly Platform

Designed for accessibility, the database is available to users worldwide, fostering collaboration and data-driven decision-making.



Haplotype Identification & Standardization

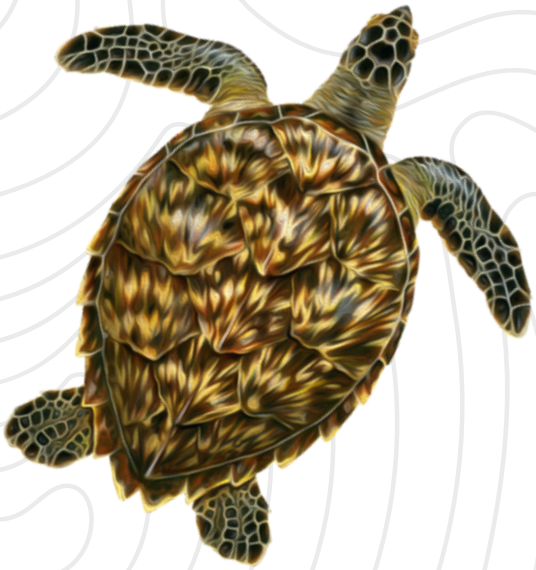


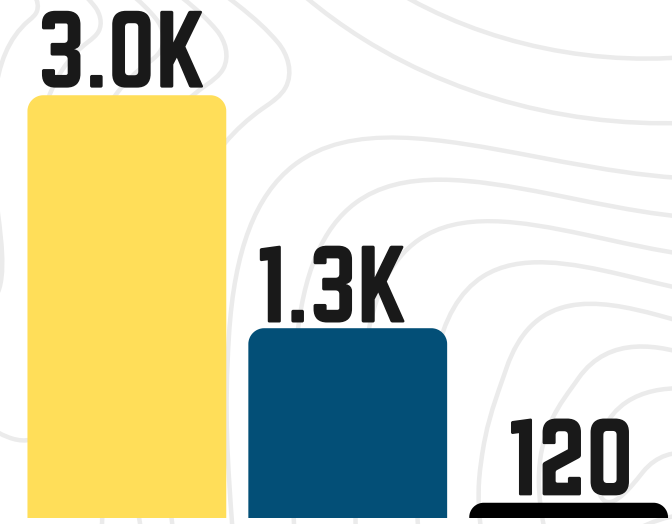
Custom Haplotype Frequency Tables

SHELLBANK DATABASE IN NUMBERS

HAWKSBILL TURTLES

(Eretmochelys imbricata)



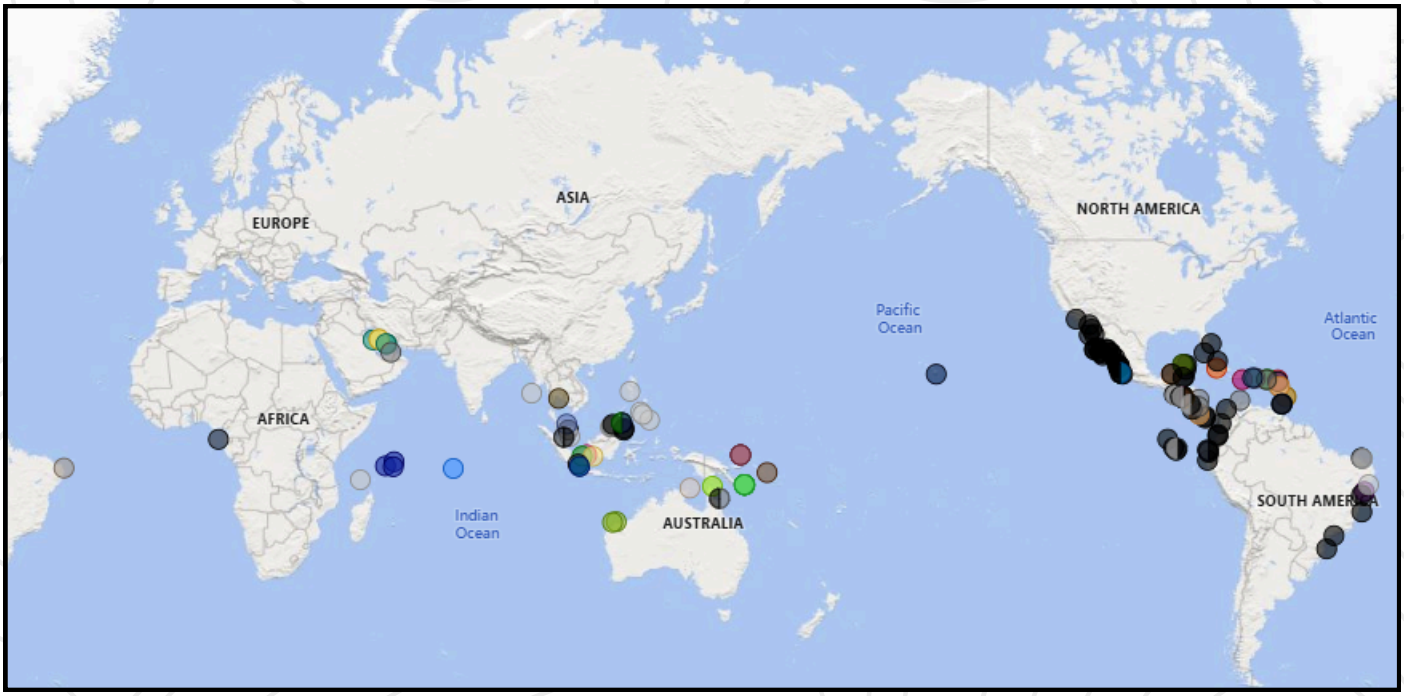


DATABASE ENTRIES

151 LOCATIONS

47 GENETIC STOCKS

34 COUNTRIES

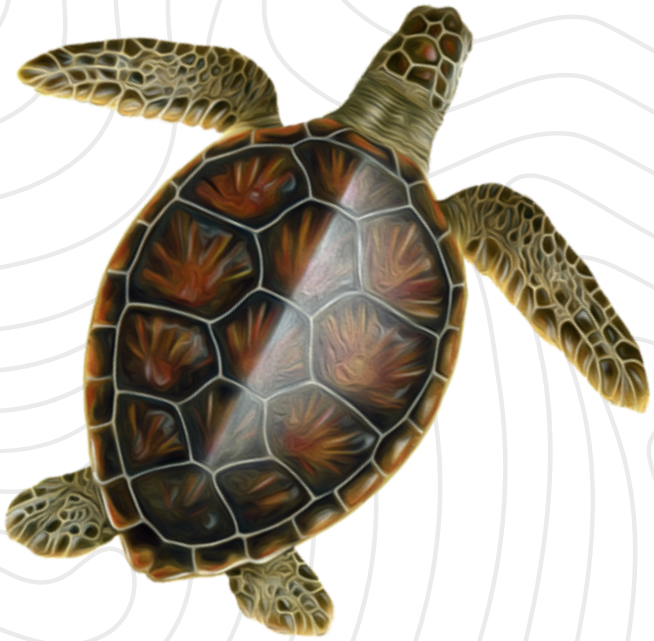


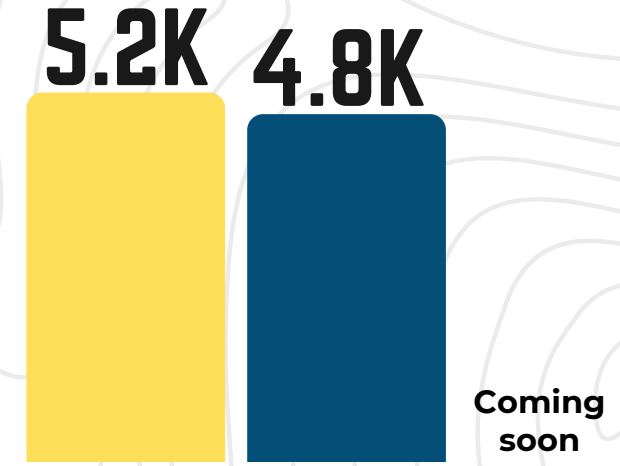
Hawksbill Turtle Genetic Sampling Locations - *This map displays hawksbill turtle sampling locations from the ShellBank database. Color-coded points represent genetic stocks/management units, black dots indicate in-water datasets, and grey dots highlight TBD stocks due to low sample sizes, marking priority sampling areas.*

SHELLBANK DATABASE IN NUMBERS

GREEN TURTLES

(Chelonia mydas)



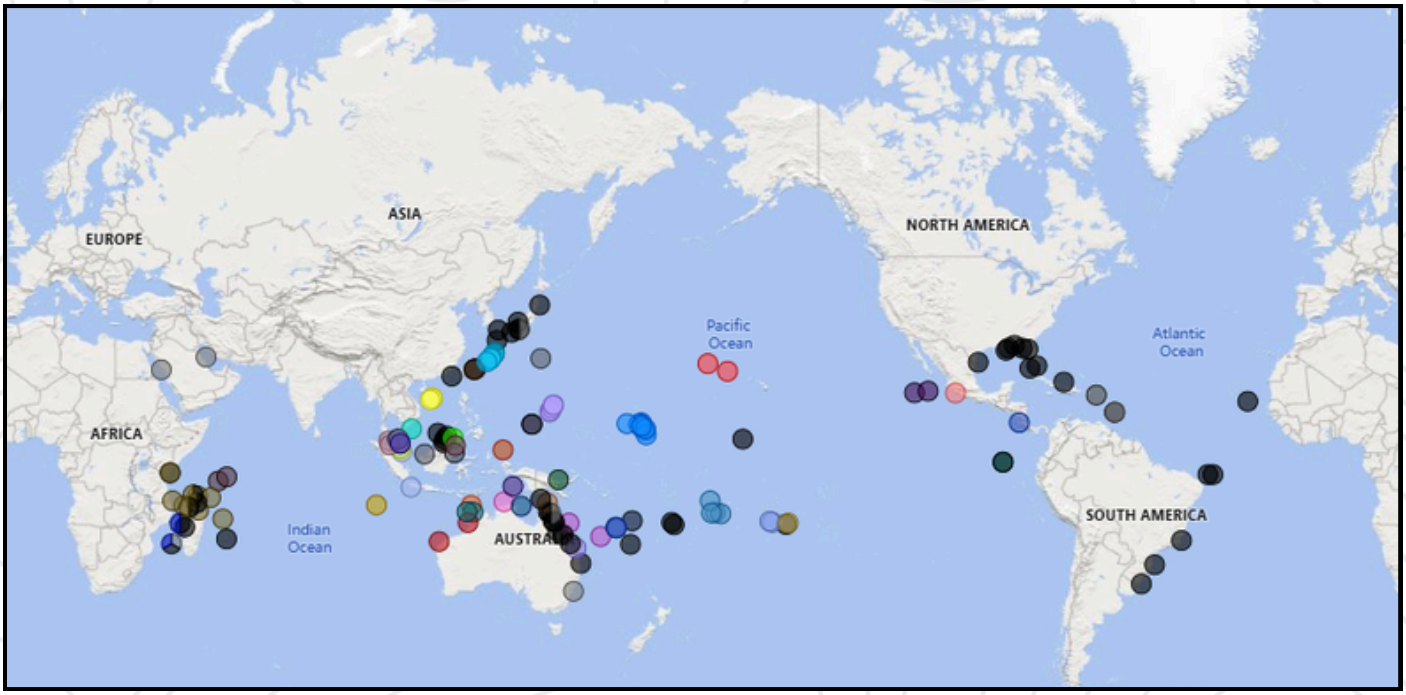


DATABASE ENTRIES

149 LOCATIONS

56 GENETIC STOCKS

41 COUNTRIES



Green Turtle Genetic Sampling Locations - *This map displays hawksbill turtle sampling locations from the ShellBank database. Color-coded points represent genetic stocks/management units, black dots indicate in-water datasets, and grey dots highlight TBD stocks due to low sample sizes, marking priority sampling areas.*

FEATURED STORIES

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FEATURED STORY

FILLING CRITICAL GAPS IN HAWKSBILL TURTLE CONSERVATION IN INDONESIA

Indonesia is renowned for its rich marine biodiversity, and sea turtles are an integral part of this natural heritage. Our recent study has shed light on the genetic diversity of hawksbill sea turtles in Indonesia's Java Sea, marking a significant advancement in understanding this critically endangered species.

Led by researchers at Oceanogen and IPB University, this work represents Indonesia's first extensive genetic analysis of hawksbill turtles. The project and the findings have significantly advanced our understanding of this critically endangered species.

This project began under the guidance of the late Dr. Hawis Madduppa, whose vision and dedication laid the groundwork for this project. Although Dr. Madduppa sadly passed away during the course of this project, his commitment to marine research conservation continues to inspire and drive our work.

The study focused on collecting tissue samples from hawksbill turtles across six nesting sites on small, isolated islands in the Java Sea. These samples were analyzed at Oceanogen in Indonesia, targeting the mtDNA d-loop, a genetic marker that is critical for understanding the population structure of sea turtles.

The results revealed a surprisingly high level of genetic diversity.

Lalu M. Iqbal Sani
Oceanogen/IPB

5 NEW
GENETIC STOCKS

9 NEW
NESTING BEACHES

In collaboration with:

IPB University | Oceanogen | Yayasan Penyu Laut Indonesia | Everlasting Nature of Asia (ELNA) | World Wide Fund for Nature - Australia | Kyoto University

In fact, our findings suggest that this region may possess some of the highest levels of genetic richness globally for hawksbill turtles.

Most notably, we identified five previously unknown genetic stocks across nine new nesting beaches. These findings fill a critical gap in the global ShellBank database, significantly enhancing the baseline data for hawksbill turtles in the region.

By expanding the baseline data, the study enables more precise tracking and conservation management of hawksbill populations. This is particularly important for developing targeted conservation strategies and strengthening law enforcement actions against the illegal trade of hawksbill turtles.

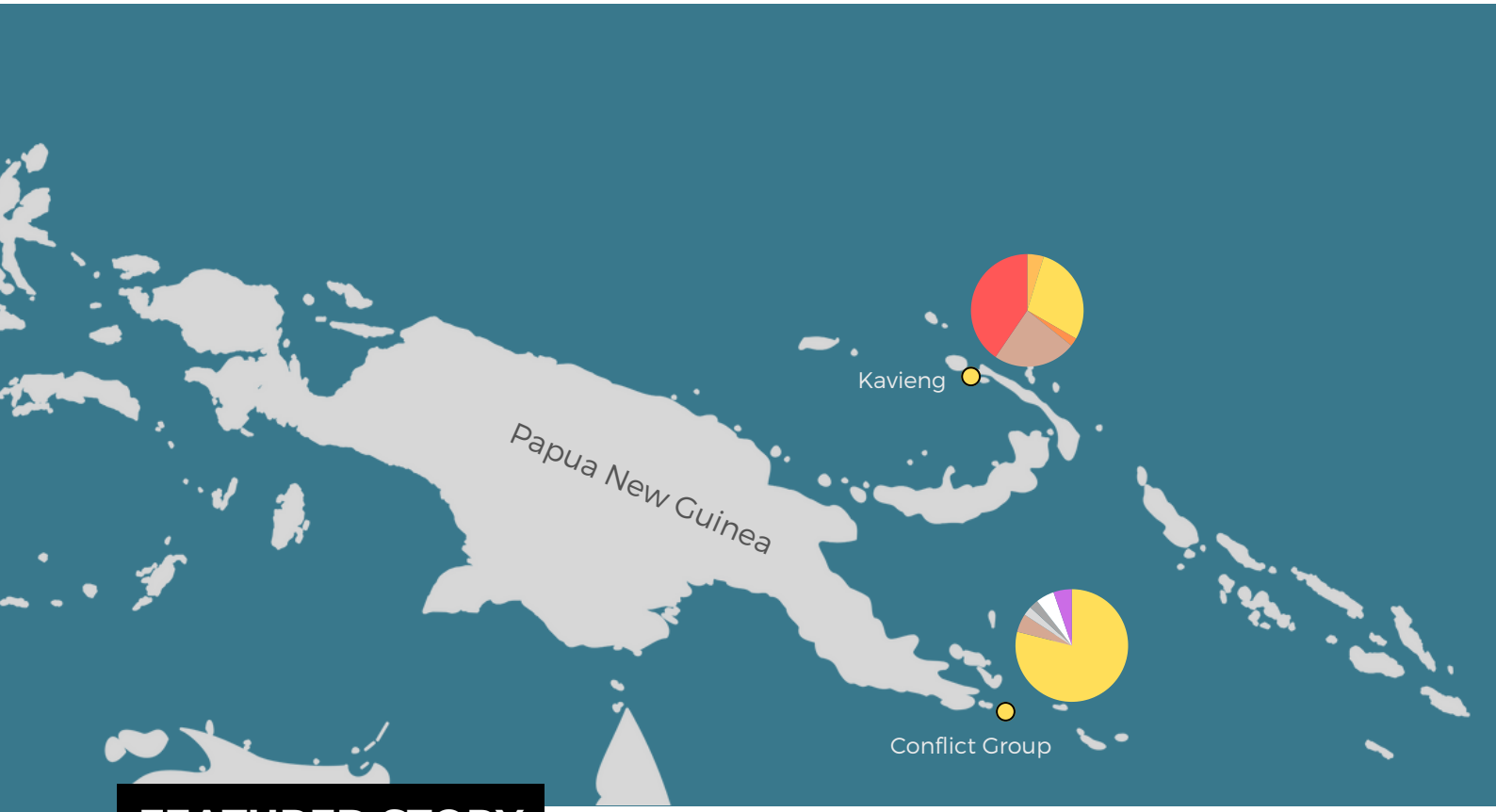
A Collaborative Effort for Conservation

These findings demonstrate the necessity for such studies in more areas in Indonesia to have a comprehensive understanding of the interconnections across hawksbill turtle populations. This research was made possible through collaboration with a dedicated team of partners, including Yayasan Penyu Laut Indonesia (YPLI), Everlasting Nature of Asia (ELNA), World Wide Fund for Nature (WWF), University of Kyoto, IPB University and Oceanogen. These partners underscore the power of collective efforts in advancing marine conservation.

This study not only addresses critical knowledge gaps but also honors the legacy of Dr. Hawis Madduppa, whose dedication continues to guide efforts in marine research and conservation. By building on this foundation, Indonesia is taking meaningful steps to ensure the survival of hawksbill turtles and protect its rich marine biodiversity for future generations.

LEARN MORE ABOUT THIS STUDY

Sani et al. (2024) Unraveling fine-scale genetic structure in endangered hawksbill turtle (*Eretmochelys imbricata*) in Indonesia: implications for management strategies. Front. Mar. Sci. 11:1358695.



FEATURED STORY

BRIDGING CONSERVATION GAPS: HAWKSBILL TURTLES IN PAPUA NEW GUINEA

DR CHRISTINE MADDEN

WWF-CTP

Our recent study, "From Rookeries to Foraging Grounds", provided new and important genetic and migratory insights into hawksbill turtles from two critical nesting locations in Papua New Guinea (PNG). This collaborative research, involving local and international scientists, used mitochondrial DNA sequencing and satellite telemetry to uncover vital data about the genetic structure and migratory behavior of these endangered turtles.

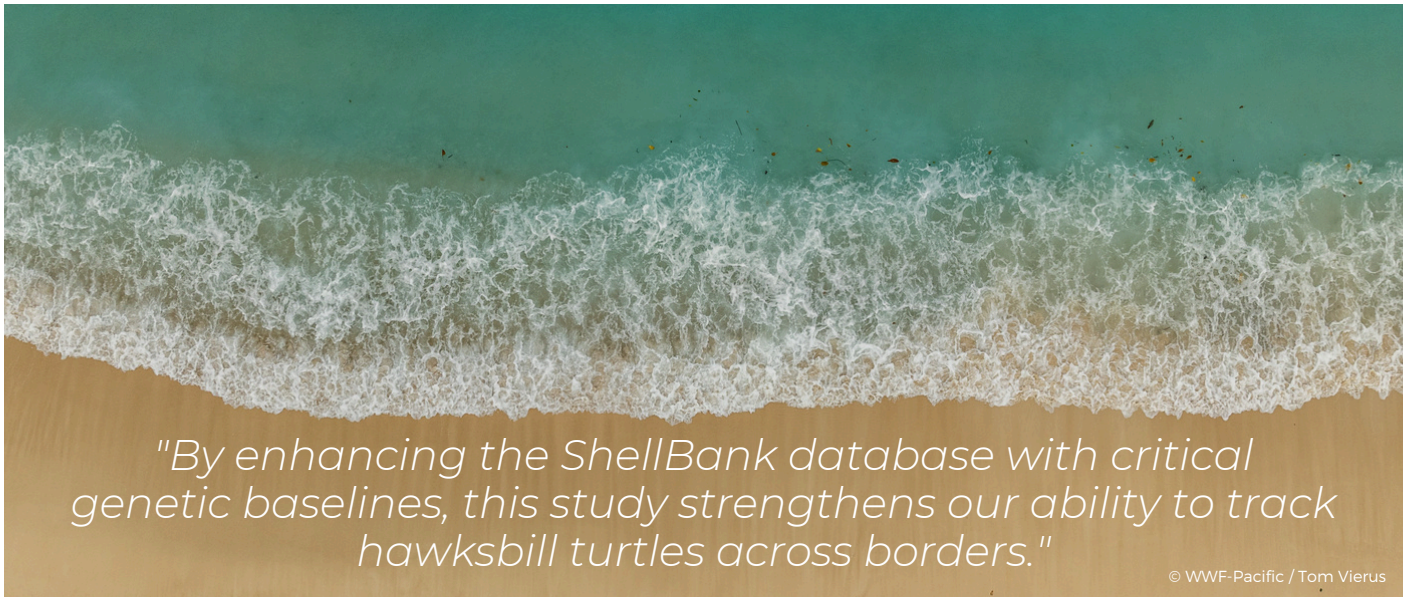
The study focused on hawksbill turtles at the Conflict Group and Kavieng nesting sites.

Tissue samples from 75 nesting females revealed significant genetic diversity, including haplotypes previously unidentified. These findings not only enhance our understanding of hawksbill genetic stock structure in the Asia-Pacific region but importantly identified two new management units crucial for informed conservation planning while plugging important information gaps in the ShellBank nesting baseline.

In addition to the genetics work, we used satellite telemetry to track 15 turtles during their post nesting migration.

In collaboration with:

University of the Sunshine Coast, Australia | WWF-Australia | WWF Coral Triangle Programme | Lissenung Resort Island, Papua New Guinea | Conflict Islands Conservation Initiative

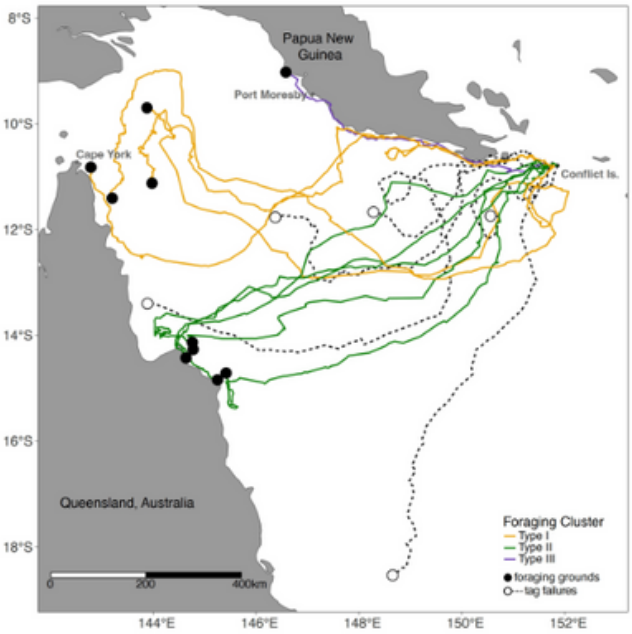


The results revealed broad connectivity between PNG nesting sites and foraging grounds across the Asia-Pacific region, including eastern Australia.

This is the first detailed migratory mapping for PNG hawksbill turtles, highlighting three distinct migratory strategies.

Filling Critical Gaps in Global Conservation Efforts

This research fills critical gaps in the ShellBank database, enhancing the genetic baseline for PNG hawksbill turtles. The data strengthens global efforts to track and protect these populations and highlights the importance of transboundary conservation strategies to safeguard migratory corridors and foraging habitats.



By combining genetic and satellite data, this study underscores the need for region-specific conservation measures tailored to distinct management units and greater promotion of using genetics as a cost-effective 'tracking' tool to inform management. It also exemplifies the value of collaboration between local and international researchers in advancing marine conservation. The findings will play a vital role in shaping future conservation strategies and ensuring the survival of hawksbill turtles across the Asia-Pacific region and beyond.

LEARN MORE ABOUT THIS STUDY

Christine A. Madden Hof, et al. 2023. "From Rookeries to Foraging Grounds: Understanding Regional Connectivity and Genetic Diversity in Hawksbill Turtles." Frontiers in Marine Science.

FEATURED STORY

TRACING TORTOISESHELL: UK'S FIRST GENETIC INVESTIGATION OF ILLEGAL TURTLE TRADE

CARLA ALONSO O´FRIEL
University of Strathclyde
Glasgow, Scotland
United Kingdom

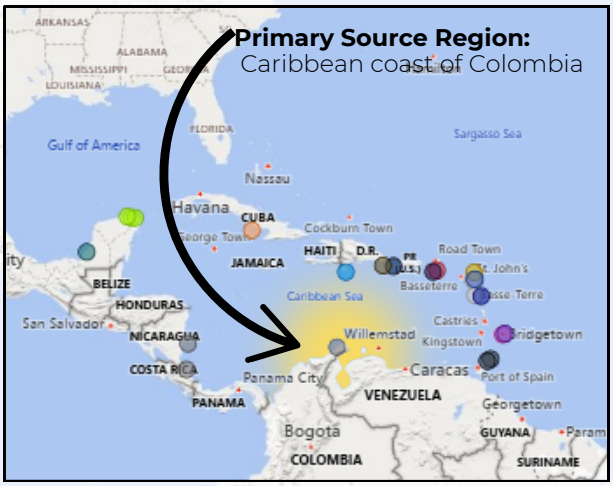
When UK Border Force intercepted a collection of suspected hawksbill turtle shell items, a genetic investigation was launched to uncover their origin. This work aimed to identify the species, trace the geographical origin of the specimens, and contribute to ShellBank's growing database of genetic data from tortoiseshell products, which helps illuminate patterns in the illegal turtle trade.

How Was It Done?

Fifty-eight pieces of tortoiseshell scutes were sampled and analyzed. Mitochondrial DNA (d-loop) was extracted, sequenced and compared with ShellBank´s global database. Bayesian Mixed Stock Analysis (MSA) was then used to estimate the origin of the samples.

What did we find?

DNA was successfully extracted from 48 samples, identifying eight distinct hawksbill turtle haplotypes—all from the Atlantic. The most common haplotypes matched those found in the Eastern Caribbean, One rare haplotype, EiA68, had never been recorded at any nesting site, while another sample contained loggerhead turtle DNA, suggesting a potential loggerhead x hawksbill hybrid.



Notably, the mixed stock analysis pointed to origins in the Caribbean, with Colombia and Tobago as major contributors to the seized material. This supports intel about the likely journey of these items before they were seized by the UK Border Force.

Why does it matter?

This case shows how genetic tools like ShellBank can support law enforcement by identifying the likely origin of illegally traded marine turtle products. In this instance, genetic results—supported by seizure intelligence—pointed to nesting populations in the Caribbean waters of Colombia.

While this is a promising start, the study also highlights the importance of strengthening the ShellBank reference database. Filling gaps in nesting data will further improve traceability. Expanding sampling from foraging areas is also valuable for refining our understanding of population boundaries and connectivity across regions.

The detection of a rare haplotype and a potential hybrid further illustrates how genetic data can uncover new insights into turtle biology and trade. This case demonstrates ShellBank's potential to inform enforcement action in the fight against illegal wildlife trade.

LEARN MORE ABOUT THIS STUDY

This research will be featured in the upcoming scientific publication, "ShellBank: traceability toolkit and global database of marine turtle DNA", expected in Spring 2025. **Visit www.shellbankproject.org for updates.**

KEY SHELLBANK EVENTS 2023/24

2023

42nd International Sea Turtle Symposium
Conference presentation
March 2023 | Colombia

ShellBank Workshop
Coral Triangle Initiative - Coral Reefs, Fisheries and Food Security (CTI-CFF) Threatened Species Working Group Annual Meeting
June 2023 | Indonesia

Indonesian Sea Turtle Symposium
Conference presentation
July 2023 | Indonesia

Core Team Retreat
Planning meeting
July 2023 | Indonesia

National Plan of Action for Vietnam
ShellBank introduction workshop
September 2023| Vietnam

HONG KONG IWT
Research project
July 2024 | Hong Kong

Interdisciplinary conversations on wildlife trade
Conference presentation
July 2024 | Hong Kong

International Society for Biological and Environmental Repositories (ISBER)
Invited conference presentation
March 2024 | Australia

WIDECAST ANNUAL MEETING
Invited presentation(Online)
March 2024 | Costa Rica

CMS CoP-14
ShellBank side event
February 2024| Uzbekistan

2024

International Association of Forensics Science
Conference presentation
November 2023 | Australia

INTERPOL
Invited meeting presentation
December 2023| France (Online)

Conference/meeting
Training/workshop
Research project

ShellBank Database
Release of online database
June 2024 | Online

Website relaunch
Updated website released
June 2024 | Online

ShellBank Workshop
Socialization and
sample collection
June 2024 | Tanzania

CMS-IOSEA MOS9 meeting
ShellBank presentation
June 2024 | Tanzania

Society for Wildlife Forensics (SWFS)
Conference presentations
June 2024 | Malaysia

2025 →

Analysis of marine turtle genetic samples from Papua New Guinea, Solomon Islands, Fiji, and Tonga
WWF/SPREP/AM
December 2024 | Australia

19th Senior Official Meeting (SOM-19)
Coral Triangle Meeting
ShellBank presentation
November 2024 | Timor Leste

US Government
ShellBank partnerships
November 2024 | USA

Training on ShellBank for Officers, Civil Servants, Officials
TRAFFIC/DFS
September 2024 | Vietnam

WHAT TO EXPECT IN 2025: BUILDING ON SUCCESS FOR GLOBAL IMPACT

As we look forward, 2025+ promises to be a transformative year for the ShellBank project. With a focus on expanding species coverage, forging impactful collaborations, and scaling up capacity-building efforts, ShellBank is set to continue to scale with impact.

EXPANDING OUR REACH: NEW SPECIES AND REGIONS

Building on the strong foundation established with hawksbill and green turtles, ShellBank aims to incorporate additional species, such as olive ridley and leatherback turtles, into its genetic database. This expansion will offer a more comprehensive understanding of global marine turtle populations, further strengthening conservation strategies to protect these species.

NEW UPCOMING RESEARCH: WESTERN PACIFIC GREEN TURTLES

In collaboration with WWF-CTP, SPREP, and the Australian Museum, ShellBank is conducting the first comprehensive genetic study of harvested marine turtles across the Western Pacific. Covering Solomon Islands, Papua New Guinea, Fiji, and Tonga, is analyzing 500+ harvested turtle samples to assess how regional harvest practices impact nesting populations. This is the largest-ever application of ShellBank to evaluate sustainability concerns related to turtle take, providing critical data to guide national and regional management efforts. This project is part of the global Turtle Use Project led by WWF, financially supported by WWF-CTP, WWF-Pacific, and the SPREP-led By-catch and Integrated Ecosystem Management (BIEM) Initiative of the Pacific-European Union Marine Partnership (PEUMP) Programme funded by the European Union and the Government of Sweden.

UNCOVERING TRADE NETWORKS IN HONG KONG UNIVERSITY

An exciting new partnership with the University of Hong Kong (HKU) and the Agriculture, Fisheries, and Conservation Department of Hong Kong Government will focus on tracing the origins of seized hawksbill turtle products. Led by Tracey Leigh-Prigge (University of Hong Kong), with support from ShellBank core team, the project will analyze 200 samples seized over three decades from Hong Kong's ports. This collaboration, supported by the Ocean Park Conservation Foundation Hong Kong (OPCFHK), showcases the power of genetics in wildlife crime enforcement and conservation.

SCALING UP: TRAINING AND WORKSHOPS

ShellBank is committed to capacity-building efforts, with a busy schedule of training sessions and workshops planned for 2025 across the globe. These initiatives will equip conservation practitioners, law enforcement agencies, and researchers with the tools and knowledge to utilize genetic data effectively, fostering stronger global networks for turtle conservation.

With these ambitious goals and collaborative projects, ShellBank is poised to continue driving meaningful impact, empowering global conservation efforts to protect marine turtles and their habitats.

PRIORITIES FOR 2025/26

As we look ahead, the next two years promise to be a period of significant growth and expansion for the ShellBank project. Building on our recent successes, we are setting ambitious goals that will broaden our impact and further our mission to protect marine turtles globally.

SHELLBANK
Global Marine Turtle Genetic Database

01 Technological Advancements

Integrating cutting-edge genetic sequencing methods into the ShellBank platform to improve data resolution and precision, allowing for more targeted conservation strategies.

02 Identifying and Filling Gaps

Expanding the database to include underrepresented regions, such as the Eastern Pacific and Western Indian Ocean, to establish comprehensive genetic baselines for marine turtles.

03 Support Research Globally

Continuing to facilitate and advance research initiatives on marine turtles worldwide, focusing on collaborative efforts to enhance conservation science.

04 Expanding the Database

Broadening the species coverage, geographic reach, and technological capabilities to include additional marine turtle species like olive ridleys and leatherback turtles.

05 Real Use Case Studies

Utilizing case studies to demonstrate the practical applications of genetic data for conservation, enforcement, and management strategies1.

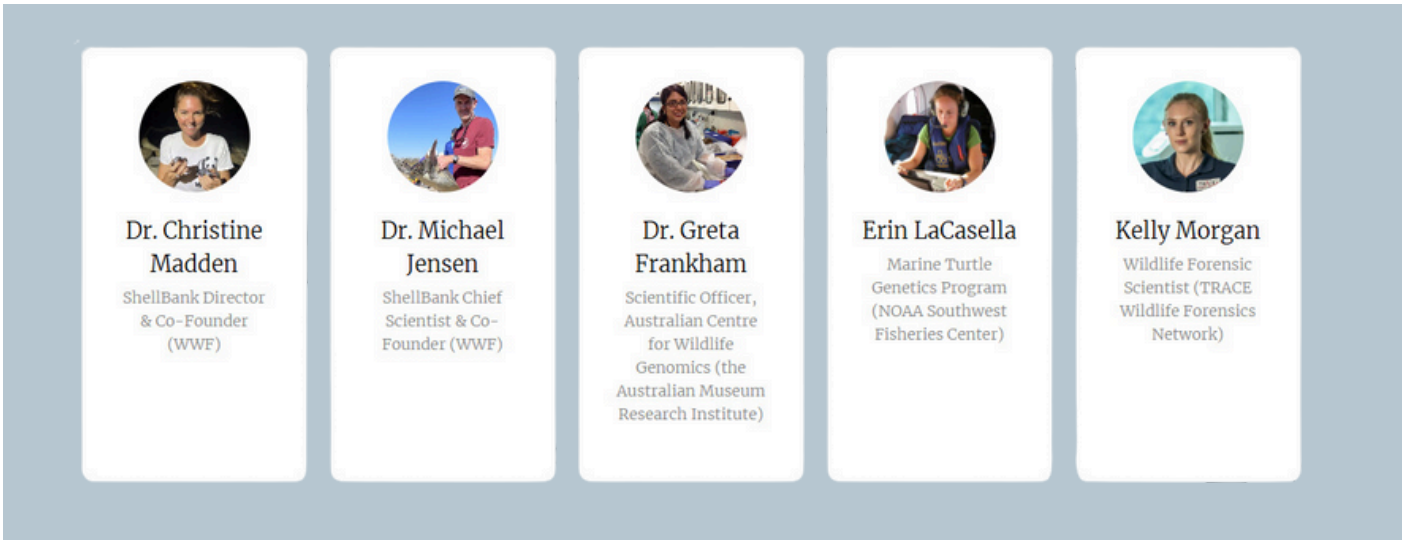
CONCLUSION: ADVANCING SHELLBANK'S IMPACT

ShellBank has grown into what we hope will be a truly important resource for marine turtle conservation. By releasing the database, adding species, building capacity, and supporting local research to fill gaps and improve the baseline, we have made significant progress in tracking and protecting turtle populations worldwide.

We are proud of how far we have come and excited to take this even further. Looking ahead, our focus is on refining the database, improving genetic resolution, strengthening global collaborations, and demonstrating the real-world applications of genetic data for wildlife forensics and conservation management. Through continued innovation and targeted research, ShellBank will become an even more powerful tool in securing the future of marine turtles.

MEET THE TEAM

ShellBank is being led by the World Wildlife Fund for Nature (WWF) in partnership with National Ocean and Atmospheric Administration (NOAA Fisheries) – Southwest Fisheries Science Center, the Australian Museum – Australian Centre for Wildlife Genomics (ACWG), and TRACE Wildlife Forensics Network (TRACE).



World Wide Fund For Nature

NOAA Fisheries Southwest Fisheries Science Centre

Australian Museum Research Institute

TRACE Wildlife Forensics Network

OUR COLLABORATORS

ShellBank is only possible by collaborating and supporting government agencies, researchers, universities, conservation organizations and communities.

The ShellBank database is a comprehensive repository for published data derived from the incredible work conducted by researchers and governments worldwide. This collection showcases the dedication and achievements made in marine turtle genetics.

We ensure that all original data is properly referenced, giving credit where it is due. As such, any data used from the ShellBank database must also clearly reference the original datasets, maintaining the integrity and recognition of the source material and reflecting the hard work and discoveries made by our research community.

We invite any organization whose data is featured in our database to have its logo displayed on this page. If your research has contributed to ShellBank and you would like your organization to be recognized, please reach out to us. We are committed to transparency and collaboration and value the opportunity to showcase your contributions. See our website for our contributors to date.

HELP BUILD SHELLBANK

To achieve our vision and goal we need to work closely together to build and scale ShellBank. For ShellBank to work, the database needs to grow.

While the amount of data in the Asia-Pacific region alone has tripled since ShellBank's establishment, more support is needed to fill the many gaps in our understanding of marine turtle populations, and as we expand to include all other marine turtle species.

Ensuring effective project roll-out are critical steps that hinge on our ShellBank core team supporting local researchers and governments through hands-on sample collection training and analysis. By bolstering local research and government capabilities, we not only fill existing data gaps but also lay the foundation for sustainable, local leadership in marine turtle conservation and action.

OUR SUPPORTERS

Since ShellBank was created in 2018, several donors and corporations have shown their commitment to protecting marine turtles, financially supporting the pilot phase of ShellBank. Their support has enabled ShellBank to continue to expand and deliver its conservation impact over the years.

Royal Caribbean Group

Humble Bundle

TIMiD Isaacson Davis Foundation

Officially launched in mid-2024, our Supporter Tiers Program is ready to welcome new members into its community. By joining our program, companies can leverage their knowledge and experience of sustainability issues by working with our conservation experts. This Supporter Tiers Program is also open to philanthropic and foundation entities and major donors. Please connect with us if you're interested in supporting ShellBank in any way. Please email shellbank@wwfint.org

We would like to thank our existing members for their valuable support.

DATA SOURCES

We extend our deepest gratitude to all contributors who have made this database possible. The data housed within ShellBank is the result of extensive research and fieldwork conducted by scientists and conservationists across the globe. Their dedication and hard work in collecting, analyzing, and sharing this genetic data are invaluable to the advancement of marine turtle conservation

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