

ICRI Webinar: Harnessing AI to monitor coral reefs



MERMAID

A shared model, many contributors: co-creating better, simpler coral reef AI for all.



Alexandra Kler Lago

Field Support & Partnerships Manager



Introducing MERMAID

An initiative of the **Wildlife Conservation Society**, MERMAID is the first and only **end-to-end platform** for monitoring coral reefs that integrates **fish**, **benthic**, **bleaching**, and soon **macroinvertebrate data**.



Introducing MERMAID

94% of MERMAID users are from outside WCS — forming a thriving, global community of NGOs, research institutes, academics, practitioners, and government agencies.

>3,000
users

>180
organizations

8,000
monitored
sites



The first of the
MERMAID AI
suite of tools:

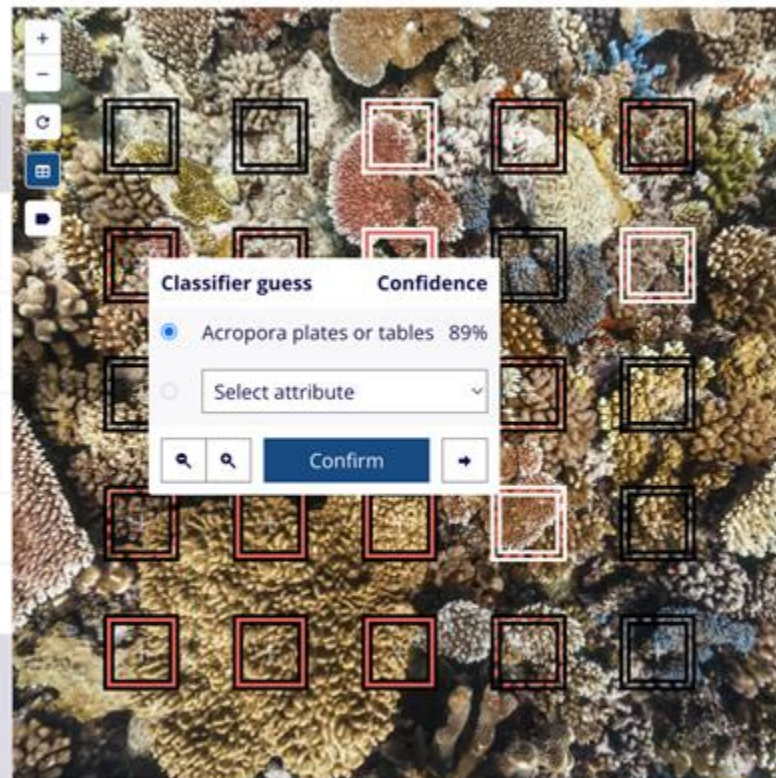
Image Classification (Beta)



Ben Neal - GBR5.jpg

	Benthic attribute / growth form	Confirmed	Status
	Acropora plates or tables	2 / 5	Confirm all
	Crustose coralline algae	0 / 2	Confirm all
	Hard coral branching	0 / 3	Confirm all
	Pocillopora	0 / 3	Confirm all
	Soft coral	5 / 5	Confirmed

7 Unclassified points



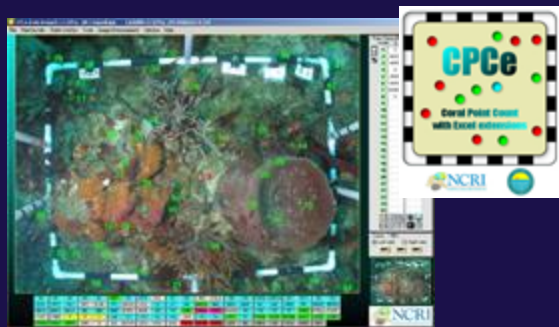
Confirmed Unconfirmed Unclassified

Close Save changes

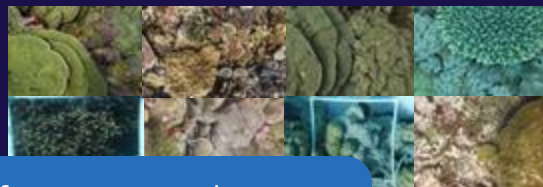
Challenges in turning coral reef images into data

Monitoring coral reefs is essential — but it's hard.

Traditional approaches are very slow and labor-intensive



Current AI pipelines require model training and validation



Often, users need to use
~30% of photos in training
before running model



Training
AI model



CORALNET
A WEB SOLUTION FOR CORAL
REEF ANALYSIS



→ Harder adoption, limited model/labels standardization,
coral reef images underutilized, and inaccessible

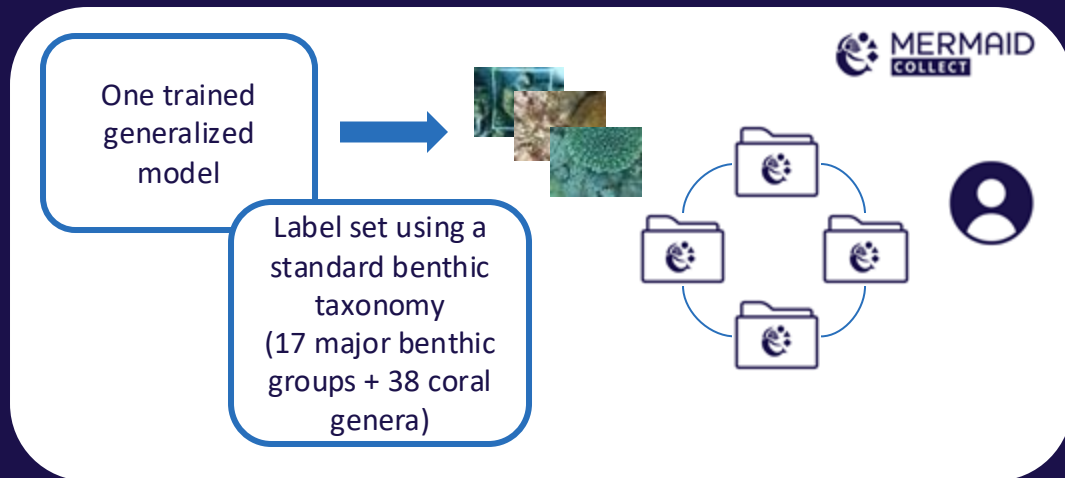
Our approach to AI for coral reef images

Instead of having each team training and maintaining their own models, MERMAID developed a shared generalized model already trained and integrated into our platform.

With CoralNet



>500,000 images from
326 public sources
used in training



Shared across sites, projects and teams

A simple and easy image classification workflow

Step 1: Users drag-and-drop photos into MERMAID

The screenshot displays the MERMAID COLLECT web application interface. The top navigation bar includes links for Projects, Reference, MERMAID Explore, and a user profile icon. The left sidebar contains a menu with sections: DATA (Collecting, Submitted), METADATA (Sites, Management Regimes), OVERVIEW (Sample Units / Observers, Sample Units / Management Regimes), and ADMIN (Project Info, Users, Data Sharing, GPCR). The main content area is titled 'Benthic Photo Quadrat' and features a 'Save' button, a 'Validate' button, and a 'Submit' button. The form includes a 'Notes' section with a large text area, an 'Observers' section with a dropdown menu showing 'Alexandra Kler Lago' and a prompt to 'Select one or more observers to add', and an 'Observations' table. The table has columns for '#', 'Photo', 'Quadrat', 'Benthic Attribute', 'Growth Form', 'Confirmed Points', and 'Unconfirmed Points'. Below the table is an 'Upload photos' button. At the bottom left, a status bar shows 'You're ONLINE' and a 'Delete Record' button.

MERMAID COLLECT

Projects Reference MERMAID Explore

DATA

Collecting 1

Benthic Photo Quadrat

Submitted

METADATA

Sites

Management Regimes

OVERVIEW

Sample Units / Observers

Sample Units / Management Regimes

ADMIN

Project Info

Users

Data Sharing

GPCR

Benthic Photo Quadrat

Save Validate Submit

Notes

Observers

Observers *

Alexandra Kler Lago

Select one or more observers to add

Observations

#	Photo	Quadrat	Benthic Attribute	Growth Form	Confirmed Points	Unconfirmed Points
Upload photos						

You're ONLINE

Delete Record

A simple and easy image classification workflow

Step 2: MERMAID instantly makes predictions for 25 points in each photo

MERMAID COLLECT

Projects Reference MERMAID Explore

DATA

Collecting 1

Benthic Photo Quadrat

Submitted

METADATA

Sites

Management Regimes

OVERVIEW

Sample Units / Observers

Sample Units / Management Regimes

ADMIN

Project Info

Users

Data Sharing

GPICR

You're ONLINE

Benthic Photo Quadrat

Save Validate Submit

#	Photo	Quadrat	Benthic Attribute	Growth Form	Confirmed Points	Unconfirmed Points
2		1	Crustose coralline algae		0	2
3		1	Hard coral	Branching	0	2
4		1	Hard coral	Digitate	0	6
5		1	Pocillopora		0	3
6		1	9 Unclassified points			
7				Queued...		
8				Processing...		

% Crustose coralline algae 12.5

% Hard coral 87

A simple and easy image classification workflow

Step 3: Users review and confirm annotations, which are saved to build better future models

Super Reefs Majuro SR6 - GOPR3611 (cropped) (1).JPG

Benthic attribute / growth form	Confirmed	Status
Acropora	0 / 3	Confirm all
Crustose coralline algae	8 / 8	Confirmed
Hard coral	1 / 1	Confirmed
Montipora	7 / 7	Confirmed
Porites	1 / 4	Confirm all
Psammocora	0 / 1	Confirm all

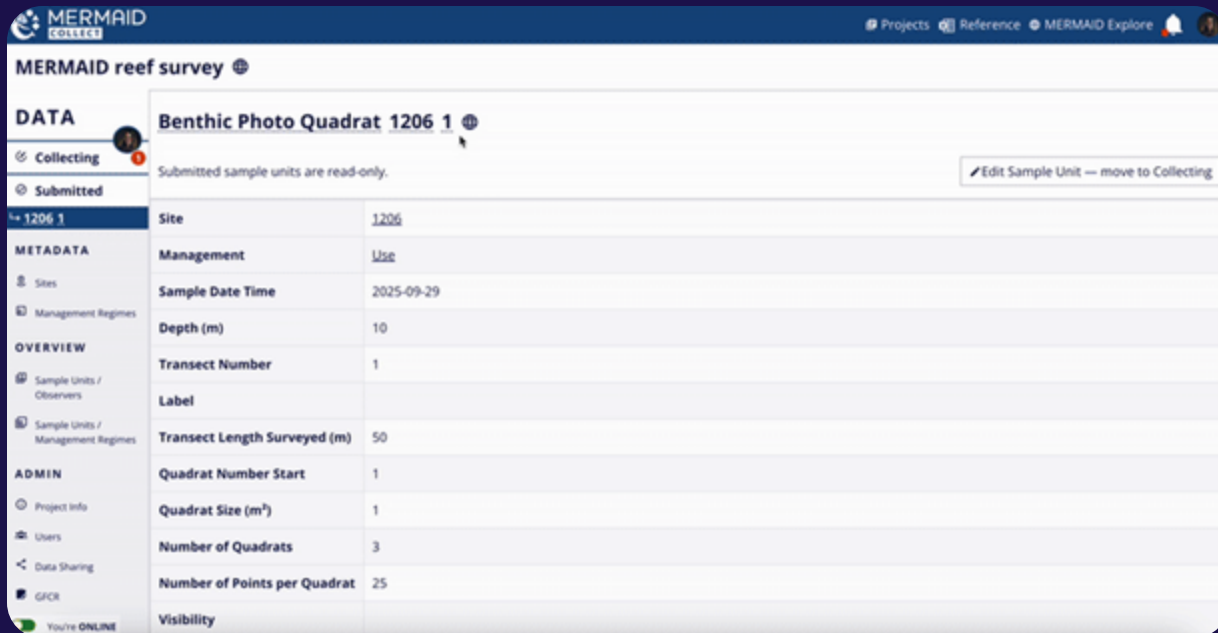
1 Unclassified point

Confirmed Unconfirmed Unclassified

Close Save changes

A simple and easy image classification workflow

Step 4: Visualize instant results and download in MERMAID Explore and *mermaidr* R package



The screenshot displays the MERMAID reef survey web interface. The top navigation bar includes the MERMAID COLLECT logo and links for Projects, Reference, MERMAID Explore, and a user profile. The main header reads 'MERMAID reef survey'. On the left, a sidebar menu lists sections: DATA (with sub-items Collecting and Submitted), METADATA (with Sites and Management Regimes), OVERVIEW (with Sample Units / Observers and Sample Units / Management Regimes), and ADMIN (with Project Info, Users, Data Sharing, and GPCR). A status indicator at the bottom left shows 'You're ONLINE'. The main content area is titled 'Benthic Photo Quadrat 1206.1' and includes a note: 'Submitted sample units are read-only.' with a button 'Edit Sample Unit — move to Collecting'. Below this is a table of metadata for the selected quadrat.

Site	1206
Management	Use
Sample Date Time	2025-09-29
Depth (m)	10
Transect Number	1
Label	
Transect Length Surveyed (m)	50
Quadrat Number Start	1
Quadrat Size (m ²)	1
Number of Quadrats	3
Number of Points per Quadrat	25
Visibility	

→ No training, validation, or advanced settings needed, which makes this approach accessible to any team

Open training data in MERMAID

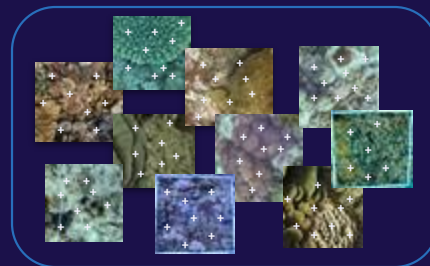
High-quality, open training data are essential for improving coral reef image classification.

Yet, most training datasets are closed or inaccessible, limiting progress and innovation.

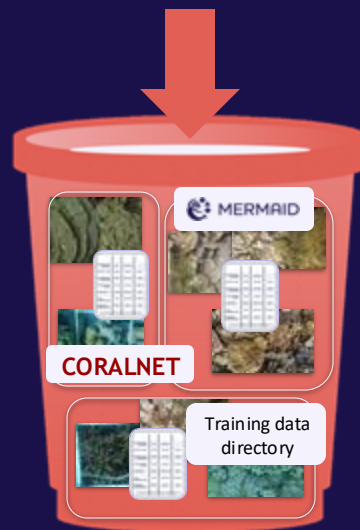
With support from the AWS Imagine Grant, WCS is creating the first open, global repository of anonymized coral reef photos and annotations — a shared resource to build and test better models.

Every contribution counts: as MERMAID AI users upload photos, confirm annotations, and add new labels, they're collectively improving future coral reef AI models.

Labelled training data



Anonymized, metadata-scrubbed photos and confirmed annotations submitted in MERMAID Collect (and other sources)



Training data public bucket

(Amazon S3 Public Bucket)

Training of new AI models for coral reef data applications

Raw observation data remains secure in projects

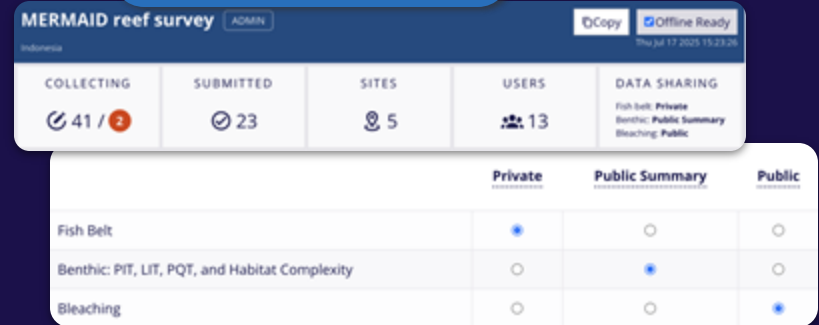
Users' original photos and benthic PQT data (observations and summaries) are securely stored in MERMAID.

Users control data sharing through their projects (Public, Public Summary, or Private).

Only project members can view data unless made public, in which case it's accessible via MERMAID Explore or the R package.

Details available in MERMAID's Terms of Service: datamermaid.org/terms-of-service.

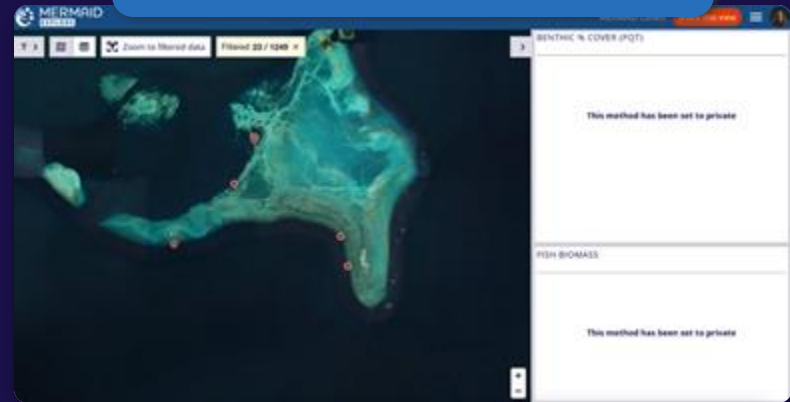
Benthic PQT data remains protected. Accessible to project users.



The screenshot shows the 'MERMAID reef survey' dashboard. At the top, there are buttons for 'ADMIN', 'Copy', and 'Offline Ready'. Below this, a summary bar shows: COLLECTING (41 / 2), SUBMITTED (23), SITES (5), USERS (13), and DATA SHARING. The DATA SHARING section indicates: Fish belt: Private, Benthic: Public Summary, Bleaching: Public. Below this is a table with columns: Private, Public Summary, and Public. The rows are Fish Belt, Benthic: PIT, LIT, PQT, and Habitat Complexity, and Bleaching. The Benthic row has a blue star in the Public Summary column, indicating it is set to be public.

	Private	Public Summary	Public
Fish Belt	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Benthic: PIT, LIT, PQT, and Habitat Complexity	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Bleaching	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

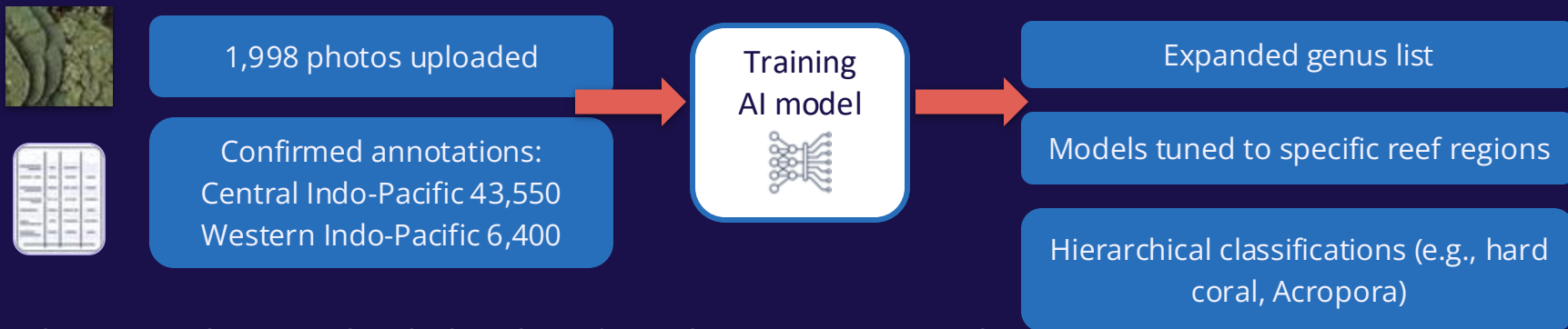
Only visible to others if data sharing is set to Public Summary / Public.



What's next for MERMAID AI?

MERMAID AI *beta* model is freely available to all MERMAID users. Next year, we'll be **actively training and releasing a better model (v1)**.

Using MERMAID AI expands open training datasets and helps improve the classifier to more coral genera and better performance.



The more photos uploaded and confirmed annotations, the faster we can release new models.

Collaborating on R&D (Research & Development)

We're part in the R&D of new hierarchical segmentation models with Coralscapes, a project from Transnational Red Sea Center at EPFL (École Polytechnique fédéral in Lausanne).

Sparse to dense
predictions

Hierarchical label set +
orthogonal classes



Improves representation, accuracy, and completeness of benthic attributes with growth forms and health status, while providing more reliable and flexible benthic cover estimates.



Bleached
Score: 0.66

Acropora millepora
Score: 0.80

Acropora
Score: 0.88

Branching
Score: 0.95

Massive
Score: 0.00

***Acropora millepora*
– Branching –
Bleached**
Score: 0.83

Join us!

We invite you to try the *beta* MERMAID AI model. Contribute your photos and annotations, so we can improve future models.

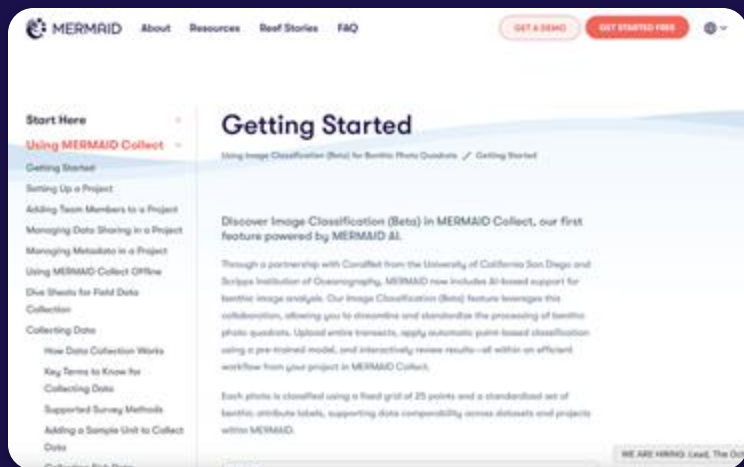
Join the public bucket if your platform/initiative has coral reef imagery and annotations.

Open data. Shared AI. Stronger reef monitoring.

We believe the future of coral reef monitoring depends on open, shared AI.

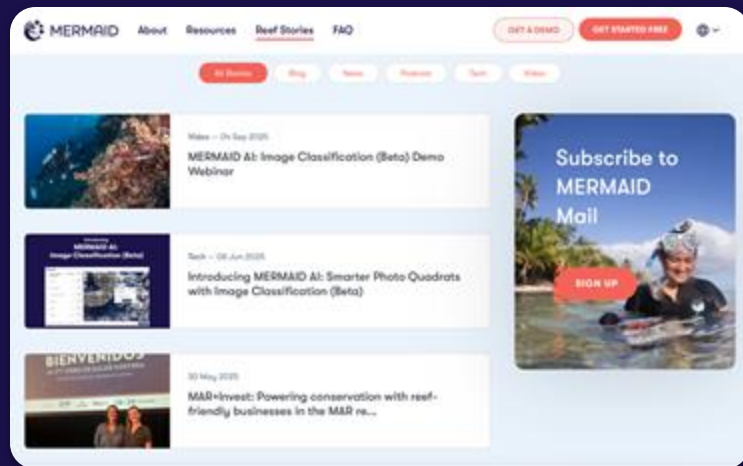


Stay tuned for what's next in MERMAID



Explore our documentation for a step-by-step on how to use the *beta* MERMAID AI model.

Sign up to our newsletter to stay up to date on new AI developments



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MERMAID

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Join our community!
We'd love your
feedback.

