Scalable full-cycle marine litter remediation in the Mediterranean: Robotic and participatory solutions

SeaClear2.0

https://www.seaclear2.eu

D2.3

Product and Service Data Sheet

WP2 – Concept design and technical specification

Grant Agreement no. 101093822

Lead beneficiary: Subsea Tech

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Deliverable description	This document presents the preliminary data sheet which describe the SeaClear 2.0 system.

[1] R = Document, report, DEM = Demonstrator, OTHER = Software, technical diagram, etc., DMP = Data Management Plan

[2] PU = Public, C-UE/EU-C = EU Confidential under Decision 2015/444, SEN = Sensitive

Document history

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DEFINITIONS

- **Beneficiary:** A legal entity that is signatory of the EC Grant Agreement no. 101093822.
- **Consortium:** The SeaClear2.0 Consortium, comprising the list of beneficiaries below.
- **Consortium Agreement:** Agreement concluded amongst the SeaClear2.0 beneficiaries for the implementation of the Grant Agreement.
- **Grant Agreement:** The agreement signed between the beneficiaries and the EC for the undertaking of the SeaClear2.0 project (Grant Agreement no. 101093822).

Beneficiaries of the SeaClear2.0 Consortium are referred to herein according to the following abbreviations:

- **TU Delft**: TECHNISCHE UNIVERSITEIT DELFT
- **DUNEA**: REGIONALNA AGENCIJA DUNEA
- **Fraunhofer**: FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV
- **HPA**: HAMBURG PORT AUTHORITY
- **ISOTECH**: ISOTECH LTD
- **MDanchor**: M. DANCHOR LTD
- **Subsea Tech**: SUBSEA TECH SAS
- **TECNOSUB**: TÉCNICAS Y OBRAS SUBACUÁTICAS, SLU
- **TUM**: TECHNISCHE UNIVERSITAET MUENCHEN
- **UNIDU**: SVEUCILISTE U DUBROVNIKU
- **UTC**: UNIVERSITATEA TEHNICA CLUJ-NAPOCA
- **VEO**: VEOLIA PROPRETE
- **VLPF**: VENICE LAGOON PLASTIC FREE

ABBREVIATIONS

- **ROV:** Remotely Operated underwater Vehicle
- **UAV:** Unmanned Aerial Vehicle

EXECUTIVE SUMMARY

This document presents the Product and Service data sheet which describes the SeaClear 2.0 system preliminary specifications on which the system has been designed, and its expected operational performances. These performances will be updated once sufficient and actual operations will have been undertaken.

1. Introduction

SeaClear 2.0 is the next step to the ongoing H2020-funded SeaClear (https://seaclear-project.eu), where several of the SeaClear2.0 partners have been developing the first autonomous robotic system for seafloor litter collection. An unmanned surface vehicle (USV) called SeaCat acts as a hub for a flying vehicle (UAV) that searches for litter from the air, an observation unmanned underwater vehicle (ROV) called Mini-Tortuga that searches for litter underwater, and a collection ROV called Tortuga that picks up the litter with a custom gripper-plus-suction device and deposits it in a basket lowered from the USV. The very nature of SeaClear (labelled 1.0 in the document) as the first project to design such a solution means it must focus almost exclusively on technological developments in robotics hardware and algorithms, with a single system.

Moreover, the system is limited to only seafloor litter of up to tens of cm in size and at depths of up to tens of meters; it cannot pick up surface litter or larger objects like fishing equipment, bikes, e-scooters, tires, shipping equipment, etc. The aim of SeaClear 2.0 is to upscale and upgrade the system initially made for SeaClear 1.0. This means collecting bigger and heavier litters with a modified SeaCat and a smart grapple, storing them and shipping them to shore with a dedicated USV Tender, as well as collecting surface litter with a USV and a team of surface robots. In the end, SeaClear 1.0 and SeaClear 2.0 will be working together, exploiting their shared and complementary litter detection and collection capabilities.

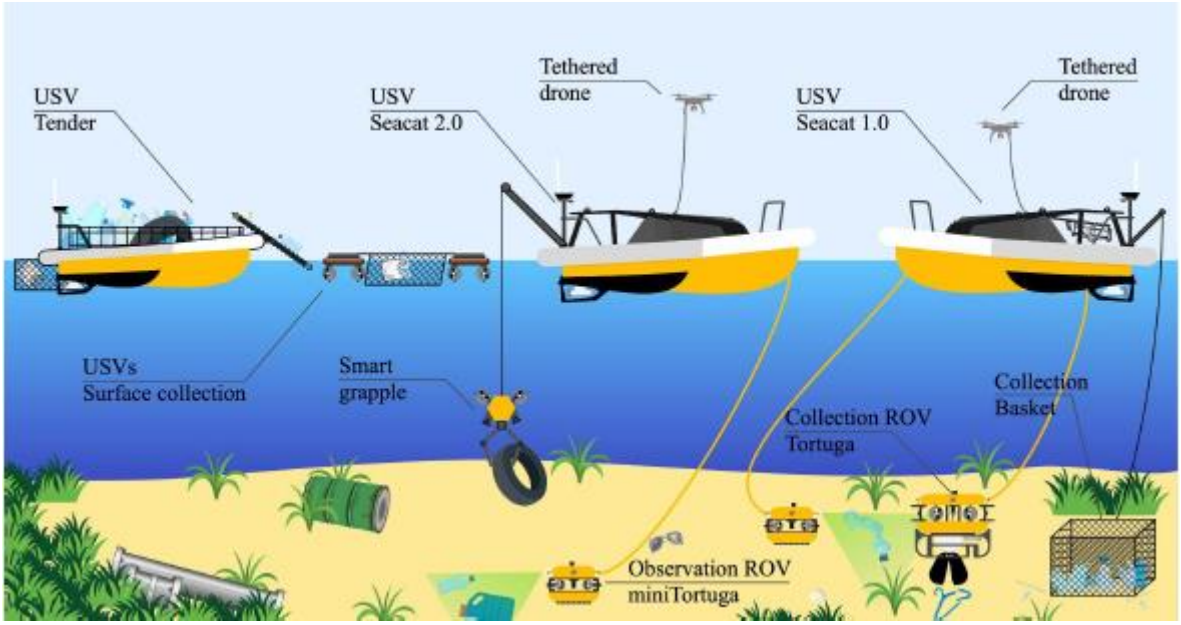

Figure 1: Concept of SeaClear 2.0 robotic system (left/middle) and SeaClear 1.0 (right)

2. Product and Service data sheet

ADVANCED MARINE WASTE COLLECTION SYSTEM

SeaClear 2.0, a revolutionary technological project aimed at reducing the plastic waste pollution in our oceans. This marine waste collection system redefines the standards of efficiency and sustainability, incorporating state-of-the-art robotic solutions.

The system comprises an uncrewed vessel to support the subsea collecting system, an ROV for underwater litter mapping, a UAV for aerial detection, a dedicated grapple for underwater litter collection, and another uncrewed vessel for the surface deposition and transportation of the marine waste.

The SeaClear 2.0 system is available both as a product and as a service.

SeaClear 2.0 is a co-funded project by the European Union under the Horizon Europe Programme.

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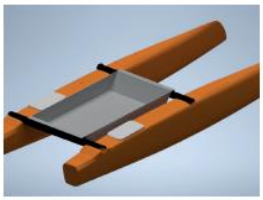
The SeaCAT, a catamaran-type surface drone, is capable of simultaneously deploying an ROV and a UAV. Its large payload capacity enables the integration of a wide range of sensors, while having the capacity to lift loads of up to 250 kg with its grapple.

The SeaCAT is equipped with a powerful grapple with thrusters that enable it to readjust its position underwater.



In order to evacuate the litter, an autonomous tender boat sails continuously back and forth to the shore.

TECHNICAL SPECIFICATIONS

VESSEL

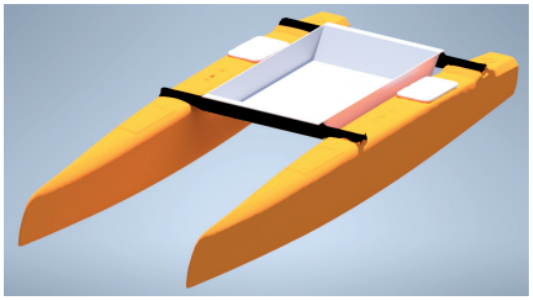
MAIN FEATURES	
Type	Twin hull catamaran, aluminium
Dimensions	L 6.83 m x B 3.1 m x H 2.15 m
Weight	1200 kg without payload
Payload capacity	250 kg
Max. speed	6 knots
Draught	0.73 m (empty), 0.90m with max payload
Max. sea state	3 (operation), 5 (transit)
Communication	Wifi / 2.4GHz radio / LTE
Endurance	Up to 10 days at 2 knots

GRAPPLE

MAIN FEATURES	
Dimensions	L 0.7 m x B 0.7 m x H 1.2 m
Weight	78 kg (in air), neutrally buoyant in water
Lift capacity	250 kg
Max. operating depth	300 m
Max. object width	1.25 m x 1.25 m
Grabbing force	250N - 1920N (configuration dependent)
Maximum speed	0.8s open to close

TENDER

MAIN FEATURES	
Type	Twin hull catamaran, fiberglass
Dimensions	L 5.5 m x W 2 m x H 2.5 m
Weight	280 kg
Propulsion	2 electric azimuth thrusters, 6kW
Payload capacity	350 kg
Communication	Wifi / 2.4GHz radio / LTE
Draught	0.3 m
Endurance	10 h at 2 kts, 2h at 9 kts
Operational sea state	4 Beaufort



SYSTEM PERFORMANCES

Seabed scanning	Up to 7 500 m2/hour (2 m swath @ 2 knots)
Seabed collecting capacity	Up to 4 T/day (2 tender rotations / hour) at 8h/day
Seabed surface collection capacity	Up to 6 T/day (3 tenders rotations / hour) at 8h/day
Maximum collecting depth	300 m
System endurance	7 days @ 8 hours/day
Control range	3 000 m
Operating team	2 people
Transport	On standard road trailer or 20' container

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