



# eSpecia



The Smart  
Biogeoinformatic  
Platform



**TRIDEL TECHNOLOGIES**

GEOSCIENCE | GEOINFORMATICS | GEOENGINEERING

# eSpecia

Over the last 50 years there has been a profound impact on the ecosystem of our planet. Mankind directly takes part in this process by affecting the biodiversity. Our global common goal is to prevent loss of flora and fauna species as well as their habitats introducing environmental monitoring and nature management. After all, biodiversity is a complex system where every piece is vital to its functionality. Food we are eating, air we are breathing, water we are drinking and climate which makes our planet appropriate for life's existence - all these are due to biodiverse nature.

Scientific research of biodiversity is focused on measuring and mapping the current state of biodiversity, recording species presence, at which places and in which abundance, and making extrapolations and future projections. Data about biodiversity is either scattered in many databases or reside on paper or other media which are not amenable to interactive searching. A framework for facilitating the digitization of biodiversity data and for making it interoperable is a challenge.

eSpecia is Tridel's solution to the environmental challenges of modern times. It provides a strong foundation to accessing, storing, and managing biodiversity data. This centralized database offers long term archiving, reporting and its data serves as input parameters for the scientific research, modelling system and GIS applications.



eSpecia provides several data entry features for wildlife recording on terrestrial as well as marine habitats. Observations based on both direct encounters and samplings and indirect evidence such as droppings, footprints, can be entered into the eSpecia portal. Collected media, GIS and sampling data is analyzed, georeferenced and consequently presented on the platform in forms of reports, maps and species profiles containing statistics, videos, photos. All data types can be viewed online or downloaded by user.



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# Terrestrial Habitat

In terrestrial habitats, observations can be recorded for all the five major taxonomic groups: plants, mammals, reptiles, arthropods (insects) and birds.



## MAMMALS

Mammals play an important role in the ecosystems and act as indicators of general ecosystem health.



## INSECTS

Insect monitoring is important for farmers, pest managers and healthcare industry to understand insect activity.



## BIRDS

Birds monitoring is needed to assess the effectiveness of conservation measures and to provide an early warning of problems.



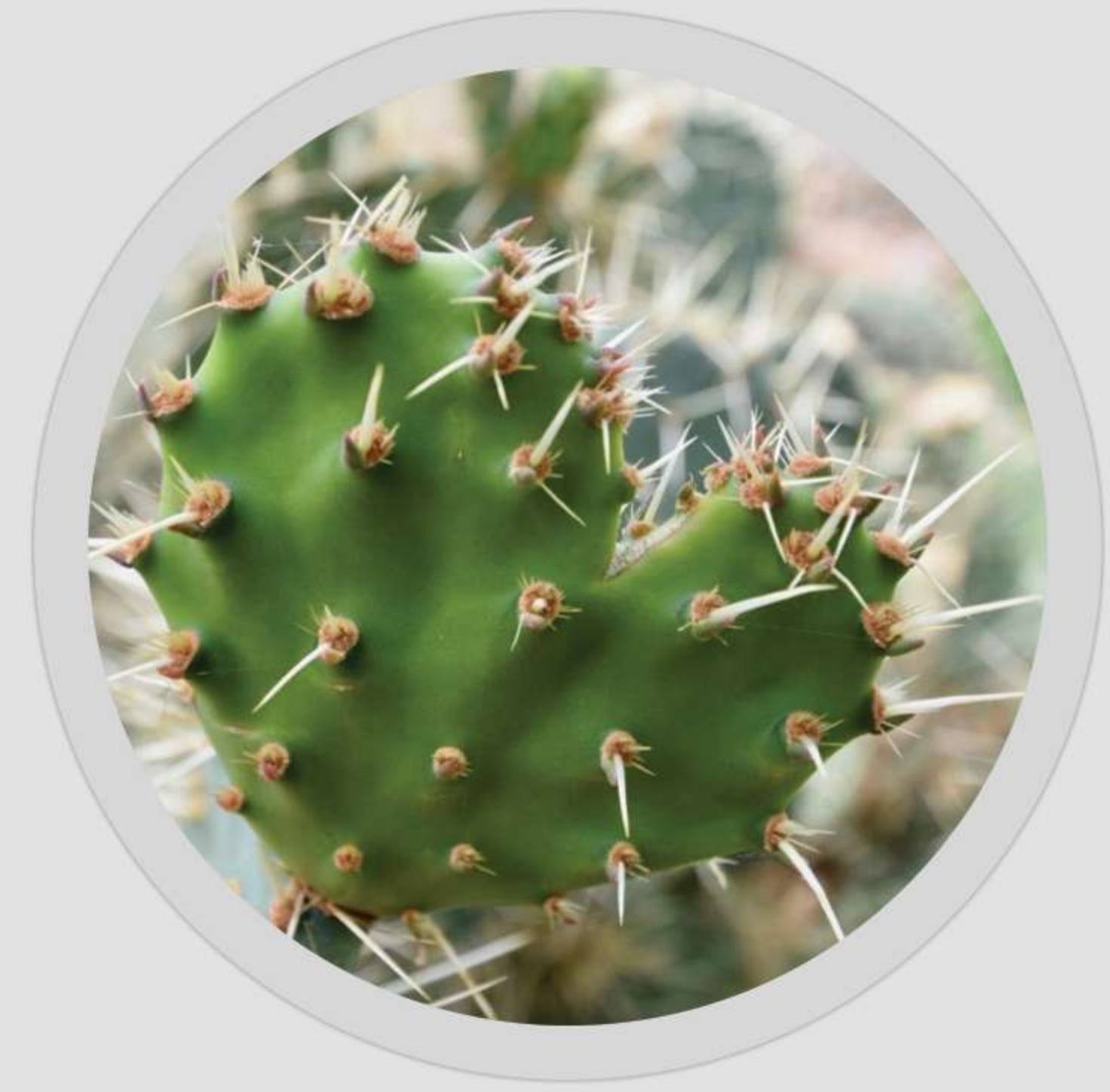
## REPTILES

Reptiles are important components of the food webs in ecosystems. They fill a critical role both as predator and prey species.

## VEGETATION

Vegetation is important to the environment because it produces oxygen, helps to cycle energy and nutrients throughout an ecosystem, and improves water quality, along with helping to moderate flooding and land erosion. Vegetation can also affect our climate.

Monitoring efforts give us a better understanding of the occurrence, distribution and status of plant populations. Data collected through plant monitoring help us make sure that common species remain common and that rare, threatened, and endangered species receive continued protection.



**Terrestrial survey involves observations based on both direct encounters from the land and air and indirect evidences of animal presence.**

- Direct day/night species observation
- Aerial survey with drones
- Camera traps
- Animal tracks, paw prints, and footprints detection
- Dwellings and holes detection
- Droppings detection

# Marine Habitat

In marine habitats, observations can be recorded for six major taxonomic groups: plankton, benthos, fish, marine plants, seabirds, and megafauna.



## MARINE MEGAFUNA

Comprised of all large-bodied organisms inhabiting seas and oceans, including bony fishes, sharks and rays, marine mammals and reptiles.



## SEABIRDS

Play a number of important functional roles: transfer of nutrients from offshore areas to islands and reefs, distribution of organic matter.



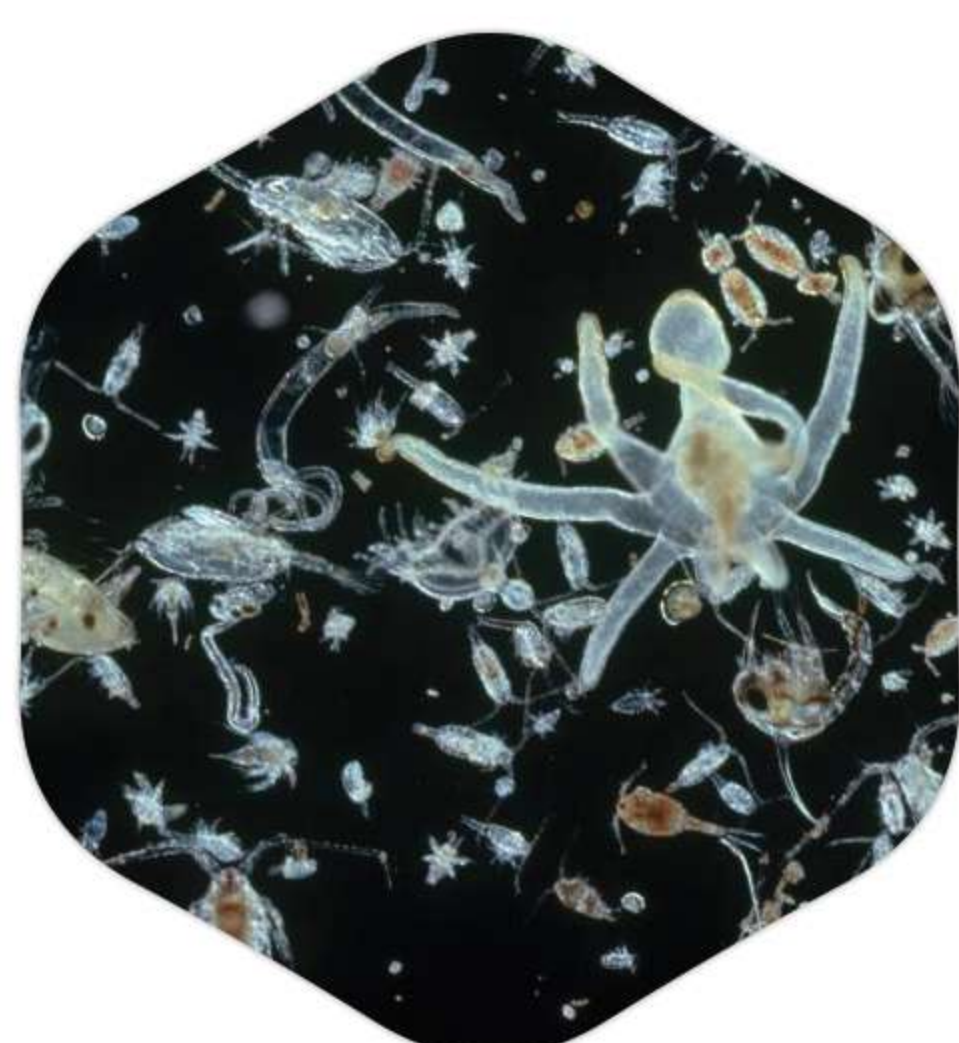
## MARINE PLANTS

There are two main types of marine plants: seagrass and algae. Both these types provide living organisms with oxygen, food, and shelter.



## FISH

Fish are a vital component of marine habitats. They are complexly related to other organisms – through the food web and other mechanisms.



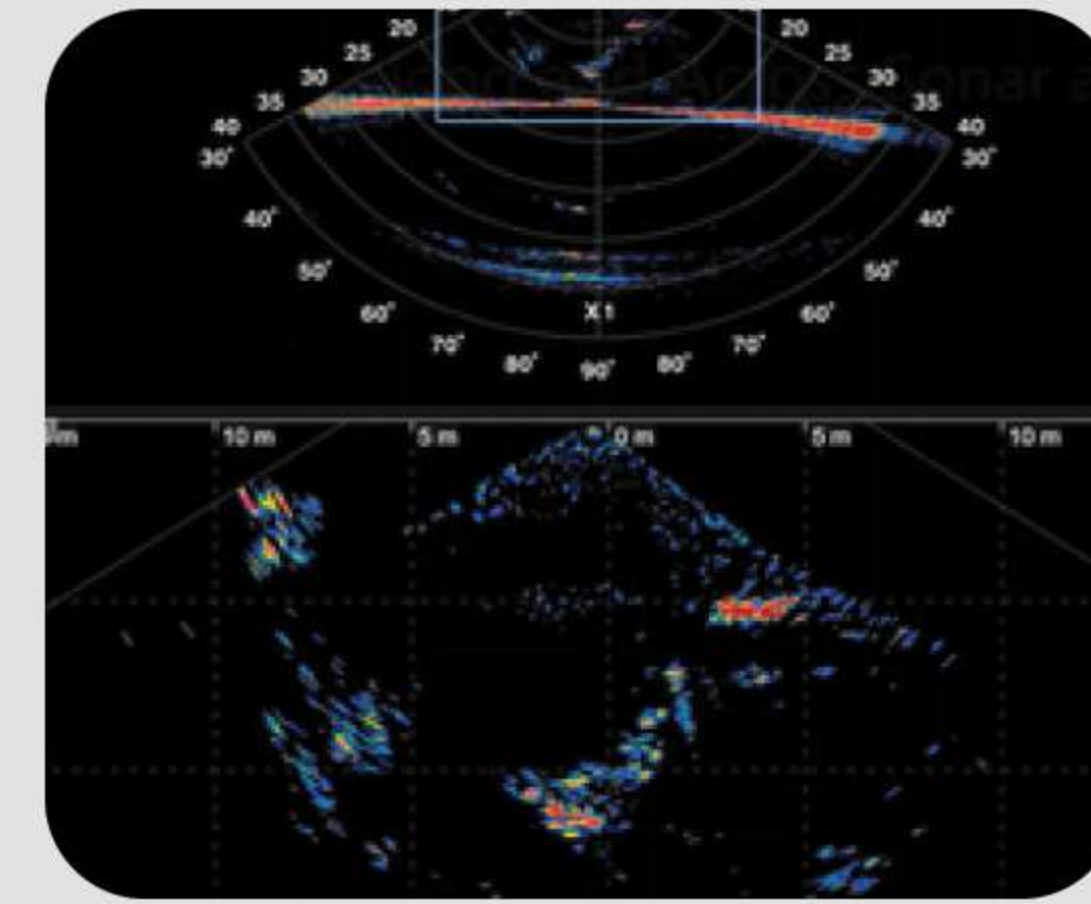
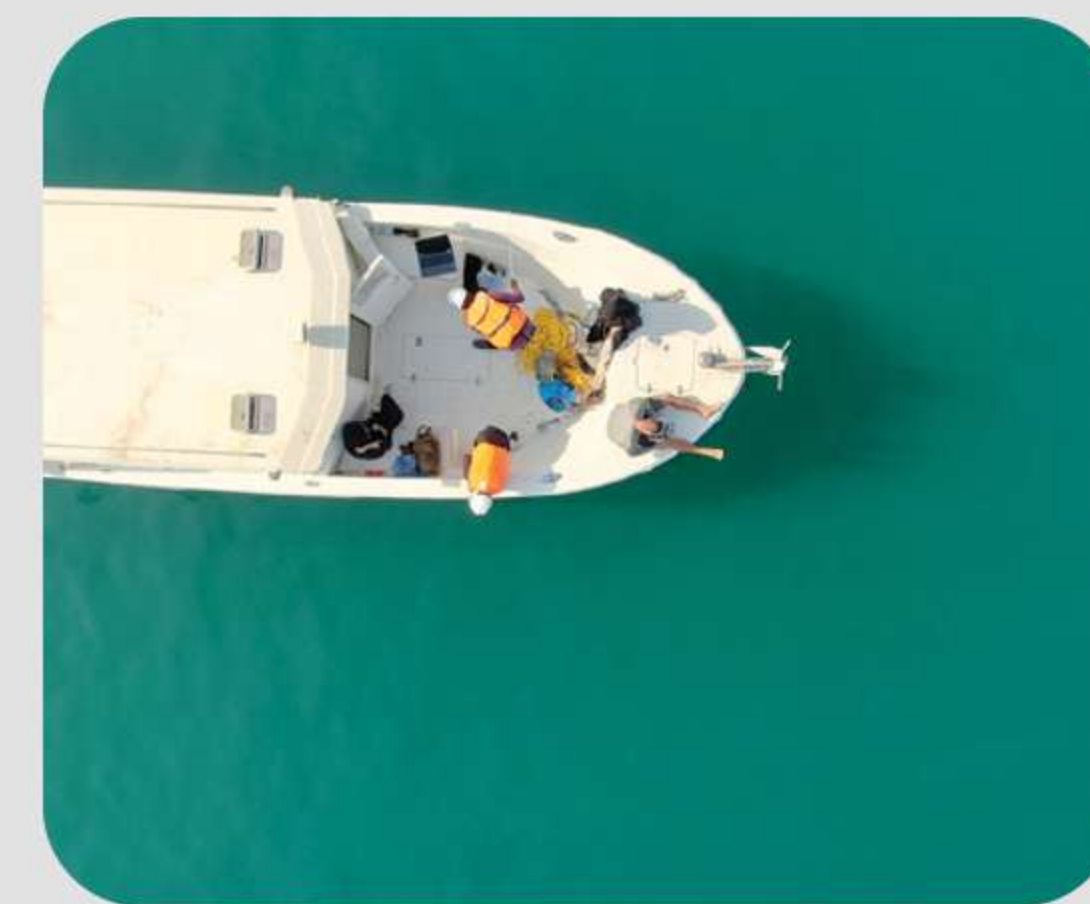
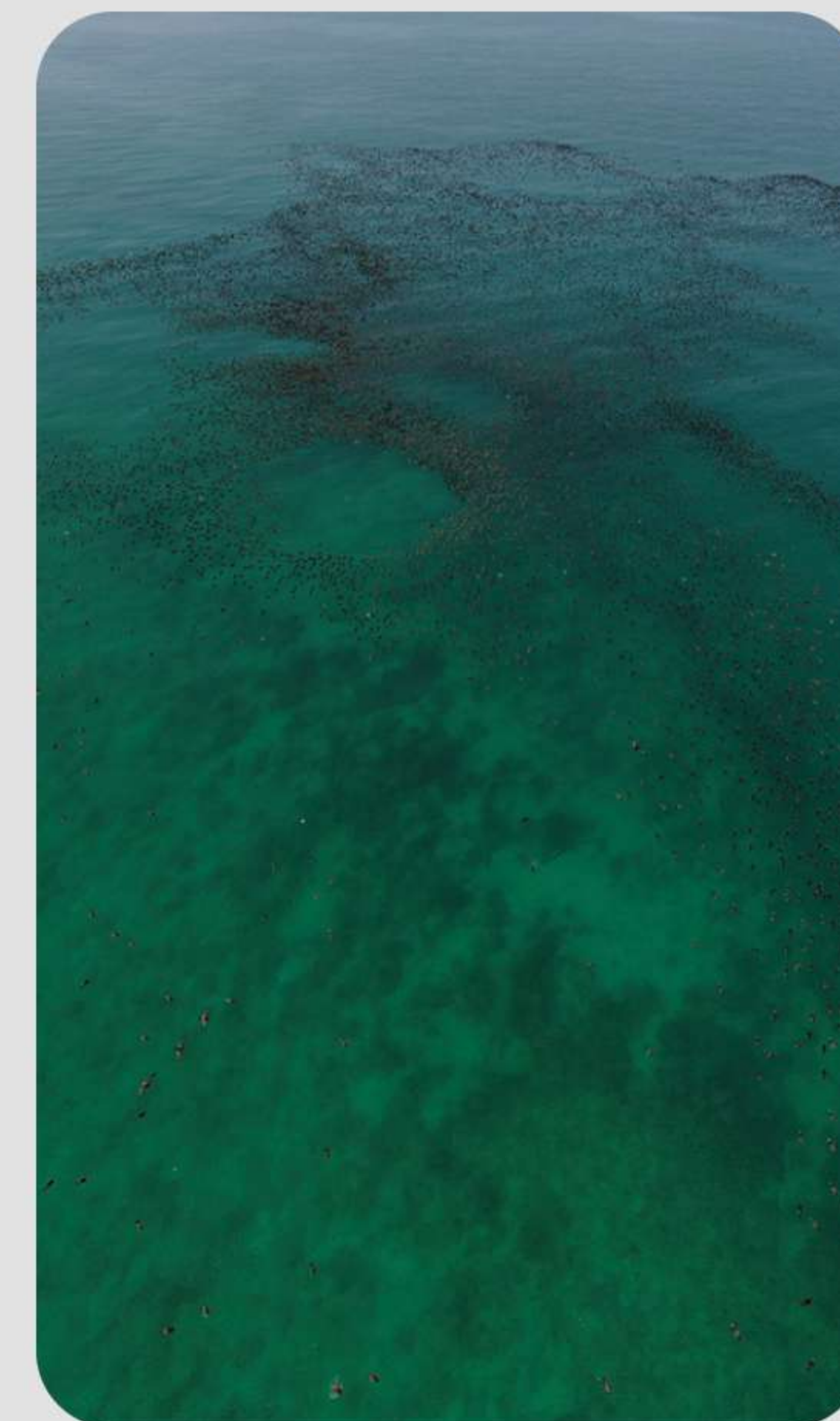
## PLANKTON

Plankton includes all those organisms that live their lives drifting in the water column. These organisms underpin the entire ocean food web.

## BENTHOS

Benthos are organisms living in or on the sediment of the seafloor. Most of these animals lack a backbone and are called invertebrates. Typical benthic invertebrates include sea anemones, sponges, corals, sea stars, sea urchins, worms, bivalves, crabs, and many more.

Benthic marine organisms play a critical role in global cycles of nitrogen, sulfur, and carbon. At the same time, coral reefs are some of the most diverse and valuable ecosystems on Earth. Coral reefs support more species per unit area than any other marine environment.



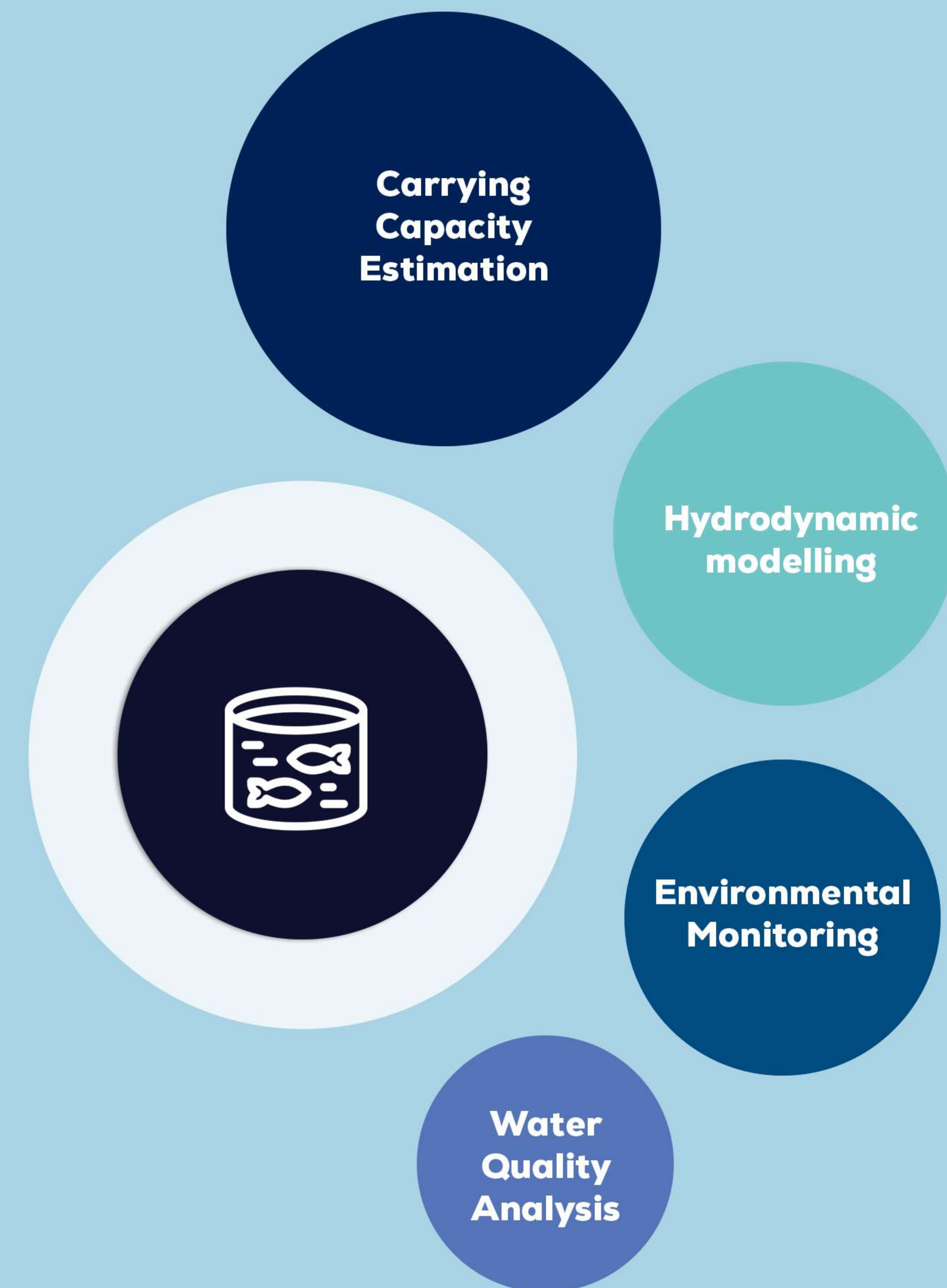
**Marine habitat survey involves three types of survey: land-based survey for coastal and intertidal data collection, boat-based survey and underwater survey.**

- ⬡ Direct boat-based and land-based species observation
- ⬡ Aerial survey with drone
- ⬡ Underwater survey with Multibeam Echosounder
- ⬡ ROV Dropdown Camera survey
- ⬡ Water Quality Analysis (turbidity, salinity, DO, pH, chlorophyll, nitrate, heavy metals,...)
- ⬡ Biological sampling (phytoplankton, zooplankton, macrobenthos)
- ⬡ Animal tagging

# Aquaculture

Aquaculture is one of the fastest growing food supply sector and supports food security for the growing world population. The expansion and sustainability of marine aquaculture depends on the development and adoption of best management practices throughout the cycle of production from site selection, cage deployment and operation, to fish husbandry and culture practices through to audit and monitoring of activities and impacts.

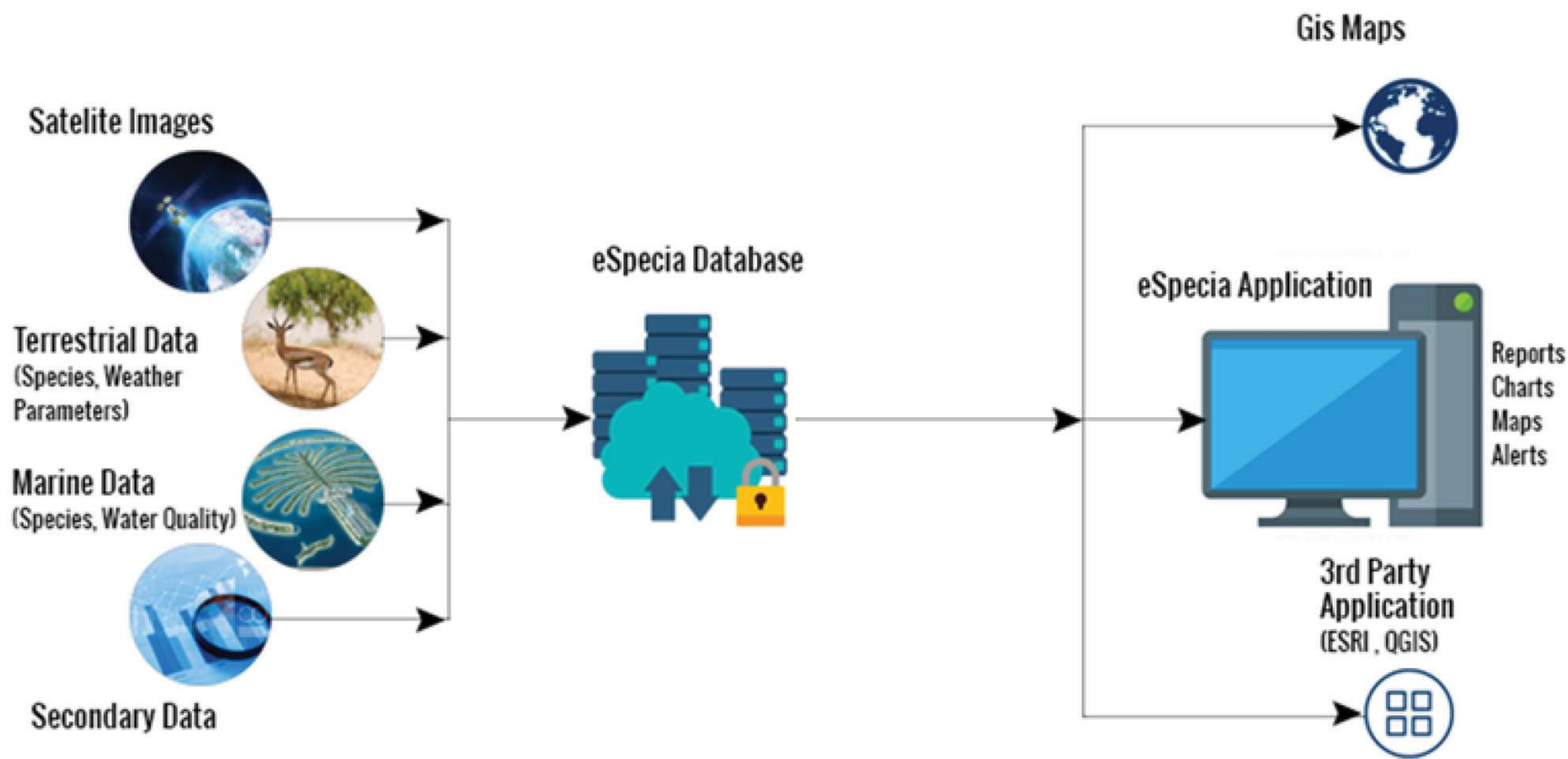
Monitoring involves designing an appropriate survey, then collecting, analysing and reporting the data, and establishing a link to improve impact management, to help achieve a better understanding of cause-and-effect relationships between the cage farm and water and sediment quality and to improve environment impact prediction and mitigation methods. Monitoring is used to evaluate changes in the ecosystem and in this context, monitoring can be used to evaluate the changes against a measured pre-development state. All collected data is visualized in eSpecia platform.



eSpecia support data visualization of four types of survey: hydrodynamic modelling, water quality analysis, carrying capacity estimation and environmental monitoring. Hydrodynamic modelling is conducted to estimate flushing time, vertical mixing, and other key parameters. The water quality parameters which are recorded for each aquaculture research are conductivity, temperature, depth, salinity, pH, dissolved oxygen (DO), turbidity, total dissolved solids (TDS).

Carrying capacity is a key parameter which is defined as the biomass of cultured organisms that can be supported without altering system state or function measured by water or sediment quality standards and processes. Environmental monitoring includes but not limited to assessment of nutrient and chemical pollution, benthic assemblages, waste management, site contamination, air quality and noise level.

# Data Management



eSpecia, the centralized geographically referenced database system, consists of data comprising biological, physical, ecological, climatic, and socio-economic information for surveys, including biologically significant or important species, habitats and ecosystems. The GIS database system allows data collection from numerous ways, locations and methods as well as management and remote maintenance.



## Data Exchange

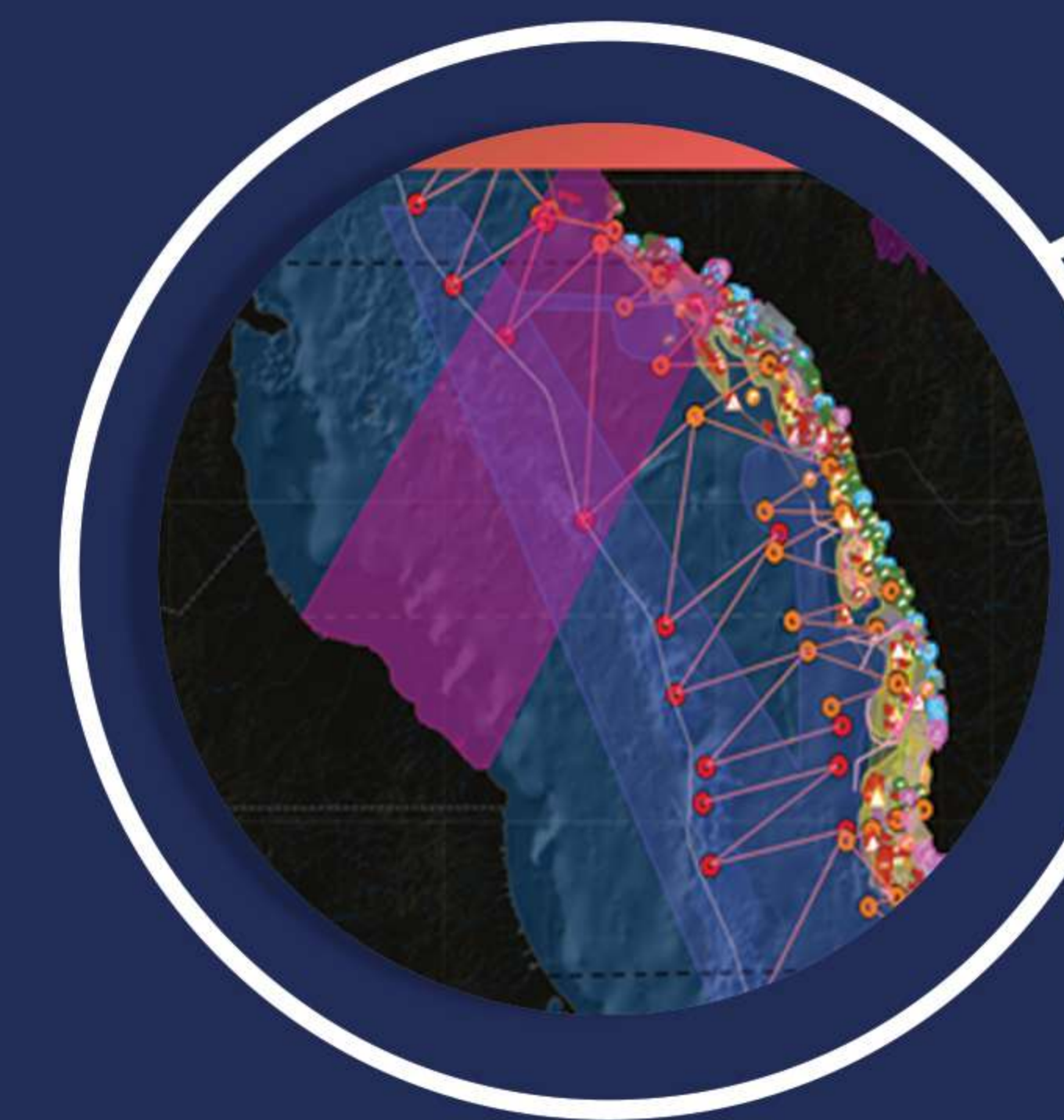
Data Exchange Service is provided as REST API solutions enabling seamless data integrations with third-party systems and applications. The system is designed to efficiently integrate into master systems and enhance user experience in delivering speedy and accurate data exchange.



## Data Security

eSpecia application is secured with Role based access control (RBAC) that provides fine-grained access management of eSpecia resources. This security approach authorizes and restricts system access to users based on their role(s) and privileges.

# Data Presentation

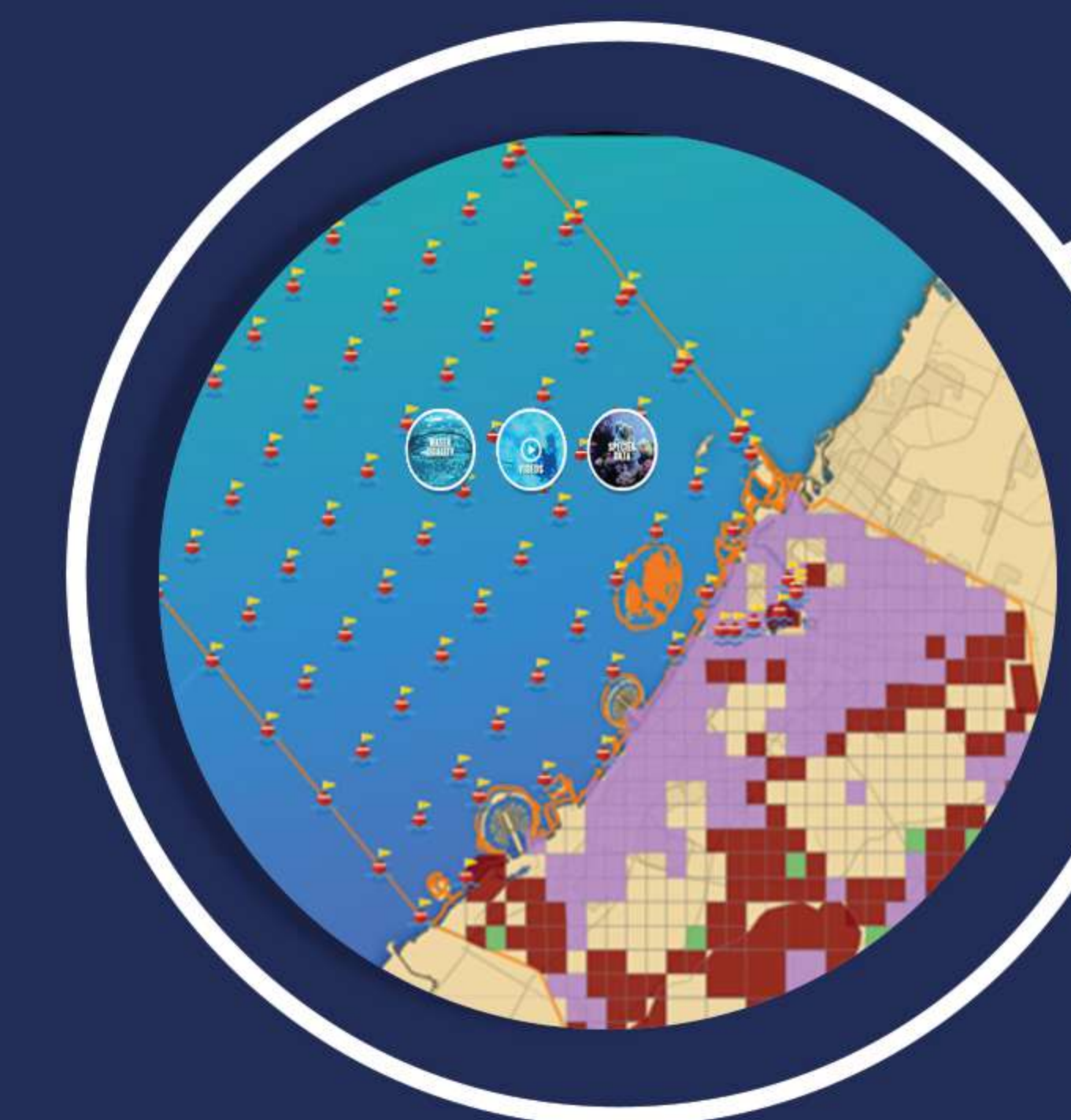
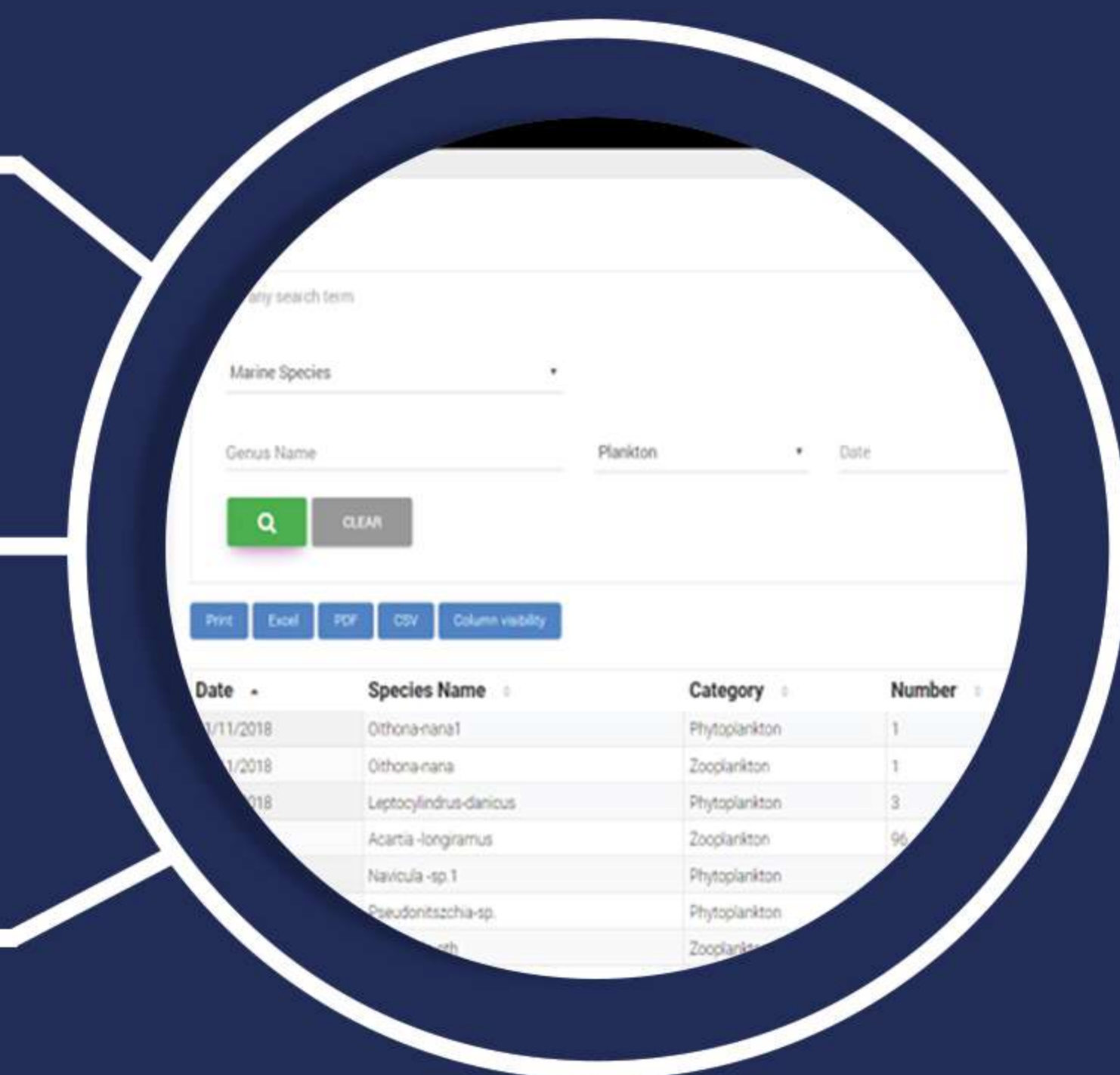


- Dynamic mapping interface
- Ability to add supporting map layers
- Time and season filtering of data

eSpecia is featured with outstanding visualization capabilities, connectivity to multiple data sources, quick insights and interactive presentations.

- Manual and automated reporting tools
- Map Tools  
Map Printing
- Various formats for data export & import

eSpecia supports xls, csv, PDF, SHP, GeoTIFF, Raster, ASCII data formats.



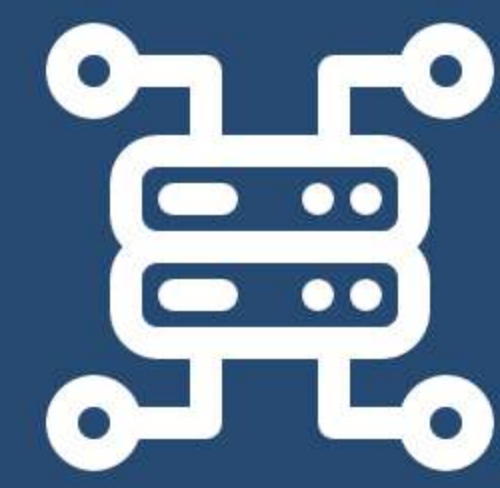
- Live camera integration  
Live monitoring
- Project videos and time lapse
- Data archiving

The data obtained in the eSpecia database will be assessed with the aim of improving knowledge about the natural environment of each location.

# Key Features



Open architecture platform



Centralized database



Scalable system configuration



Accurate and georeferenced data



Field data capture using mobile devices



Customizable interfaces and reports



Species library system

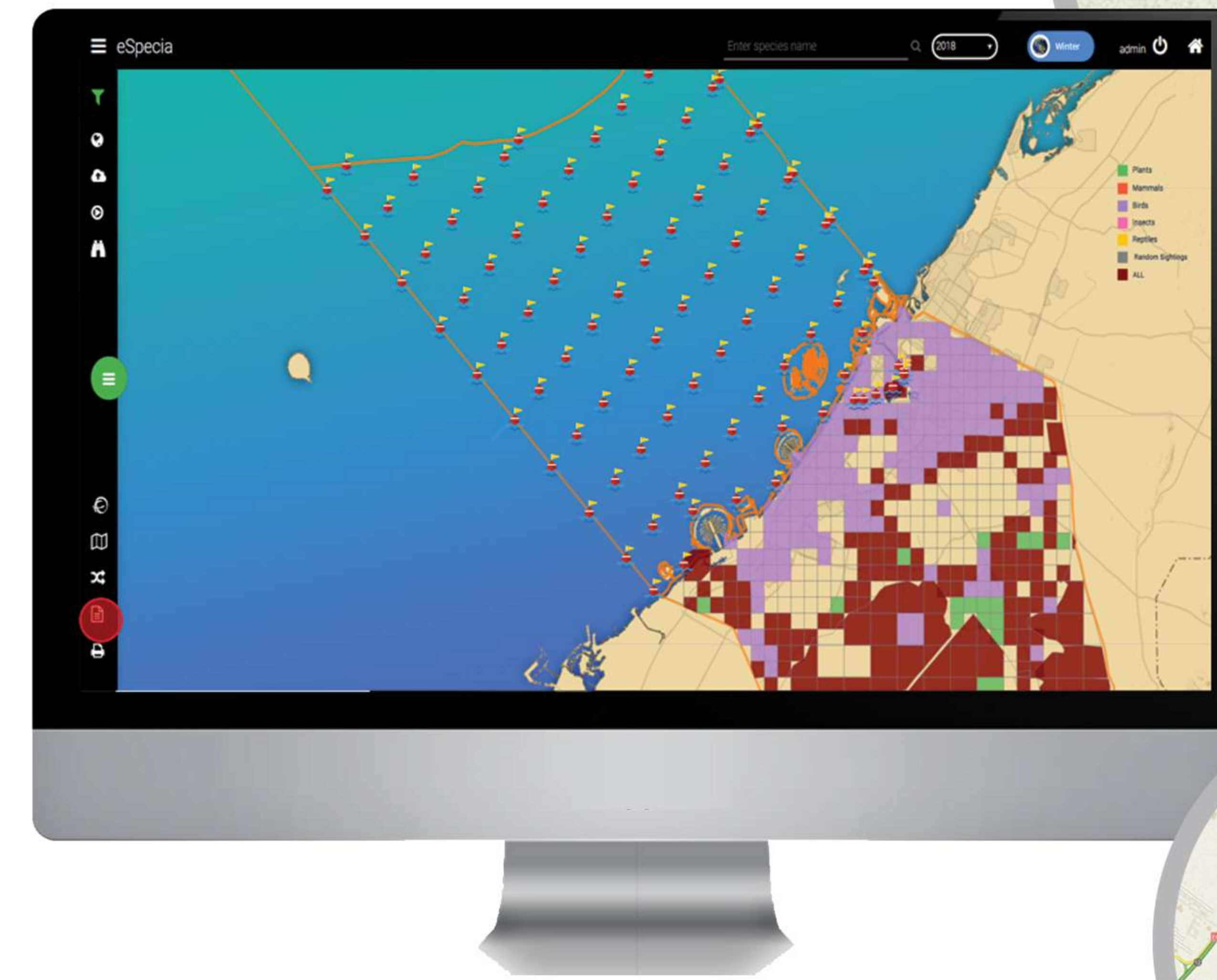


Secured database system



Data visualization in graphs, charts, maps

# eSpecia



eSpecia provides an opportunity to view captured photos, to display species information chosen from an interactive map or to see all locations of particular species on the map. There is a possibility to view species profile page which contains all the data corresponding to the selected species.

eSpecia enables field data capture using mobile devices as well as links to an archival database to permit analysis and output results in desired formats. The data is made available in formats useful to planners, researchers, government, nongovernmental organizations, and to the public.

# Case Studies

## Terrestrial Biodiversity Baseline Survey for Dubai Municipality

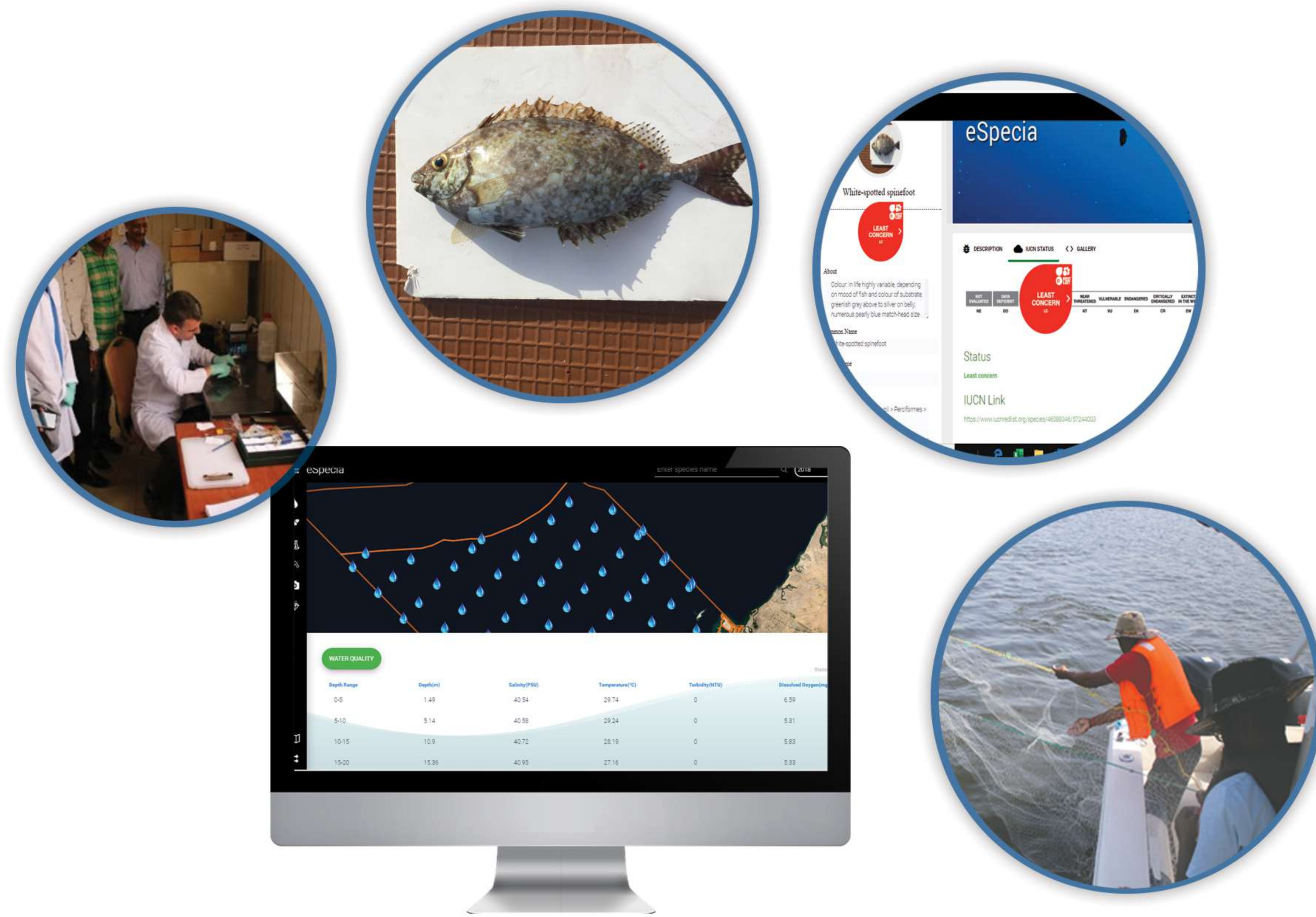


Biodiversity Baseline Survey for Dubai Emirate is first of its kind in Dubai and aimed at conducting terrestrial biodiversity baseline survey through collection of systematically comprehensive and geospatially referenced information on current status of terrestrial habitats. The whole Emirate of Dubai was overlaid by 2.5 km X 2.5 km grid cells. The whole landscape was categorized into three types based on the land use pattern in the Emirate. Four taxonomic groups were comprehensively studied and quantified within the grid cells: plants, mammals, birds and reptiles.

eSpecia software was used for data collection, visualization and summarization of biodiversity data. Numerous GIS maps were built for varied factors such as Habitat map of Dubai Emirate, Species richness map across various categories of Landscapes, Species richness map as per the seasons. New methods were applied for trapping such as camera trapping for large mammals, Sherman trapping for small mammals. Reptiles and ground dwelling insects were sampled using a combination of cover boards, drift-wall fences, pitfall traps and light trapping.



# Integrated Fisheries Management plan for Dubai Municipality



The main objective of Fisheries Research survey was to update Dubai's fish stocks assessment and monitoring program due to overexploitation and lack of information on Dubai's fisheries. Data was collected through two types of survey: land-based survey to note fish species caught from water body, to record the intertidal flora and fauna at selected coastal locations as well as

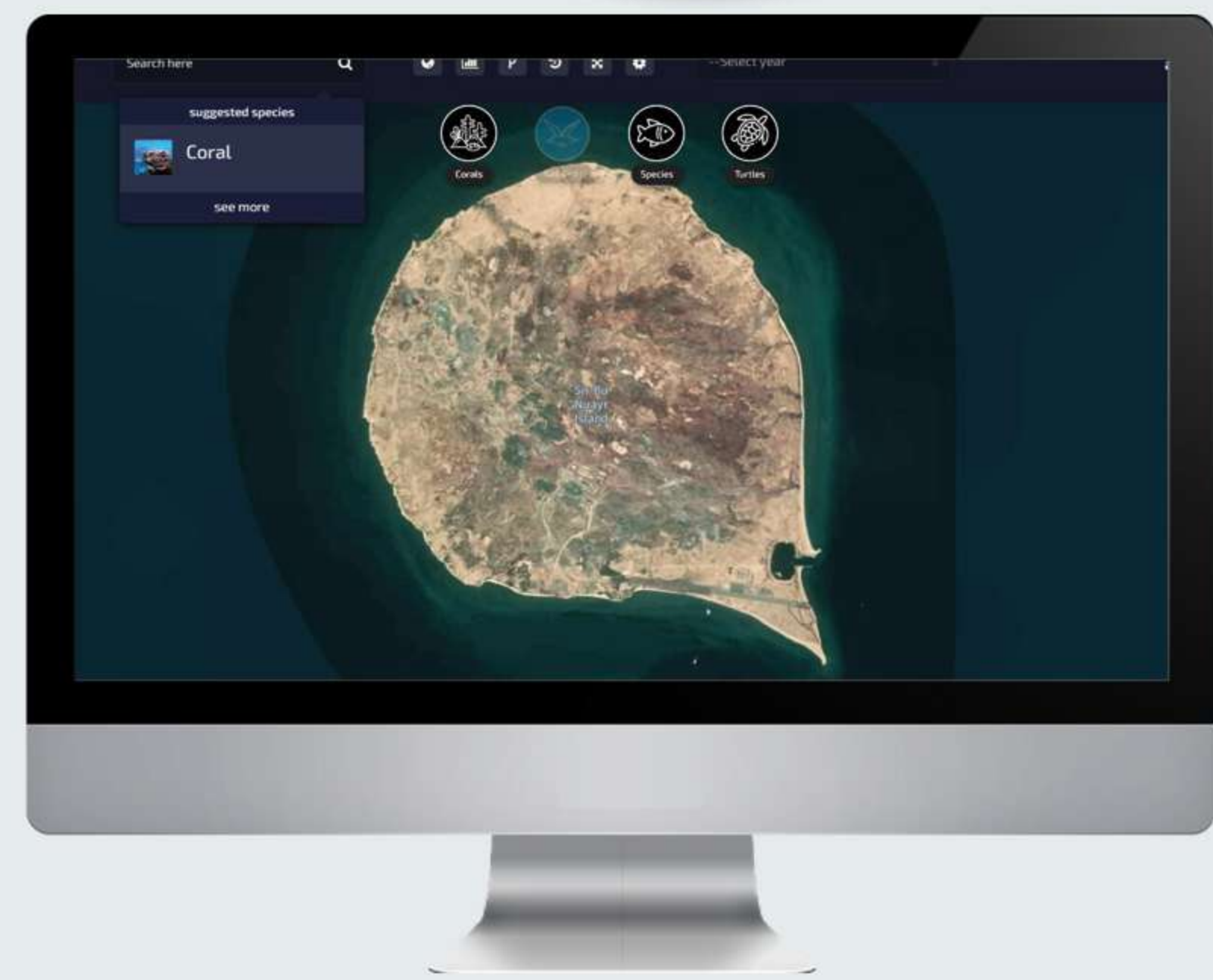
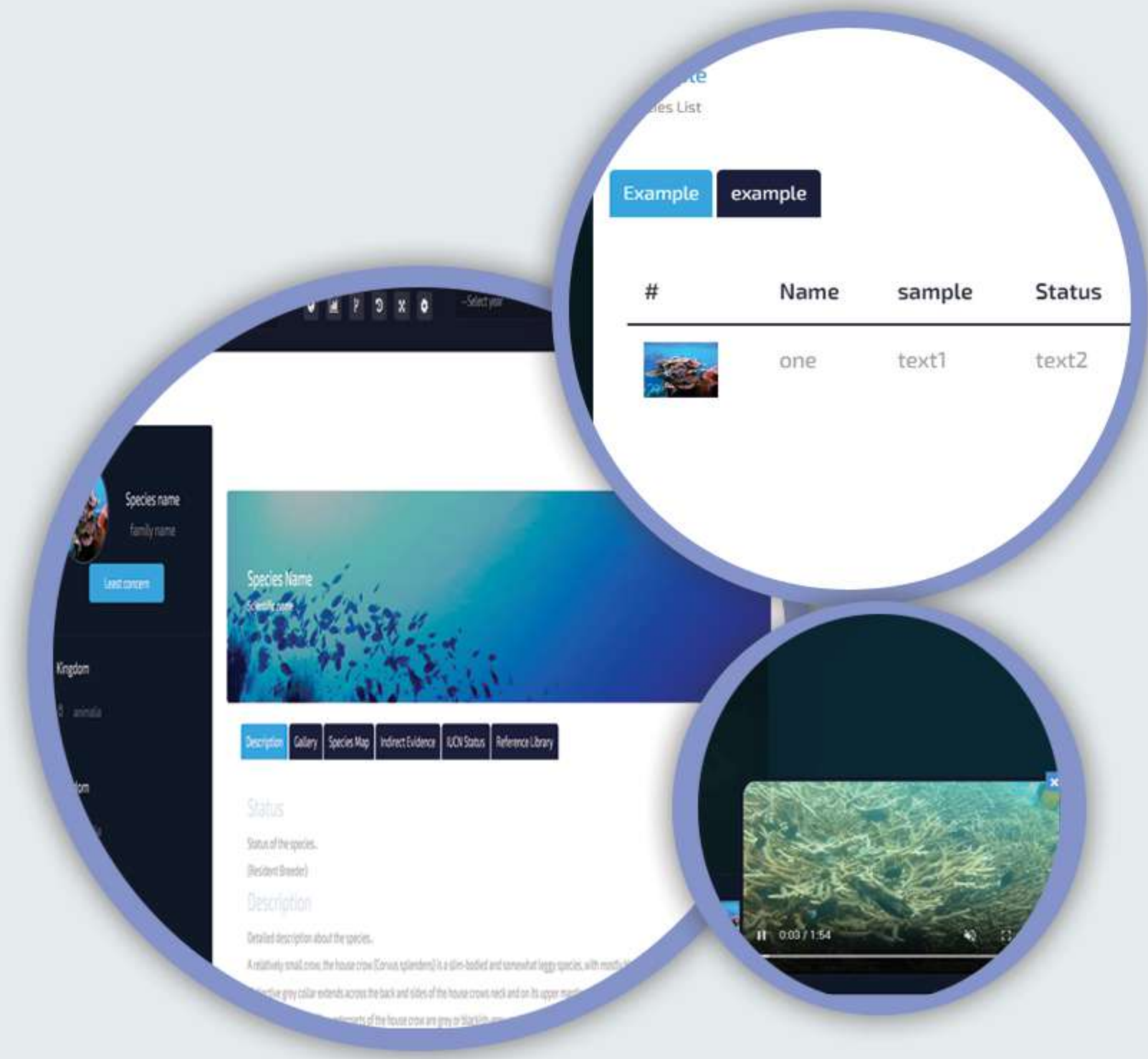
boat-based survey which was conducted to study hydrographic parameters such as temperature, salinity, dissolved oxygen, chlorophyll and to do biological sampling for studying phytoplankton, zooplankton, benthos, intertidal organisms and for experimental fishing. Web based application eSpecia enabled visualization and complicated analysis of the surveyed data.

# Biodiversity Survey of selected sites in Al Maktum International Airport, Dubai



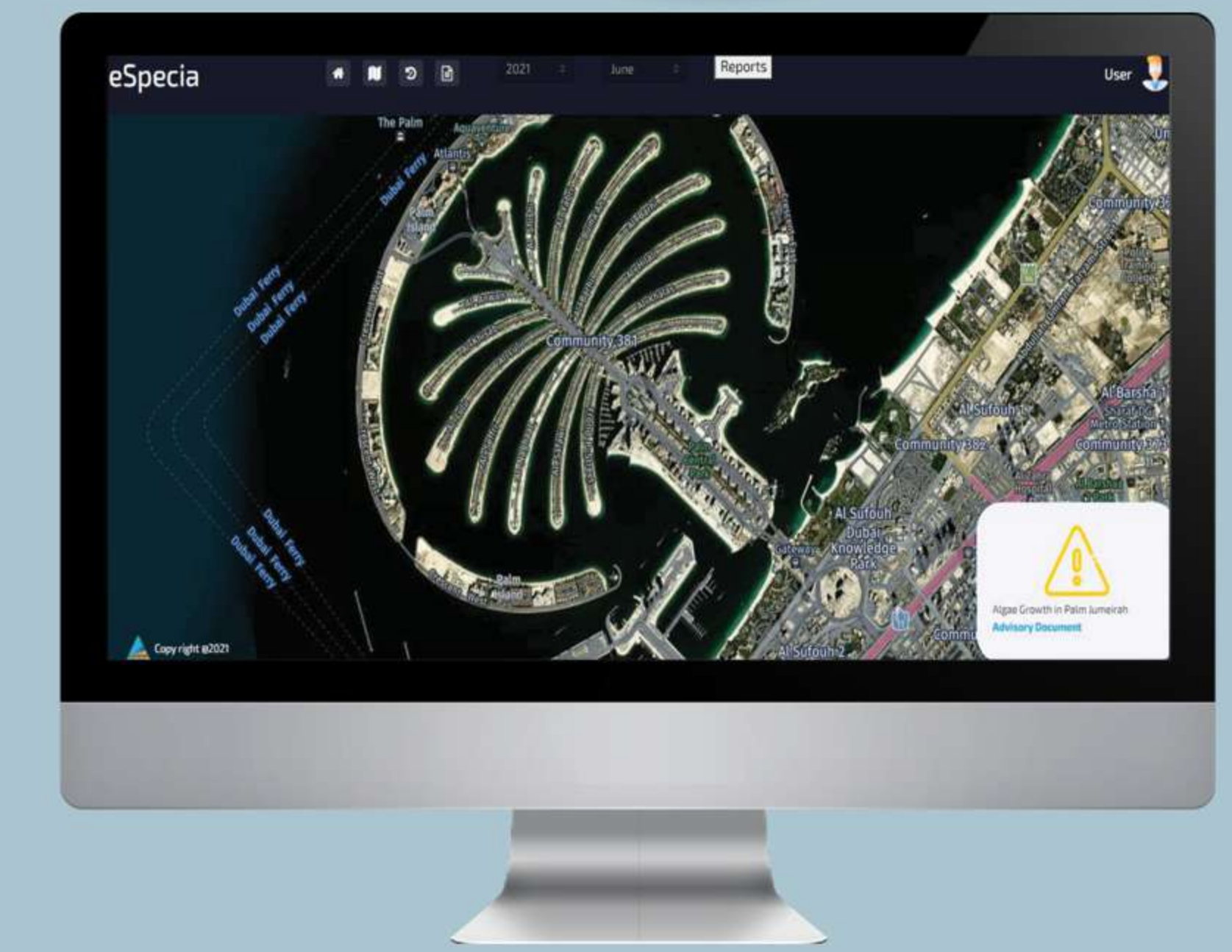
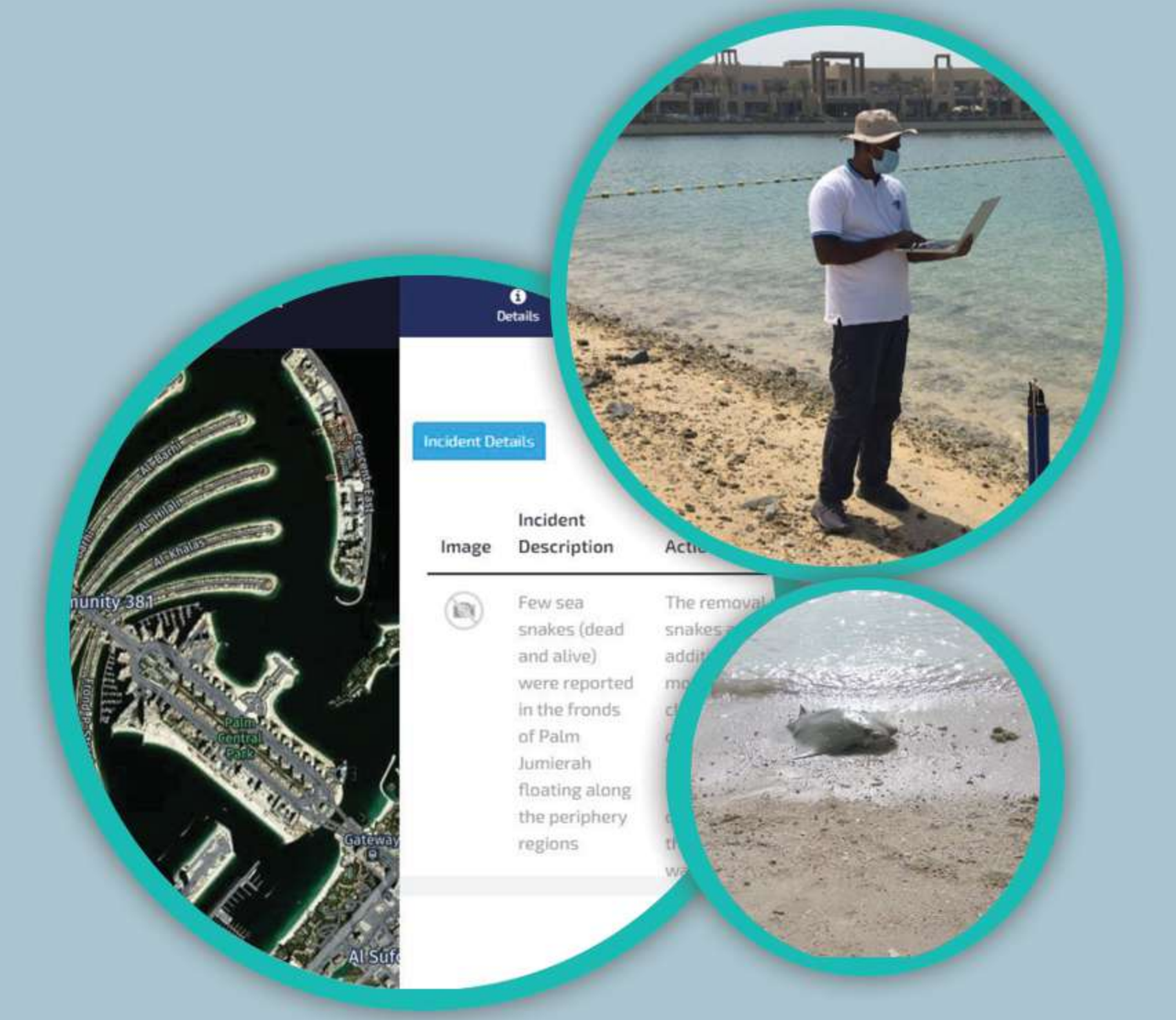
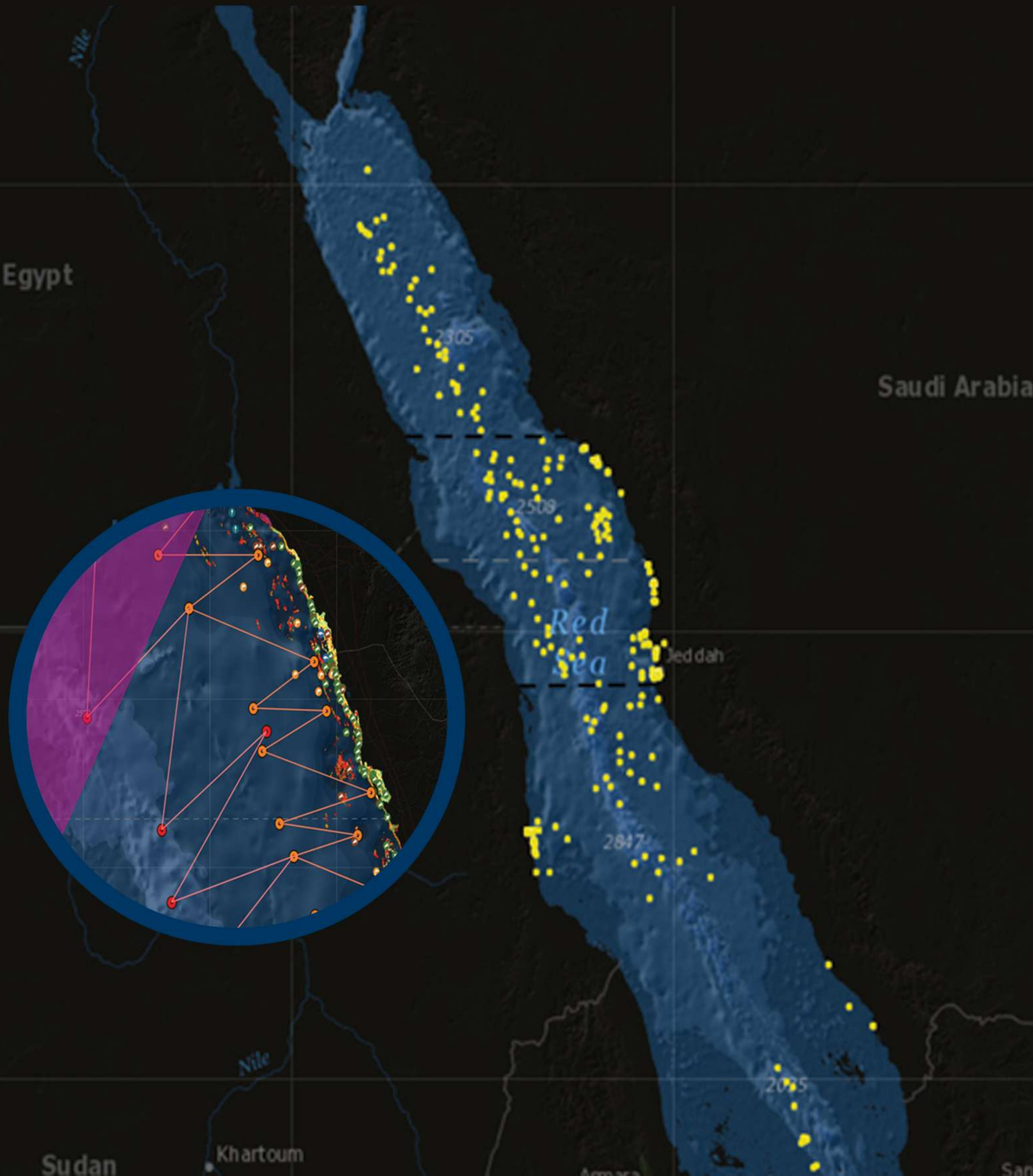
The Dubai Aviation Engineering Projects (DAEP) and the Dubai South including the EMAAR South constituted a huge project site in which developmental work was already in progress. The entities aimed to conduct the biodiversity survey for selected areas to understand the presence of prevalent species and the impact of development activities on them. The habitats identified at the survey sites include sand sheets, sand dunes and sandy plains with relatively good vegetation, especially clumps of the grasses.

eSpecia software was used as a tool for data visualization and analysis for reporting on the details of existing biodiversity of the areas and recommendations for conducting a more comprehensive terrestrial biodiversity survey. Emphasis was laid for species and habitats of conservation importance identified during the survey in accordance with the International Union for Conservation of Nature (IUCN) Red List. Findings were compiled into a report comprising of species list, species distribution maps and charts.



## The Red Sea Data Visualization Portal for The National Center of Wildlife (NCW) in Saudi Arabia

First of its kind interactive platform for Red Sea biodiversity visualization on the basis of eSpecia and developed for the National Center of Wildlife for the purpose of sustainable management and conservation of species and habitats in the Kingdom. Under the scope of the project, eSpecia GIS database was replenished with great variety of IUCN Red List marine species including dugongs, turtles, sharks and whales. As a critical component of biodiversity management, key marine and coastal habitats, such as seagrass meadows, coral reefs and mangroves, were recorded and mapped.



## Palm Jumeirah Marine Environmental Services for Nakheel Asset Management and Infrastructure

New application for eSpecia software was found in environmental monitoring of beaches and waterways of Palm Jumeirah, an artificial archipelago created by Nakheel properties. The monitoring process includes scheduled and oncall field visits for detection of algal blooms, oil slicks, dead or hazardous wildlife (jellyfish and sea snakes). Collected data was visualized in form of maps, charts and species profiles in eSpecia for further analysis along with incident and advisory reporting. Conservation and maintenance of environmental and economic state of Palm Jumeirah surroundings becomes very essential in order to maintain its aesthetic value.

## Sir Bu Nair Island conservation program for Sharjah Environment and Protected Areas Authority (EPAA)

eSpecia acted as a key pillar for the conservation of the coastal and marine ecosystems and biodiversity of Sir Bu Nair Island. This unique nature habitat has been recognized by The Convention on Wetlands of International Importance (Ramsar) and also included in (UNESCO) World Heritage Tentative list. Ecological data collection involved information on turtle nests, resident and migratory birds, gazelles, lizards and coral reef communities which abundantly inhabit the island and its coastal waters. eSpecia data in cooperation with TEMS real-time meteorological and oceanographic data collection system were used to perform the analysis of environmental state of the island.



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AUSTRALIA | INDIA | SAUDI ARABIA | UAE



+971 4288 4395



[www.trideltechnologies.com](http://www.trideltechnologies.com)



+971 4348 3650



[mail@trideltechnologies.com](mailto:mail@trideltechnologies.com)