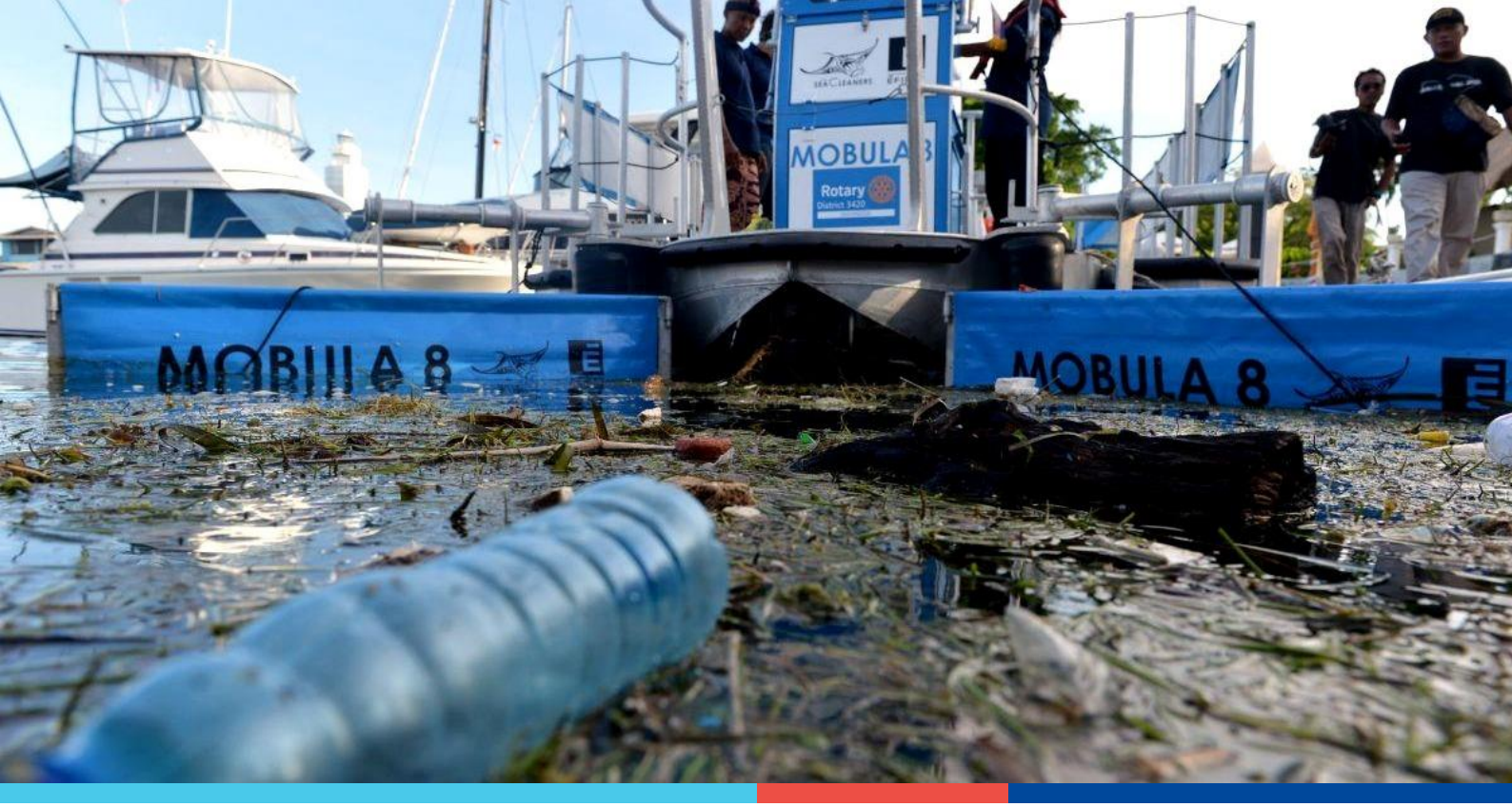

MOBULA 8
MOBULA 8
Rotary
District 3420

BALI · INDONESIA · 2023 TO 2024

Bali: the pioneering Mobula 8 expedition

Collect. Understand. Empower.

A field experience that helped shape an integrated approach: collection solutions, scientific evidence, education and local partnerships.

Field mission report, Benoa Bay and partner projects in the Bali region

The SEA CLEANERS

Retrospective field report
Published by The SeaCleaners Swiss · www.theseacleaners.org

00 Executive summary

In 2023 and 2024, The SeaCleaners carried out its first international floating-debris collection project with the Mobula 8 in Bali. Based in Benoa Bay, the expedition combined a collection vessel operating in sheltered waters, a research programme with Udayana University and awareness-raising activities delivered with local partners.

The mission went beyond removing waste from the water. It tested the operational model in real conditions, improved understanding of floating plastics in the bay and identified the conditions needed for a longer-term response. In parallel, The SeaCleaners supported local waste-management capacity, particularly through its partnership with Peduli Alam in the Amed area.

This report brings together the documented results and lessons from the pilot. It deliberately separates vessel-collection volumes, individual items examined by the scientific survey and people reached through awareness activities: these are complementary indicators with different methodologies and cannot be added together.

5.32	3,834	360	7
tonnes of plastics collected	**items characterised**	**people reached**	**study locations**
06/2023 to 12/2023	Survey 06/2023 to 03/2024	Initial activity report, late 2023	Benoa Bay

Operational records also report 14.75 tonnes of material recovered from the water, including a substantial organic fraction. Scientific figures relate to sampled items, not to the full tonnage collected.

How to read the metrics

Operational collection

Weight of material retrieved from the water.

Source: 2023 collection logs

Research

Macro-litter items examined using a scientific sampling protocol.

Source: CReSOS and The SeaCleaners

Awareness

People counted in a late 2023 activity report.

Source: activity report

The periods and methodologies differ: in the interest of transparency, the three datasets are presented separately.

01 The first international field operation

Setting and ambition

Benoa Bay, in southern Bali, connects rivers, built-up areas, commercial and fishing-port activities, mangroves and tourist coastlines. Tides, currents and water depth shape the movement and accumulation of floating litter. This made the bay a relevant test location for waste interception in sheltered coastal waters and for studying variations in floating pollution.

The Mobula 8 is a debris-collection catamaran developed with EFINOR Sea Cleaner for harbours, canals, estuaries and other calm waters. Its Bali deployment was a pilot: measured outputs, operational setbacks and methods refined on site all provided lessons for subsequent interventions.

THE VESSEL	ITS WATERS	ITS METHOD
Collection catamaran designed with EFINOR Sea Cleaner	Harbours, canals, estuaries and sheltered waters	Guide, retrieve between the hulls, sort on board

Key milestones

2022	Mobula 8 arrives in Indonesia and local partnerships are prepared
03/2023	Vessel inaugurated in Benoa Bay
06/2023 to 12/2023	Documented operational collections and education activities
06/2023 to 03/2024	Debris characterisation campaign with CReSOS and Udayana University
02/2024 to 03/2024	Peduli Alam sorting centre equipment completed and project closed out

02 Intercepting floating waste

Operating the Mobula 8 in the field

The vessel reached Indonesia in late 2022, was inaugurated at Benoa in March 2023 and began regular collection activities in June. A local crew working with Bali Marine Service handled navigation, collection and initial waste sorting. The operating area covered Benoa Marina, port zones and selected parts of the bay.

The vessel guides floating waste into its forward collection system, retrieves it between the hulls and allows on-board sorting before materials are landed. Routine collection outings were interspersed with outings dedicated to the scientific protocol, which required defined transects and standardised sampling conditions.

5,316.9
kilograms of plastics
Recorded from 06/2023 to 12/2023

14,753.4
kilograms of total material
Including almost 9 tonnes of organic matter

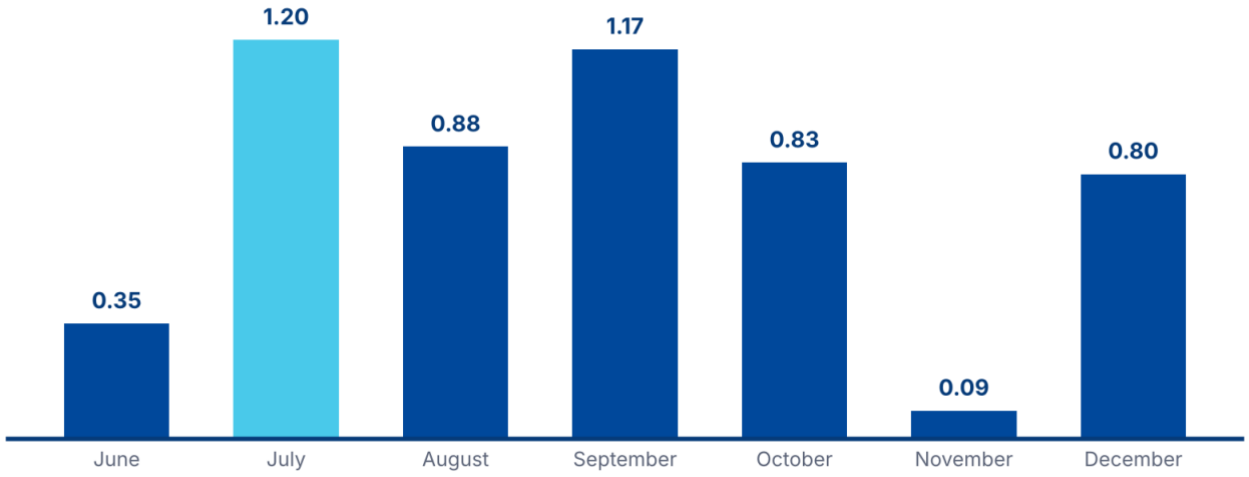
Operational results, 06/2023 to 12/2023

The collection database records 5,316.9 kilograms of plastics and 14,753.4 kilograms of total material recovered over the seven-month period. The latter figure includes almost nine tonnes of organic matter and must not be described as 14.75 tonnes of plastic. Out of 150 potential operating days, 105 collection days were documented, including 42 days involving scientific sampling. Other days were affected by maintenance, breakdowns, weather, navigational restrictions and non-working days.

Monthly plastics recovery varied considerably. Wind and current conditions, as well as interruptions in vessel availability, are plausible contributing factors; however, the records do not isolate the causal effect of each. These figures alone cannot demonstrate a lasting decrease in pollution across Benoa Bay.

105	42	150
documented collection days	days involving scientific sampling	potential operating days

Plastics collected each month, in tonnes



Source: Mobula 8 annual collection log, 06/2023 to 12/2023. Values are rounded for display.

Month	Plastics (kilograms)	All material (kilograms)
June	347.2	628.6
July	1,201.8	8,030.3
August	879.9	3,068.4
September	1,173.5	1,299.6
October	831.8	837.8
November	85.0	86.0
December	797.7	802.7
Total	**5,316.9**	**14,753.4**

Sorting and downstream treatment

Recovered materials were sorted into categories including plastics, glass, metal, textiles, paper and organic matter. Several local collection and treatment arrangements were explored, with informal waste collectors removing part of the accumulated material. The records also document difficulties in establishing a stable treatment chain and tracing the final destination of every waste stream.

KEY LESSON

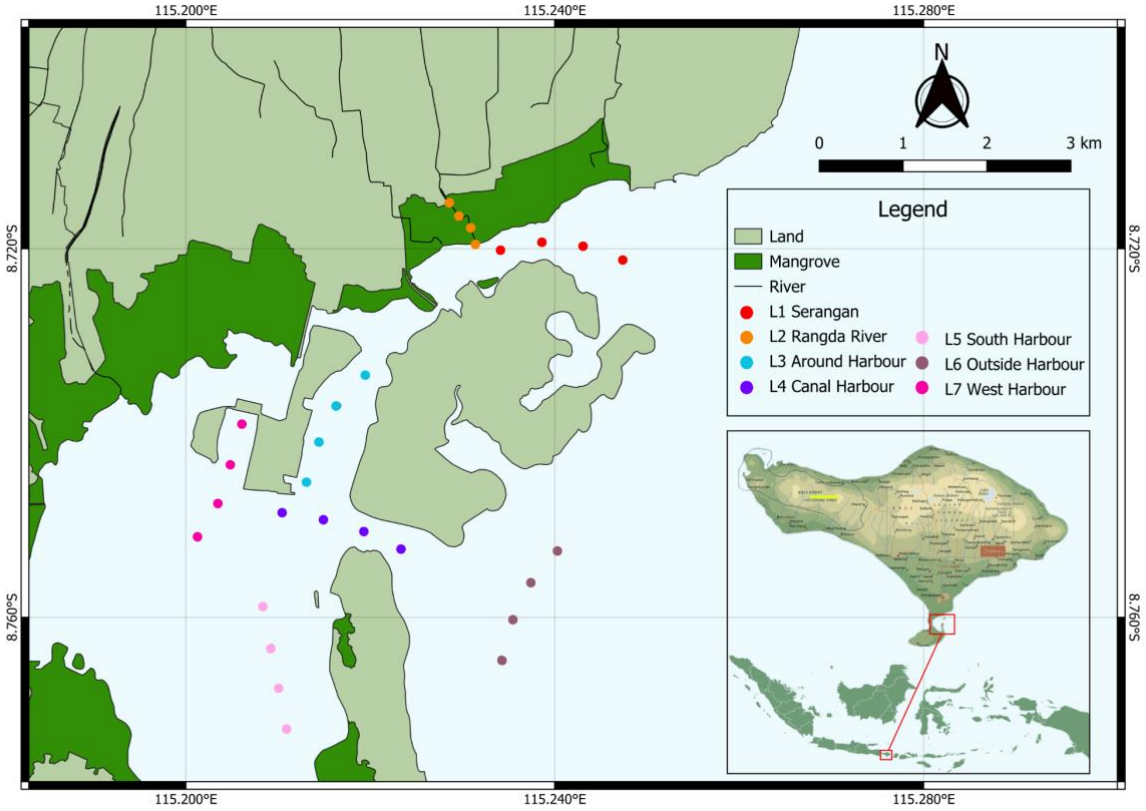
Floating-waste interception needs credible onshore sorting, storage and downstream management from the outset. The available records do not support a verified overall recycling rate.

03 Building scientific understanding

Research developed with Udayana University

Together with Udayana University's Center for Remote Sensing and Ocean Sciences (CReSOS), The SeaCleaners developed a survey of floating macro-litter distribution and composition in Benoa Bay. Between June 2023 and March 2024, seven locations were investigated using repeated transects: Serangan, Rangda River, Benoa Harbour, Harbour Canal, South Harbour, outside Benoa Bay and West Benoa Harbour.

The locations captured contrasting settings, including river influences, mangroves, ship traffic, port infrastructure and open-water exposure. After outings, surveyors classified debris by material group, whole item or fragment, and identifiable product use. Detailed characterisation focused on macro-debris larger than 50 millimetres.



Map of the seven scientific observation locations in Benoa Bay. Source: CReSOS and The SeaCleaners scientific report (2024).

Key findings

3,834

items in the analysed dataset

86% whole, 14% fragments



Composition of characterised macro-litter, based on item counts rather than weight.

The scientific report retains 3,834 items in the analysed dataset after excluding an “other” category that could include non-plastics. Among analysed items, 86% were whole and 14% were fragments. Soft plastics dominated by number (83%), followed by hard plastics (13%).

Identifiable product categories highlight consumer packaging. Food wrappers, sachets, lids and thin plastic bags were among the frequently encountered forms. West Benoa Harbour and the harbour canal emerged as prominent observation locations during the survey.

258 snack-related items	**214** mineral-water items	**181** instant-drink items

What the findings do, and do not, show

The study documents the predominance of soft plastics within the sampled macro-litter. It is also consistent with possible influences from tides, currents, nearby activities and port or tourism-related uses. It does not, however, prove a unique source for each item or provide a complete estimate of plastic pollution throughout the bay.

The scientific sample is separate from vessel-wide operational collection: the 3,834 items do not represent all objects removed throughout the expedition and are not equivalent to the weight of plastics collected.

TRANSPARENCY

Study scope and limitations

The ten-month monitoring window did not cover a full year. The comprehensive field-app dataset originally planned, including systematic geolocation and OSPAR waste categories for all operational collections, could not be consolidated. Systematic drone imaging considered with a remote-sensing partner was not carried out. Microplastics studies and some additional modelling remained research prospects, not completed results of this mission.

These constraints do not negate the university team's findings; they define their scientific scope and highlight methodological improvements for future programmes.

04 Education, awareness and engagement

Working with communities

Educational work brought together schools, associations, young people, local authorities and coastal stakeholders through Earth Day activities, plastic-pollution workshops, arts-based engagement, clean-ups and mangrove-focused events. The initial report submitted to Indonesian authorities records 360 people reached through these activities by late 2023.

A World Mangrove Day activity in the Tahura Ngurah Rai area involved 69 participants alongside local stakeholders and Indonesian Navy representatives. The Mobula 8 itself also became an educational tool, connecting visible floating waste with the importance of reducing leakage on land.

360
people reached
Initial activity report, late 2023

69
participants
World Mangrove Day

100
educational booklets
Distributed to children and educational organisations

Locally adapted and reusable materials

The team developed resources in Bahasa Indonesia, including a Mobula educational booklet, activities and games. These were shared with field partners, including Peduli Alam and Gili Eco Trust. Peduli Alam's final report confirms that 100 booklets were distributed to children and educational organisations, alongside sessions involving Blue School Bali and Yayasan Sanggar Tunas Pertiwi.

The 360 people counted in the first activity report should not be interpreted as all beneficiaries reached by partner organisations, nor added to partner figures without checking for overlap.

05 Strengthening local capacity

Amed: partnership with Peduli Alam

Alongside Mobula 8 operations, The SeaCleaners supported the Balinese organisation Peduli Alam around Amed and Bunutan. The goal was to strengthen onshore collection and local sorting facilities, helping manage waste before it escapes into waterways and the ocean. The 03/2024 final report confirms tangible improvements:

- ✓ Refurbishment of a collection truck body
- ✓ 20 metal waste bins built and delivered in Gulinten village
- ✓ Sorting facility upgraded: enclosure, roof, water and electricity
- ✓ Waste compactor installed in 02/2024
- ✓ Awareness work, beach clean-ups and marine discovery activities

These results reflect onshore waste-management support and are distinct from the tonnage collected by the Mobula 8 in Benoa Bay. They demonstrate the value of working with organisations familiar with local practices and constraints.

Wider collaboration in Indonesia

Under the broader MAPP Indonesia initiative, The SeaCleaners also collaborated with Gili Eco Trust on Gili Trawangan, near Lombok. Records describe educational support and work exploring sorting and recovery options. Gili Trawangan is geographically separate from Bali; proposed infrastructure works on the island are not presented as completed outputs here without a verified close-out report.

06 Technical and collaborative learning

A network of field partners

The project operated within a framework of dialogue with the Indonesian Government, particularly the Coordinating Ministry for Maritime Affairs and Investment (Kemenko Marves), and with port authorities and stakeholders. Udayana University and CReSOS led the academic component. Bali Marine Service and the crew supported vessel operations, while Indonesian civil-society organisations were essential to onshore initiatives.

The project also faced real constraints: vessel repairs, tidal and traffic-dependent access, weather limitations, uneven collection schedules, coordination across operational and scientific teams, and unsettled onshore waste treatment arrangements. Reported transparently, these are valuable lessons from a first overseas deployment.

Applying the learning

The expedition emphasised the need for:

1	2	3	4	5
Advance analysis of litter seasonality	Reliable local project coordination	Realistic maintenance allowances	Separate scientific and operational datasets	A planned waste-treatment chain before operations begin

These observations informed thinking about Mobula design improvements and future programme preparation. The wider lesson is the complementarity of approaches: collecting floating debris provides an immediate response, while scientific knowledge, education and resilient local waste-management capacity make that response better targeted and more sustainable.

07 The legacy of Bali

Conclusions and outlook

> **“ Bali was not a demonstration that a bay had been fully cleaned. It was a demanding pilot.**

It enabled plastics recovery, a substantial baseline of field observations with Indonesian scientists, engagement with the public and support for a local waste-management organisation. Its lasting value lies in combining these activities and learning where operational systems must improve.

The SeaCleaners Swiss now carries this integrated approach forward in Southeast Asia, with active operations in Malaysia and a programme under development in Indonesia. The Bali experience remains an important milestone in developing locally grounded programmes built with partners and focused on measurable results.

Partners, contributors and acknowledgements

SCIENTIFIC RESEARCH
Udayana University, Center for Remote Sensing and Ocean Sciences (CReSOS), led by Professor I Gede Hendrawan and the research team.

HISTORICAL SCIENCE COORDINATION
Gwenaële Coat, The SeaCleaners Science Manager during the design and implementation of the survey.

FIELD OPERATIONS
Bali Marine Service and the Mobula 8 crew, together with The SeaCleaners field and coordination teams.

ONSHORE ACTIVITY AND EDUCATION
Peduli Alam, Gili Eco Trust and the local associations, schools and organisations involved.

Thank you to everyone involved: this expedition is above all a collective achievement.

08 Source documents

1 CReSOS, Udayana University and The SeaCleaners (2024), *Characterization of Floating Plastic Debris in Benoa Bay using a Collecting Debris Vessel Mobula 8*, survey 06/2023 to 03/2024.

2 The SeaCleaners, Mobula 8 operational collection records for Benoa Bay, 06/2023 to 12/2023.

3 The SeaCleaners (2023), *Activity Report*, 06/2023 to 11/2023, submitted to Kemenko Marves.

4 The SeaCleaners (2024), *Lessons learnt, Bali project*; lessons-learned reviews of operations (08/02/2024) and of waste management in Bali.

5 Peduli Alam and The SeaCleaners (15/03/2024), *Final Report, Sorting Center in Amed*.

6 The SeaCleaners, MAPP Indonesia, education and the Mobula 8 pre-inauguration briefing (2023).

Internal working files and field logs are identified for editorial traceability; not all are public sources. Operational and scientific datasets have not been merged.

WHAT COMES NEXT

Writing the next chapter, together

Bali laid the foundations. Today, our Mobulas continue their mission in Southeast Asia and we are preparing to deploy new, complementary collection systems. Companies, foundations, institutions and donors: every partnership helps us move from pilot to lasting, measurable impact.

Collect
Fund on-water collection campaigns

Understand
Support research and scientific monitoring

Empower
Back education and local organisations

www.theseacleaners.org

The SeaCleaners Swiss, a Swiss public interest organisation