8 Vies pour la planète

Projet ZoRRO
Etang de berre
2021 – 2030

Project ZoRRO

Reintroduction of the eelgrass
in the Berre lagoon

ZoRRO3 – following-up report
(Spring 2024) – English version

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DÉCENNIE DES NATIONS UNIES POUR LA RESTAURATION DES ÉCOSYSTÈMES 2021-2030

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1 Project presentation

The aim of the ZoRRO project is to help eelgrass (*Zostera marina*) recolonize the Berre lagoon (étang de Berre, southern France).

Eelgrass, once dominant along almost the entire shoreline of the lagoon, disappeared in the 1970s. In recent years, we believe that physical and biological conditions have once again become favorable, particularly as the recolonization of the pond by dwarf eelgrass (*Zostera noltei*) has been significant, recognized and documented. Eelgrass, on the other hand, has yet to make a comeback. The project promoters assumed that man could accelerate the process.

From a biological point of view, a large eelgrass meadow

- improves the physico-chemical stability of the water mass (oxygen production, regular consumption of inputs limiting plankton blooms),
- depending on the bottom, can also fix sediment, helping to improve water transparency.
- It also enhances biodiversity, with many species dependent on its presence.

In both respects, an eelgrass meadow is presumed to be better than a dwarf eelgrass or cymodocene meadow.

From a legal and administrative point of view, a significant eelgrass meadow is one of the objectives of the Water Framework Directive (WFD) for the Etang de Berre. Failure on this point would put France under threat of penalties. However, the WFD is indifferent to the type of eelgrass - dwarf or seagrass - that is dominant in the meadow. Given that dwarf eelgrass is booming, the risk of a penalty is remote.

Note that for the ZoRRO project, our association *8 Vies Pour la Planète* has been accepted as an **“actor of the United Nations Decade for Ecosystem Restoration**” in 2023.

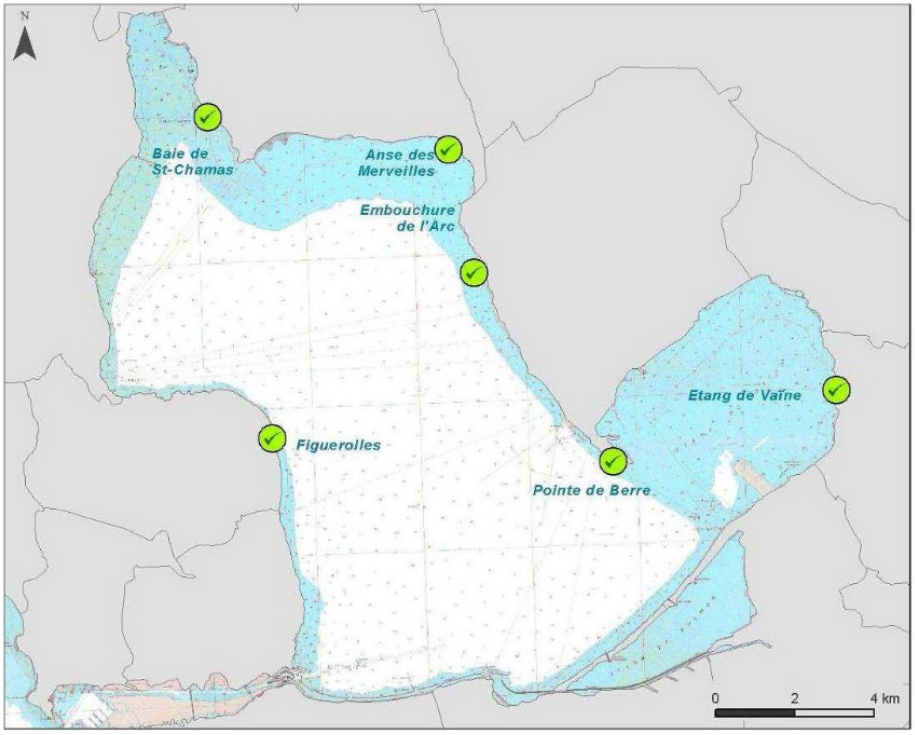
DÉCENNIE DES NATIONS UNIES POUR LA
RESTAURATION
DES ÉCOSYSTÈMES
2021-2030

2 History of reintroduction attempts

2.1 GIPREB 2009

The GIPREB is the official structure in charge of the lagoon.

In 2009, GIPREB conducted an experiment to transplant eelgrass to 6 sites around the lagoon.



This experiment was deemed a failure and follow-up was discontinued after the first year. Nevertheless, in 2017 there was

- a patch of eelgrass at the “Embouchure de l'Arc” site
- a few patches of eelgrass at the “Pointe de Berre” site

in each case amidst numerous dwarf eelgrass beds.

At the “Pointe de Berre” site, we believe that the eelgrass had spread by germination.

2.2 Activist plantations (2016-2020)

These plantings were carried out without administrative authorization for this protected plant, so it's difficult to talk about them. Nevertheless, the success of some of them is undoubtedly at the root of the ZoRRO project's acceptance by the authorities, and still motivates its volunteers today, so we'll talk about them.

It's worth noting that some transplants have been applied to cymodoceae, based on misidentification of rhizome wrecks.

The locations where transplants have taken place are as follows

Boxes circled in red are sites where transplants (eelgrass or cymodocea) were considered successful in spring 2022.

Date	Action	GPS point
2019	4 eelgrass anchors in the rocky coast of Istres	43°29'3.20"N 5° 0'11.87"E
2019	8 eelgrass anchors in Figuerolles	43°26'34.72"N 5° 3'16.60"E
2018	Cymodocea in Le Ranquet	43°28'45.01"N 5° 0'5.23"E
2017	Cymodocea in Beaurivage	43°31'34.46"N 5° 5'5.85"E

2.3 ZoRRO1 (2021)

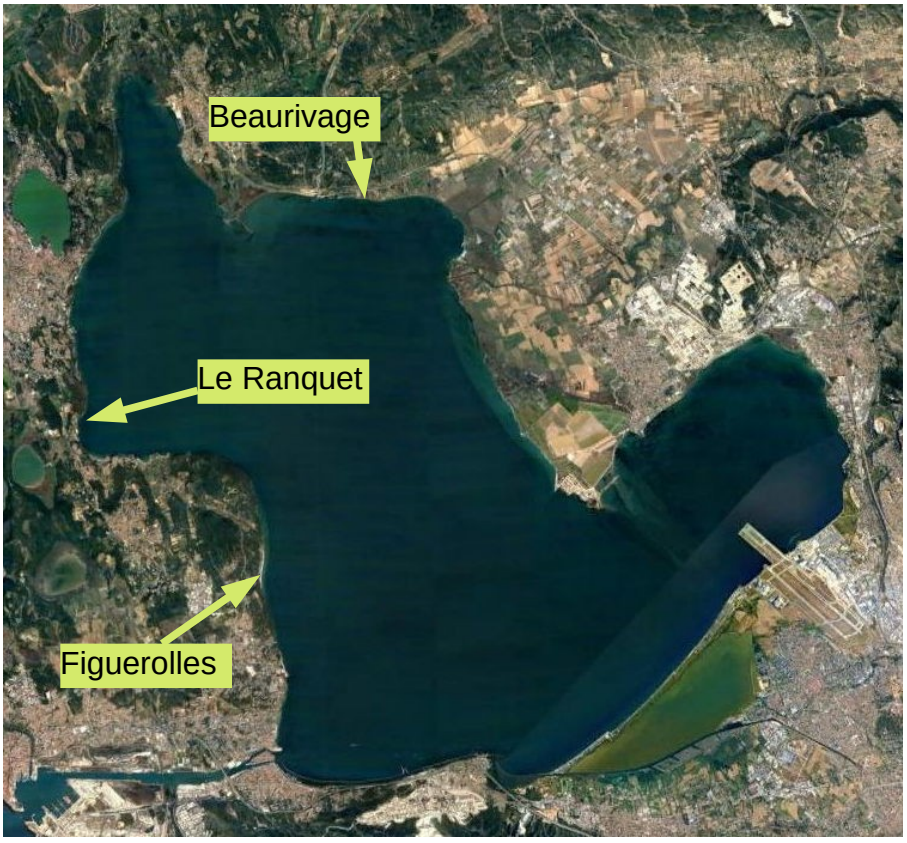
In the first year, the ZoRRO project essentially involved

- collecting eelgrass seeds (around 10,000) from the Port-Saint-Louis-du-Rhône seagrass bed, presumed to be in good condition and large enough
- transporting them to our lagoon, shelling them and sowing them in the lagoon on the same day at 4 points of Figuerolles beach (St-Mitre-les-Remparts).

Wrecked rhizomes were also collected and transplanted to 3 locations in the lagoon. These were submerged, by attaching them to rebar anchors (around 4 or 5 cuttings per anchor),

- on Figuerolles (4 anchors) at the same sites as the seeds
- at Beaurivage (8 anchors) from floating wreck rhizomes
- at Ranquet (6 anchorages), using rhizomes collected mainly on beaches.

In all, we estimated that around a hundred cuttings were transplanted, spread over some twenty anchorages.



Date	Action	GPS Point
june	8 anchors on Beaurivage (+ 4 anchors of the association L'Étang Nouveau in september)	43°31'34.46"N 5° 5'5.85"E
june	6 anchors in Le Ranquet	43°28'45.01"N 5° 0'5.23"E
june	4 anchors on Figuerolles	43°26'47.95"N 5° 3'19.42"E
may-june	10 000 seeds on 4 locations in Figuerolles	43°26'35.64"N 5° 3'16.93"E
		43°26'37.98"N 5° 3'16.93"E
		43°26'47.95"N 5° 3'19.42"E
		43°26'40.98"N 5° 3'17.75"E

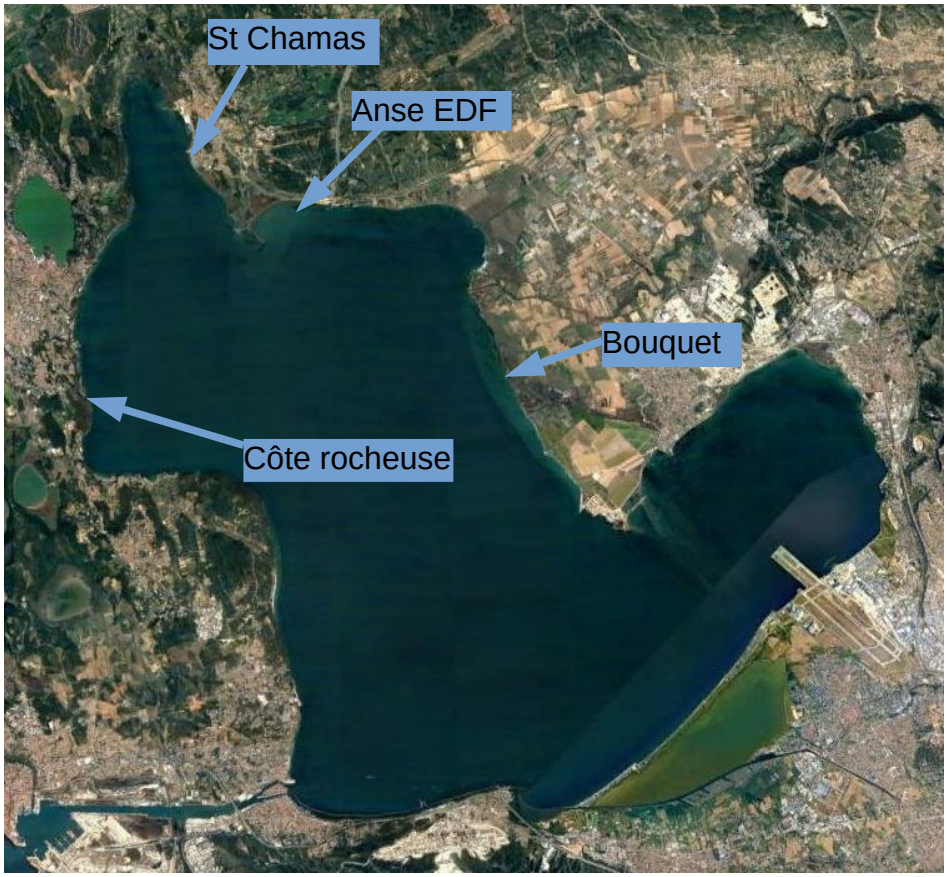
2.4 ZoRRO2 (2022)

The second year, we worked 4 days (4 Sundays),

- we went to collect seeds from the herbarium in Port-Saint-Louis-du-Rhône. We only collected around 5,000 of them (500 spathes (≈ spikes) from around 200 reproductive stems), because maturity was earlier than in 2021 and, as we only wanted harvesters who “swam” (so as not to trample the herbarium any more), participation was less. In response to a question put to Mr. Orth (the most successful American scientist in the experiment), we harvested the whole reproductive stems rather than just the spathes (as we had done for ZoRRO1).
- we transported them to the lagoon, and sowed them in the lagoon the same day using two methods:
    - a few stems in weighted hessian bags placed at the bottom of the pond
    - or a few reproductive stems placed in “dispersing buoys”.

Obviously, the wrecked rhizomes present on those days were picked up and transplanted too.

A few “rhizome days” were also carried out in autumn for the first time.



Date	Action	Point GPS
Autumn	X Anchors on the rocky coast of Istres	43°29'2.26"N 5° 0'11.89"E
June	Seeds and 11 anchors on the rocky coast of Istres	43°29'2.26"N 5° 0'11.89"E
June	Seeds + 7 anchors in St Chamas (EDF power station)	Non noté et Inretrouvables !
	2 anchors boulodrome St Chamas	43°32'53.37"N 5° 1'42.98"E
May	Seeds + 10 anchors Bouquet (Berre L’Etang)	43°29'39.45"N 5° 7'13.32"E
May	Seeds + 7 anchors in St Chamas (Petite Camargue)	43°31'57.41"N 5° 2'14.65"E

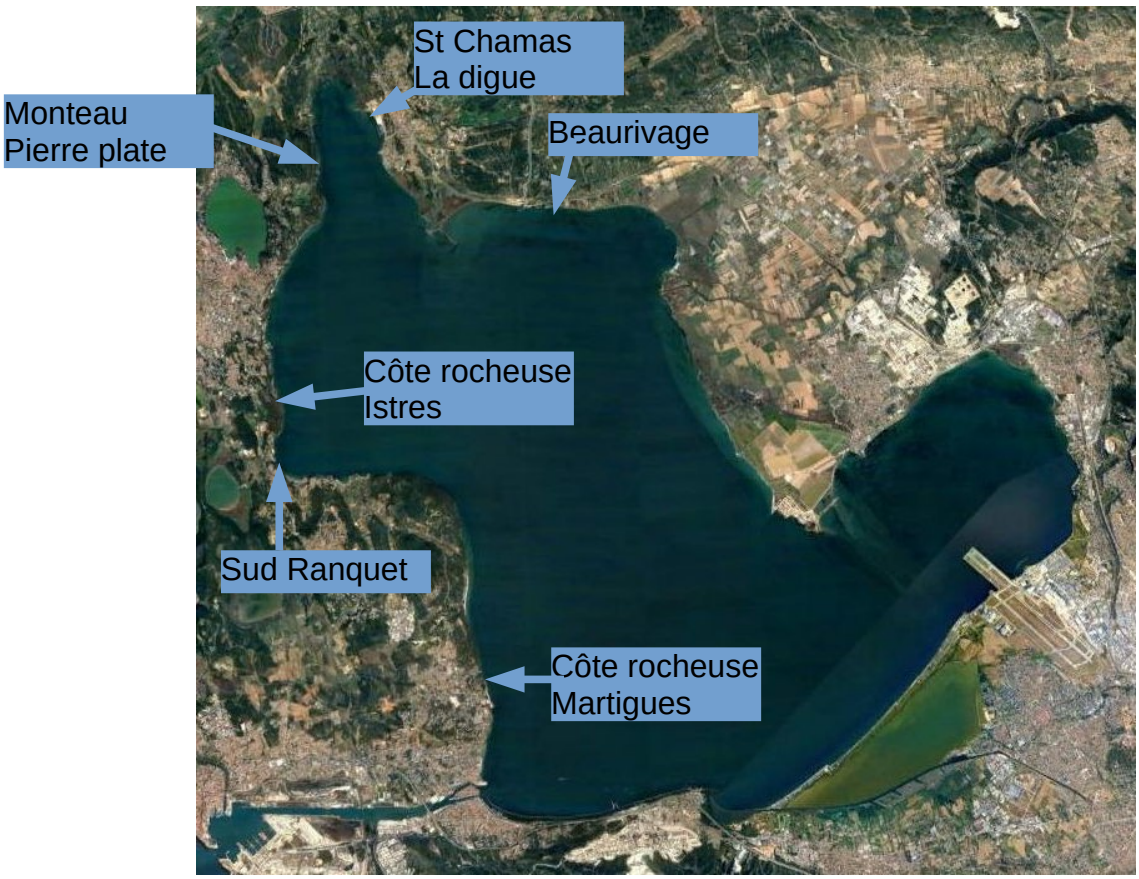
2.4 ZoRRO3 (2023)

For the third year of the project, 8 vies had planned to build a seed maturation site. In the end, two sites were built : a caravan and a permanent site at the port of Beaurivage. We were also still allowed to collect eelgrass rhizomes and, once again, we collected them all autumn.

Most of the seeds were sown in a single location:

- under the Monteau cliffs (north of Istres, east coast of the Saint-Chamas cove).

The wrecked rhizomes were placed in the following sites:



Date	Action	GPS Points
dec	10 anchors on the rocky coast of Martigues	43°25'55.07"N 5° 3'27.40"E
nov	5 anchors on the rocky coast of Martigues	43°26'1.79"N 5° 3'26.22"E
nov	15 anchors in Pierre Plate (Monteau / Istres) 15 hessian bags of seeds in Pierre Plate (Monteau / Istres)	43°31'28.64"N 5° 0'51.38"E
	2 hessian bags in St Chamas	?
	2 hessian bags in Istres (rocky coast)	43°29'4.18"N 5° 0'12.12"E
oct	12 anchors in St Chamas La Digue (filmed by Tifenn Ripoll)	43°32'23.95"N 5° 1'53.83"E
sept	4 anchors in the rocky coast of Istres (for the TV-program *Échappées Belles*)	43°29'2.26"N 5° 0'11.89"E
June	6 anchors in the marina of St Chamas	43°32'37.15"N 5° 1'59.53"E
	2 anchors ine Beaurivage harbour (St Chamas)	43°31'35.24"N 5° 4'51.76"E

June	2 anchors in Ranquet-South	43°28'24.65"N 5° 0'4.69"E
	2 anchors on the rocky coast of Martigues	43°25'55.07"N 5° 3'27.40"E
May	4 anchors on Beaurivage beach (St Chamas)	43°31'34.35"N 5° 4'52.79"E
May	4 anchors on the rocky coast of Istres (in front of Odile's)	43°29'25.25"N 5° 0'3.25"E
april	6 anchors on the coast of Saint-Chamas (with Claude)	43°32'5.61"N 5° 2'4.20"E
january	4 anchors in Beaurivage beach	43°31'34.40"N 5° 4'54.36"E

3 – Suivi du printemps 2024

For a complete follow-up, you should

- look for spots where you sowed or planted the previous year
- check whether spots from previous years have continued to grow or have died off
- find out whether other spots have sprung up in the vicinity, the result of natural swarming or cuttings that have detached from their anchorage and found themselves in a favorable location.

In addition, this year we distinguished between **“spots”** (fairly large and over a year old) and **“starts”** (cuttings or natural swarms less than a year old, with just a few leaves). The surface area of spots was also estimated.

We therefore have 3 quantization parameters:

- **number of spots**
- **the surface area of these spots** (plants over one year old, with a minimum surface area of 0.25 m^2)
- **the number of starts** (plants less than one year old, generally composed of just a few leaves).

As last year, we thought it would be simpler to monitor each location. Taking this idea one step further, we have grouped the following communes:

- Martigues/St Mitre les Remparts
- Istres
- Saint-Chamas

We didn't return to Berre-L'Étang, which is a very remote site for us, and which is the commune that hosts GIPREB. GIPREB will do a much better job of monitoring than we can, especially as the spot is the result of their 2009 transplant.

We always include

- cymodocae, which for us are limited to the two spots resulting from cuttings planted by mistake (confusion with eelgrass rhizomes)
- and ruppies, which to our knowledge are limited to the Ranquet site in Istres.

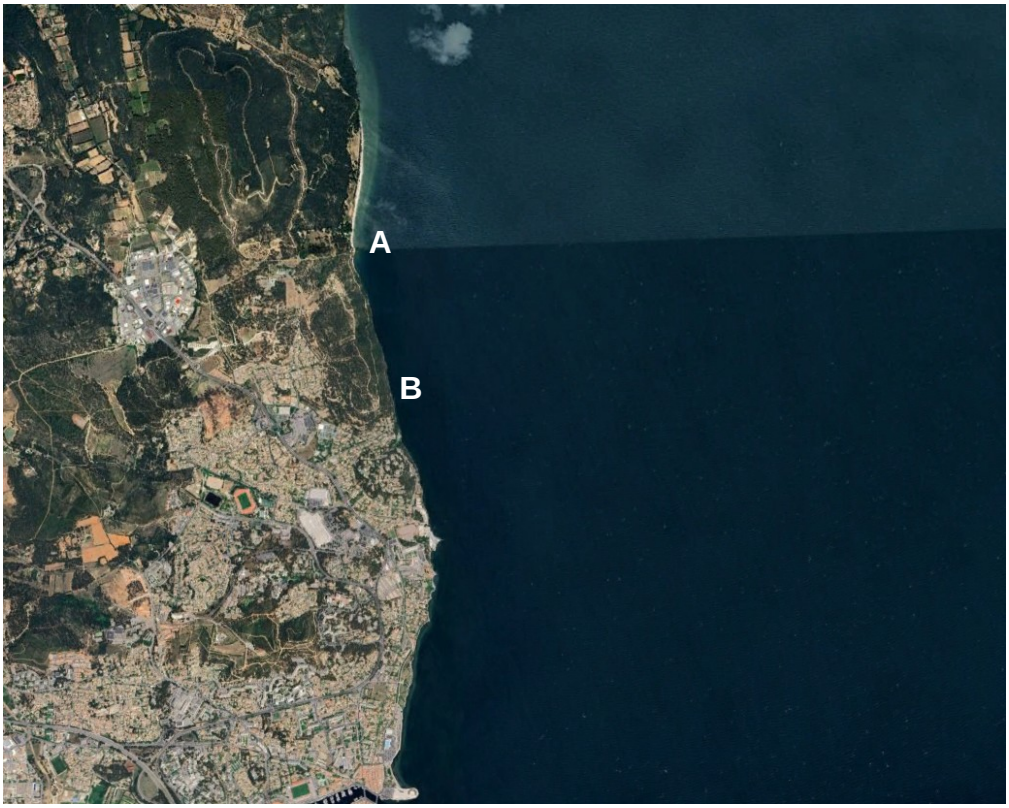
but for these two plants, April is clearly too early for quality monitoring. Our work is therefore indicative on this point.

Dwarf eelgrass is sometimes cited in this report for its relationship (which we consider rather conflicting) with eelgrass. It should be noted that they are present at all sites, sometimes in very large, dense beds (EDF basin, Ranquet cove, etc.), sometimes only in scattered patches, but increasingly numerous (rocky coast of Istres, Figuerolles, etc.).

3.1 Martigues / St Mitre les Remparts

Until August 2022, Figuerolles beach was home to three large patches, the result of militant planting in 2019, but the red tides of summer 2022 (very localized in this area) killed them off. In 2024, however, 8 new patches were found, probably from seeds from the three previous patches: https://youtu.be/ikvhVaL3MOA?si=i-UPWMH6o5L1dsyK

To the south of Figuerolles beach, the rocky coastline of Martigues resembles that of Istres, so it seemed appropriate to plant there, but so far everything seems to have failed.



Zone A (Figuerolles)

Date	Action	Point GPS	suivi	
June 21	4 anchors sur Figuerolles	43°26'47.95"N 5° 3'19.42"E	1 spot grew until the summer of 2022 and then died under the red tides of that summer in this part of the lagoon	
2019	8 anchors eelgrass Figuerolles	43°26'34.72"N 5° 3'16.60"E	3 spots alive until the summer of 2022, and dead under the red tides of that summer. 8 new spots found in May 2024 (swarming...)	

Zone B (côte rocheuse)

Date	Action	Point GPS	suivi	
Mars 24	1 anchors Martigues rocky coast	43°25'55.07"N 5° 3'27.40"E		
Dec 23	10 anchors Martigues rocky coast	43°25'55.07"N 5° 3'27.40"E	Mars 2024 (0/10) Pascal	
Nov 23	5 anchors Martigues rocky coast	43°26'1.79"N 5° 3'26.22"E	Mars 2024 (0/5) Pascal	
June 23	2 anchors Martigues rocky coast	43°25'55.07"N 5° 3'27.40"E	(0/2) April 2024 Pascal + Delphine	

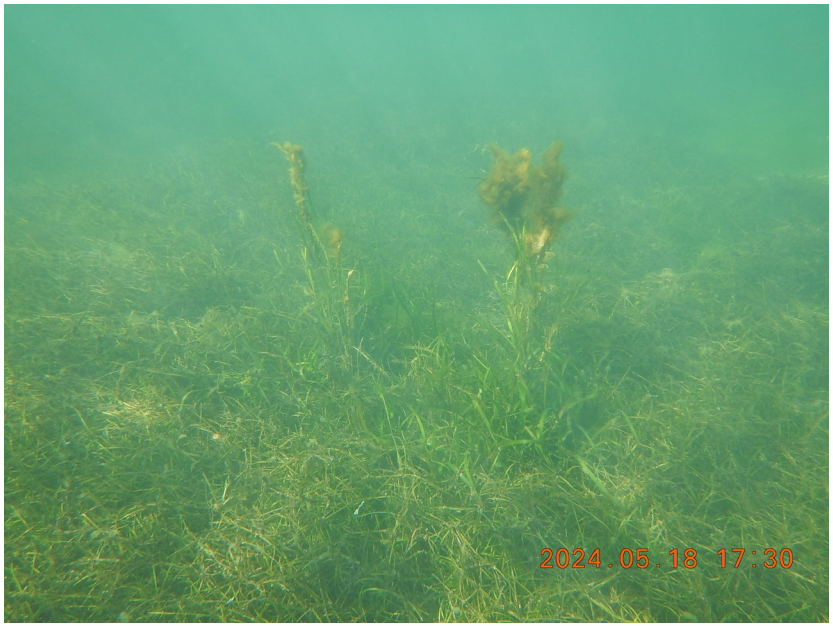


Figure 1: one of the swarming in Figuerolles

Figure 2: another

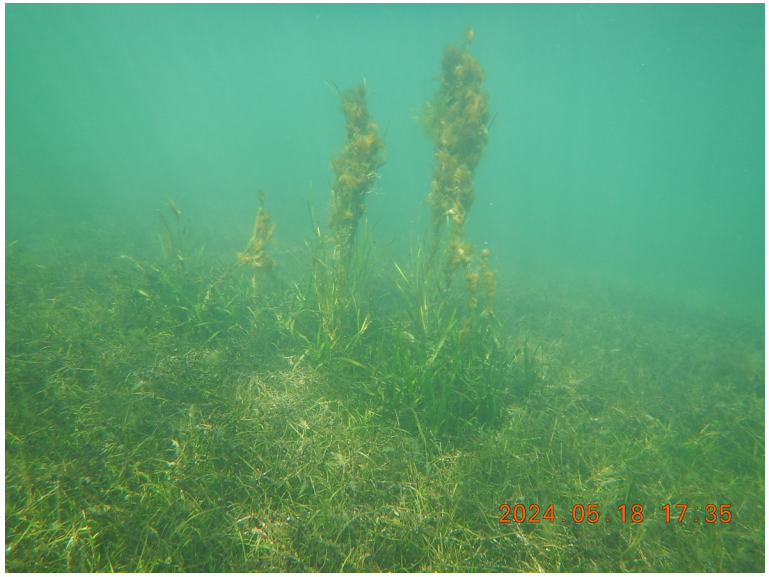


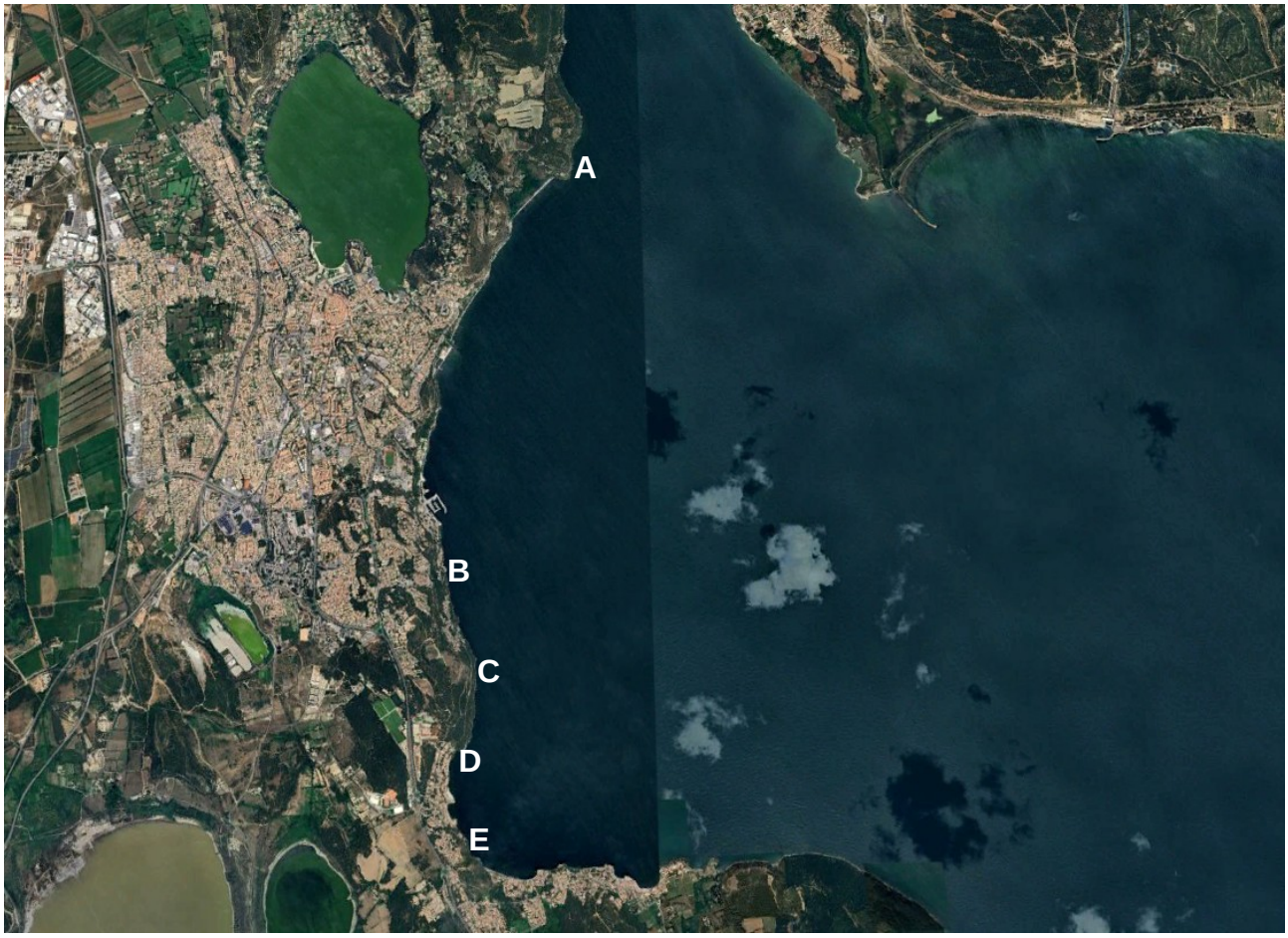
Figure 3: a third one

3.2 Istres

Istres still presents THE site that makes us optimistic for the project : the rocky coast site where there are some fifteen spots and several small starts. A video can be found here : https://youtu.be/l1qxoImTIkw

The beautiful Ranquet spot is still there, but the small start that accompanied it has not been found.

Two other sites are showing departures. We'll see if they become spots...



Zone A (Monteau cliff – Pierre plate)

Date	Action	GPS Point	follow-up	
Nov 23	15 anchors in Pierre Plate 15 hessian bags of seeds Pierre Plate	43°31'28.64"N 5° 0'51.38"E	(2/15) april 24 Pascal + Delphine	

Zone B (Rocky coast - Houses)

Date	Action	GPS Point	follow-up	
Jan 24	11 anchors rocky coast Istres (small harbour)	43°29'17.76"N 5° 0'6.35"E	(5/11) Pascal april 24	
Mai 23	4 anchors rocky coast Istres (in front of Odile's)	43°29'25.25"N 5° 0'3.25"E	(0/4) Pascal 11 april 24	

Zone C (Rocky coast – pine wood)

Date	Action	GPS Point	follow-up	
Sept 23	4 anchors rocky coast Istres (for the Tv program *Échappées Belles*)	43°29'2.26"N 5° 0'11.89"E	**12 april 2024 Pascal** 16 spots + many starts among them 1 spot of 2019 still developping 5 m²	
Autumn 22	X Anchors rocky coast of Istres + seeds			
June 22	11 anchors rocky coast Istres			

2019	4 anchors rocky coast Istres			

Zone D (Ranquet North)

Date	Action	GPS point	follow-up	
July 2023	2 spots discovered there, probably from cuttings that have wandered	43°28'46.84"N 5° 0'8.17"E la petite un peu + au nord	The large spot is still there but not the smallest one (avril 2024 pascal)	
june	6 anchors	43°28'45.01"N 5° 0'5.23"E	2 starts could be seen in the spring of 2022 but they disappeared after that under the dwarf seegrass	
2018	Cymodocea	43°28'45.01"N 5° 0'5.23"E	12 avril 2024 the spot is still there	
natural	Spiral Tasselweed		In 2023 the tasselweed were astonishingly numerous. In april 2024 there were only a few	

Zone E (Ranquet South)

Date	Action	GPS point	follow-up	
June 23	2 anchors	43°28'24.65"N 5° 0'4.69"E	11 avril 2024 Pascal (0/2)	

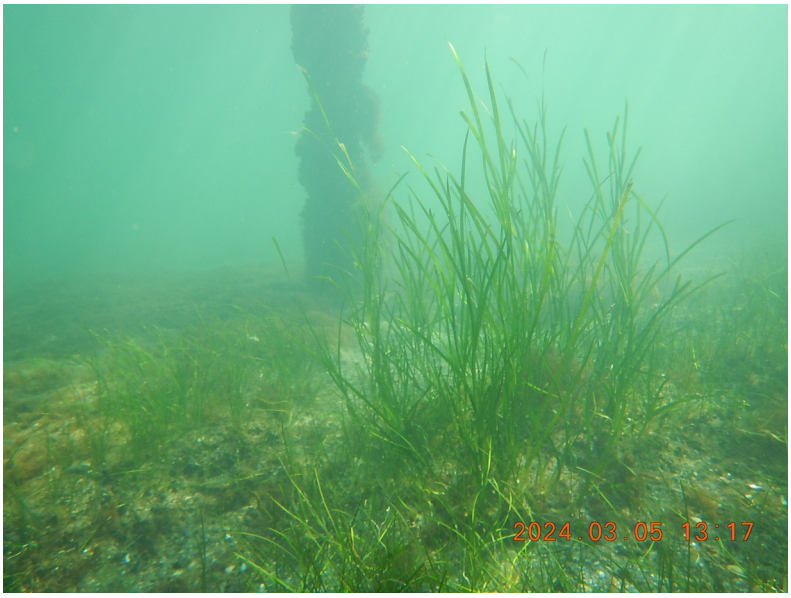


Figure 4: tache de zostères marines issue d'un essaimage nature repéré en juillet 2023 - Istres mars 2024

Figure 5: départ (bouture de ZoRRO3 ayant passé l'hiver) petit port

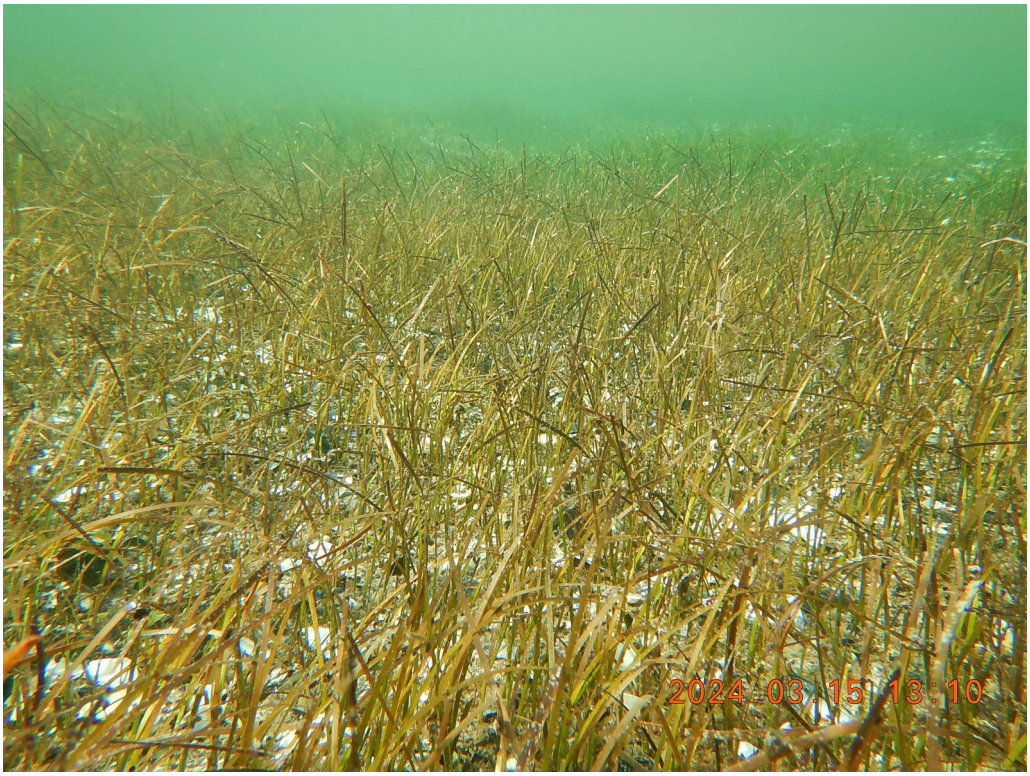


Figure 6: Cymodocea spot (Le Ranquet - Istres)

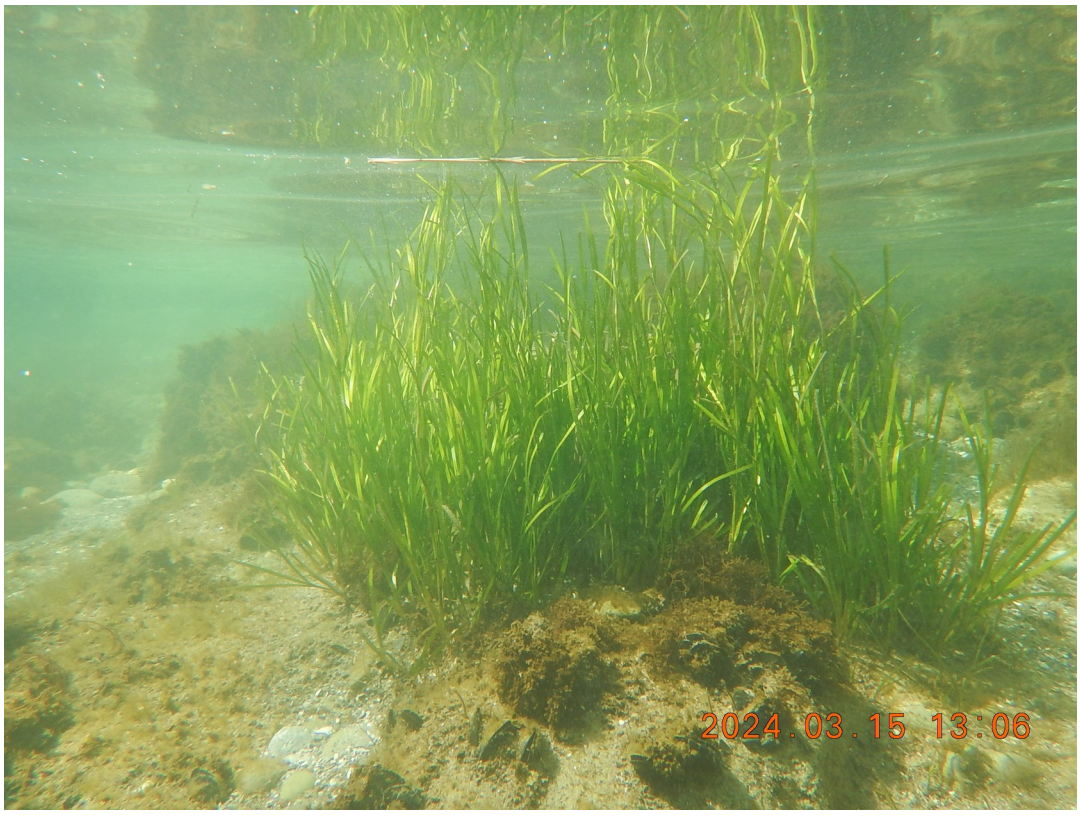


Figure 7: eelgrass spot (wandered cutting ?) (ranquet North - Istres)

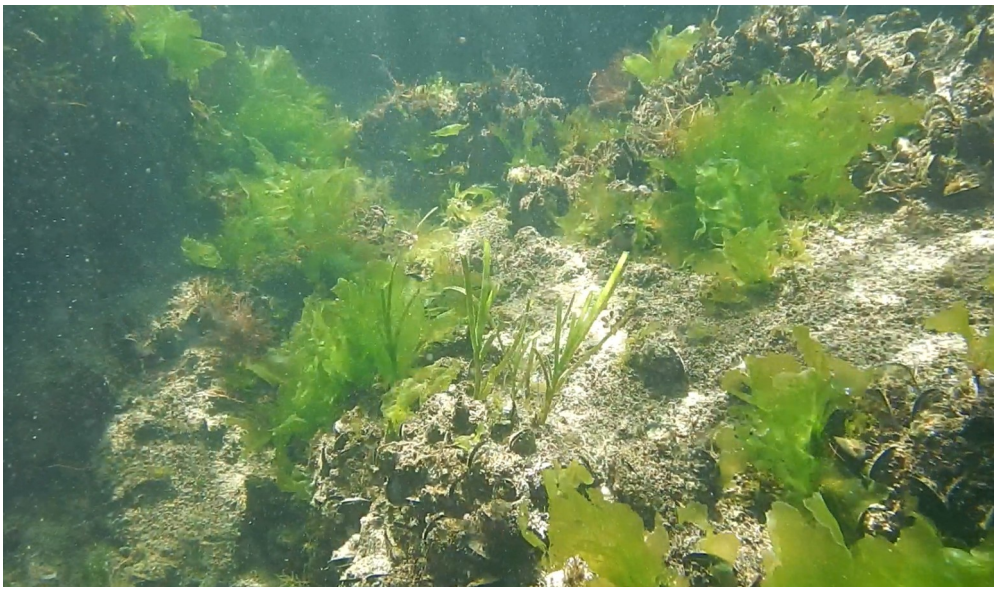


Figure 8: start from natural swarming on a very rocky substrate full of mussels (rocky coast - Istres)

Figure 9: Another start from the natural swarming on a bit more northern location, on a more sandy substrate (côte rocheuse)

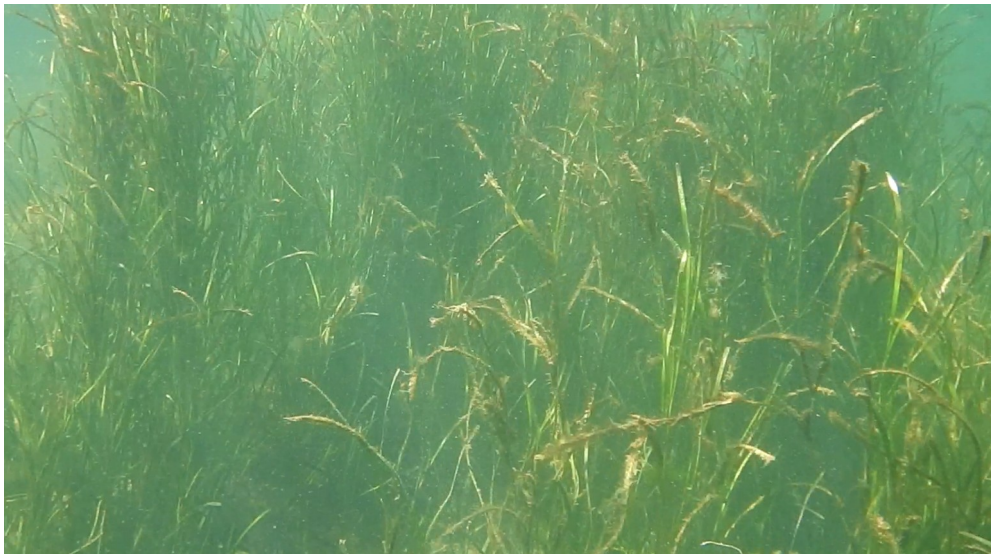


Figure 10: the big spot dating 2019 (rocky coast)

3.3 Saint-Chamas

For a long time, this area was essentially a failure zone, which caused a lot of grief among our volunteers (8 vies pour la Planète is headquartered in Saint-Chamas, and many of our volunteers are based there).

For this reason,

- the discovery on the “La Digue” site of around twenty starts from our seeds
- the survival of a spot on the Beaurivage site

have consoled us, and even more, for the failure (at this stage of the follow-up...) of other attempts.

The dike site is a major step forward for the project, since it validates our entire “seed method” by including the seed maturation stage, which was new to ZoRRO3.

Zone A (Boulodrome)

Date	Action	GPS point	follow-up	
Feb 24	3 anchors (in bad state)	43°32'53.37"N 5° 1'42.98"E		
June 22	2 anchors	43°32'53.37"N 5° 1'42.98"E	Nothing (2023 pascal)	

Zone B (marina)

Date	Action	GPS point	follow-up	
June 23	6 anchors	43°32'37.15"N 5° 1'59.53"E	Nothing (Pascal april 24)	

Zone C (Digue)

Date	Action	GPS point	follow-up	
Oct 23	12 anchors (filmed by Tifenn Ripoll)	43°32'23.95"N 5° 1'53.83"E	Nothing (april 2024 Pascal + Delphine) (malicious intent ?)	
Nov 23	seeds	43°32'22.9"N 5°01'52.9"E	Over 20 starts (may 2024 Delphine)	

Zone D (Wash house)

Date	Action	GPS point	follow-up	
Avril 23	6 anchors (with Claude)	43°32'5.61"N 5° 2'4.20"E	Nothing (Pascal + Delphine april 2024)	

Zone E (Petite Camargue)

Date	Action	GPS point	follow-up	
May 22	Seeds + 7 anchors of cuttings	43°31'57.41"N 5° 2'14.65"E	Nothing (2023 Pascal)	

Zone F (Beaurivage)

Date	Action	GPS point	follow-up	
Juin 23	2 anchors in the harbour	43°31'35.24"N 5° 4'51.76"E	Nothing (pascal april 2024)	
Mai 23	4 anchors off the beach	43°31'34.35"N 5° 4'52.79"E	Nothing en june (carried away by the too big waves)	
jan 23	4 anchors off the beach (CNBR border)	43°31'34.40"N 5° 4'54.36"E	Nothing before summer (carried away by the too big waves)	
Juin 21	8 anchors ine the cove (+ 4 anchors of the association L'Étang Nouveau in septembre)	43°31'34.46"N 5° 5'5.85"E	1 single plant visible in spring and summer 2023, struggling to resist smothering by dwarf eelgrass. Still visible in spring 2024 in better shape ("start of a mixed meadow"?)	
2017	Cymodocée	43°31'34.46"N 5° 5'5.85"E	Tstill alive in 2023 not found in april 2024 (Pascal) but can appear later then april	

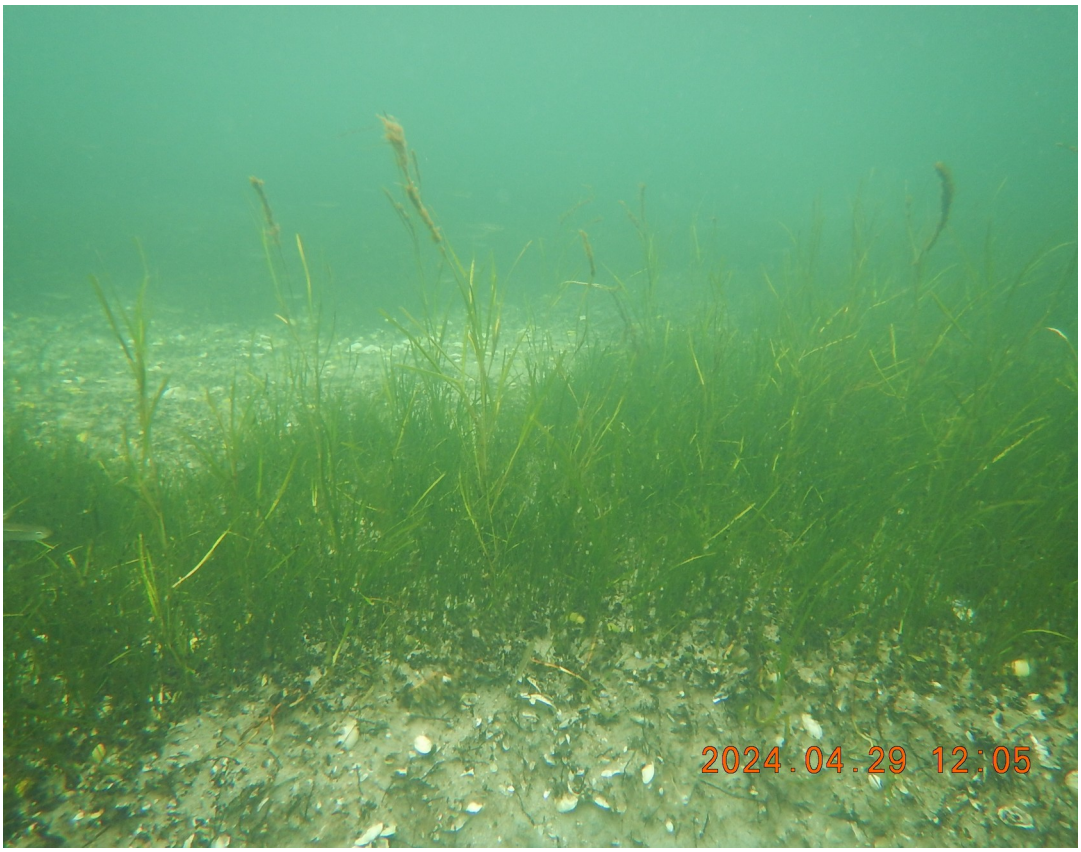


Figure 11: Beaurivage spot (dating from ZoRRO1), which we thought was dying last year but which finally seems to be in good shape

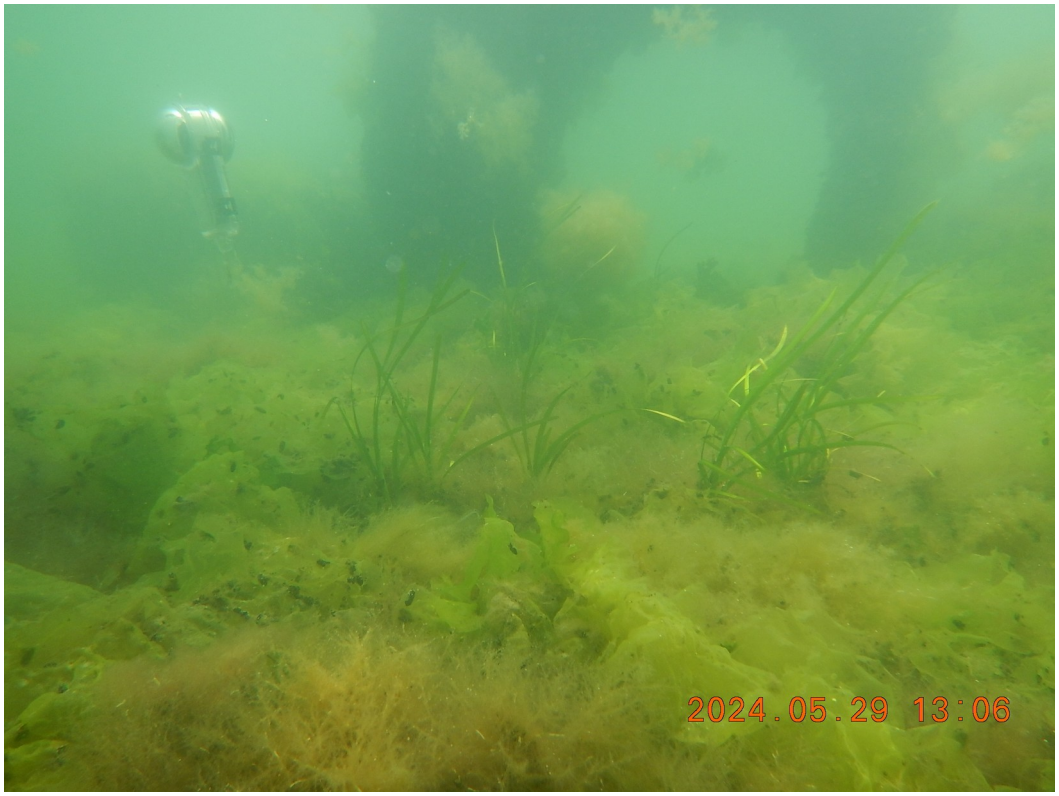


Figure 12: starts from seeds on the La Digue site (St Chamas)

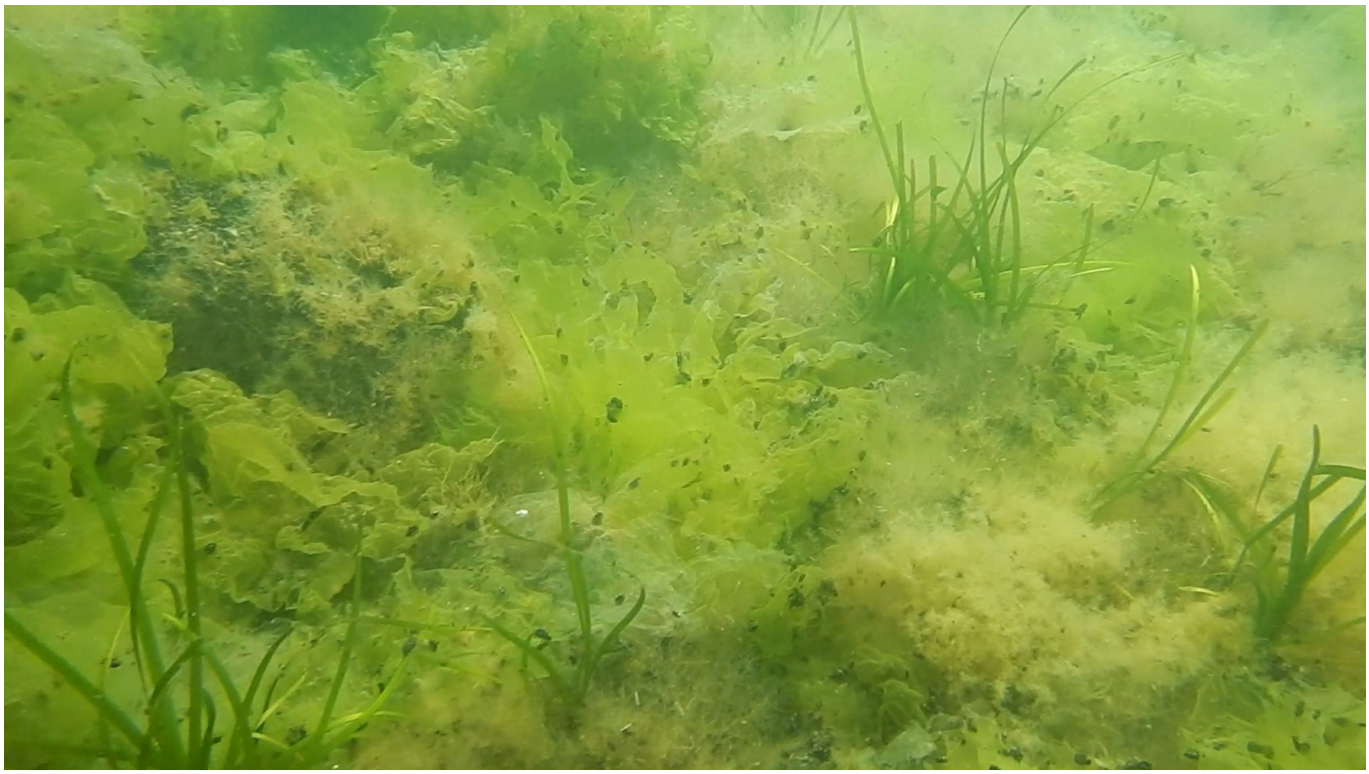


Figure 13: starts from seeds on the La Digue site (St Chamas)

3.4 Summary of existing spots of eelgrass and comparison with previous years

site	Nr of zostera marina (Zm) spots	Known or assumed date of transplant	Estimated Surface Zm (m²) spring 2024	Estimated Surface Zm (m²) spring 2023	Estimated Surface (m²) spring 2022	notes
Martigues Figuerolle sud	0 8	2019 + swarming 2022 (?)	0 8 x 0,5	0	7	
Le Ranquet	1	2021 et 2018	0,5	0,5	0,2	
Côte rocheuse Istres	1 15	2019 2022	3 15 x 0,5 + swarming	2 12 x 0,25	2	THE success of the ZoRRO project ! https://youtu.be/l1qxoImTIkw
Côte rocheuse « petit port »	0	2023	5 starts			
Falaise Monteau	0	2023	2 starts			Waiting for the seeds to germinate
Beaurivage	1	2021	1,5	1,5	1,5	Unexpected survival
La Digue	0	2023	+ de 20 starts			Our first germination of seeds !!
Pointe de Berre	1 (?)	2009	Not followed-up	2	1,2	Not followed-up
total	≥ 26		16,5	9	12,1	

The number of spots and surface area has increased compared with the spring 2023 survey, thanks to

- the astonishing development of spots on the rocky coast of Istres.
- The new spots discovered at Figuerolles sud.

In addition, a number of departures suggest an increase in the number of spots throughout 2024:

- the starts from seeds on the Digue site (St Chamas)
- a few other starts from cuttings in Istres

and these starts are linked to ZoRRO3! Both our methods are working and we're comforted.

4 - Conclusion

The 2023 campaign was the third in the ZoRRO project. Authorization for a fourth season (ZoRRO4) has now been obtained.

What can we learn from ZoRRO3 in the spring following the campaign? And from previous plantings?

1. **The seed method worked!**
   For ZoRRO3 we had gone to great lengths to stick to the state of the art, maturing the seeds and keeping them until November. We finally succeeded. Only on one site so far (La Digue in St Chamas), but it's still a big step for us.

2. **The cuttings method works... but with a low success rate**.
   Compared with the number of anchorages, and therefore cuttings, the number of ZORRO3 cuttings is low (7) and limited to two sites in Istres. It's true that the wrecked cuttings aren't all very beautiful, so we can't compare them with teams working elsewhere with cuttings that have been ripped out.
   Clearly, we don't yet know why it works or doesn't work... but sometimes it does... in Istres!
   We'll insist on this type of site.

3. **Malice is possible and discretion is probably always necessary**
   If the ZoRRO project still seems to be appreciated by the people to whom we explain it, it remains little known. The disappearance of the (very) numerous anchors from the dike site at St Chamas leads us to imagine that someone had removed them. We had worked in front of the restaurant's customers. Perhaps we should avoid this. Discretion is undoubtedly a condition for success.

4. **The survival of the Beaurivage spot is a pleasant surprise**
   Until now, all our plantings in the midst of dwarf eelgrass had failed.
   The Beaurivage spot proves that survival in these conditions is possible. This spot doesn't resemble the spots on the Istres coast, which are denser and seem to be fighting against the dwarf eelgrass. The Beaurivage spot appears to be of the “mixed meadow” type, with a relationship accepted by both parties. But this is just an impression, and it will be very interesting to follow the evolution of this patch..

5. **The large patches on Figuerolles beach didn't go away, but they had had time to spread.**
   Seaweed tides, whether local (as at Figuerolles in the summer of 2022) or general (as in the summer of 2018), kill eelgrass patches quite easily (the three patches in 2019 were large, and the one from ZoRRO1 seemed to be doing very well), no doubt through the prolonged lack of light and H_2S attack.
   The discovery in May 2024 of eight spots slightly offshore of the three previous spots was a welcome surprise. Perhaps the seeds had been waiting for the right conditions to germinate, as we hadn't seen anything in 2023.
   The heavy rains of April and May 2024 resemble those of spring 2018. Let's hope for the sake of the pond that it doesn't lead to the same crisis. Ulvae have multiplied.…

6. **The rocky coast of Istres is surprisingly productive**
   In addition to the 2019 spot and the 10 spots dating from ZoRRO2 (loss of only 2 spots this winter), some of which have grown considerably, **the spots resulting from the swarm spotted in July 2023 have developed very well, and several small starts give us hope for more spots in the future**.
   This site alone allows us to say that ZoRRO is a success!

We now have 3 “successful” sites

- the rocky coast in Istres
- the Figuerolles site in Martigues/Saint-Mitre
- La Digue site in Saint-Chamas