



## South African Kelp Farming Project (Phase 2 - Project number: 300708-201)

Funded through UK aid by the UK government.

### Project Quarterly Report

|   |                                    |
|---|------------------------------------|
|   | Quarter 1 (Apr – Jun 2024)         |
| ✓ | <b>Quarter 2 (Jul – Sept 2024)</b> |
|   | Quarter 3 (Oct – Dec 2024)         |
|   | Quarter 4 (Jan - March 2025)       |

Compiled by: Dr Lizeth Botes

On behalf of:

Bivalve Shellfish Farmers Association of South Africa (BSASA)

## Declaration of the Project Manager

I hereby declare as Project Manager (on behalf of BSASA) and as per FCDO Accountable Grant Arrangement with BSASA that (please encircle):

1. All FCDO funding has, to the best of my knowledge, been used on the project's deliverables and assets as outlined in the Grant Arrangement

YES/NO (If no, please provide explanation)

2. All assets bought with FCDO funding to date are, to the best of my knowledge, being recorded and can confirm that I have verified the assets, that they are in good working condition and being used for the purposes of the project.


YES/NO (If no, please provide explanation)


3. All progress of project deliverables are satisfactory and still within the FCDO Grant Arrangement time frames & budget, and that I have timeously reported on delays due to unforeseen circumstances.

YES/NO (If no, please provide explanation)

5. To the best of my knowledge, am not aware of suspicions or complaints of any incidences of sexual exploitation, abuse and sexual harassment (SEAH).

Confirm/Unable to confirm (If unable to confirm, please provide explanation)

  
\_\_\_\_\_  
Project Manager

  
\_\_\_\_\_

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## Glossary of Terms

|                  |  |
|------------------|--|
| AASA             | Aquaculture Association of Southern Africa                         |
| ADZ              | Aquaculture Development Zone                                       |
| AMC              | Aquaculture Management Committee                                   |
| ASTRAL           | All Atlantic Ocean Sustainable, Profitable & Resilient Aquaculture |
| BOM              | Blue Ocean Mussels   |
| BSASA            | Bivalve Shellfish Farmers Association of South Africa              |
| CTD data         | Conductivity, Temperature and Depth data                           |
| DFFE             | Department of Forestry, Fisheries and the Environment              |
| DSI              | Department of Science and Innovation                               |
| EA               | Environmental Authorisation  |
| EMPr             | Environmental Monitoring Programme                                 |
| FCDO             | Foreign, Commonwealth & Development Office                         |
| FAO              | Food and Agricultural Organisation                                 |
| GeO <sub>2</sub> | Germanium dioxide  |
| IUCN             | International Union for Conservation of Nature                     |
| POC              | Paternoster Oyster Company   |
| PM               | Project Manager  |
| PA               | Project Assistant  |
| PSSA             | Phycological Society of Southern Africa                            |
| RAs              | Research Assistants  |
| RED              | Research and Evidence Directorate within the FCDO                  |
| SA               | South Africa   |
| SB               | Saldanha Bay   |
| SABS             | South African Bureau of Standards                                  |
| SOP              | Standard Operating Procedures                                      |
| TOR              | Terms of Reference   |
| UCT              | University of Cape Town  |
| UK               | United Kingdom   |
| UNDP             | United Nations Development Programme                               |
| UNESCO           | United Nations Educational, Scientific and Cultural Organization   |
| UWC              | University of the Western Cape                                     |

# 1. Introduction

The Foreign, Commonwealth & Development Office (FCDO) deliver science and technology partnerships to maximise the UK's development impact internationally and it is within this context that the South African Kelp Farming project was commissioned.

In 2021-2022 the FCDO commissioned the non-profit Bivalve Shellfish Farmers Association of South Africa (BSASA), in collaboration with the Department of Forestry, Fisheries and the Environment (DFFE), to conduct a short three-month pre-feasibility study (Phase 1) to assess the potential for the commercial cultivation of African kelp along South Africa's West Coast. The final output report concluded/recommended that a Phase 2 Feasibility Study be conducted.

In 2022-2023, the FCDO commissioned BSASA to proceed to Phase 2 of the project with the Accountable Grant Agreement signed at the end of July 2022. Phase 2 only gained momentum toward the end of 2022 when two Research Assistants (RAs) and a Project Manager (PM) were appointed in late Nov 2022 as part of BSASA's implementation team. The Saldanha Bay Aquaculture Development Zone (ADZ) was identified as the study area for grow-out trials where oyster and mussel farming infrastructure & structures (similar to what is required for kelp farming) are already in place. Phase 2 is planned to be conducted over a 30-month period and will focus on the following activities:

- Refining kelp hatchery/nursery technologies
- Trialling kelp weaning/grow-out technologies in Saldanha Bay (SB)
- Assessing kelp quality for food safety standards and certification
- Monitoring environmental parameters and assessing environmental benefits/risks as decision support for the DFFE's Environmental Management Programme (EMPr)
- Conduct stakeholder engagements to disseminate information and gain insights into the Kelp Value Chain and associated employment opportunities
- Developing a basic Excel spreadsheet-based kelp financial forecasting model

The overall goal of the project is to disseminate information and research results to a broad stakeholder base, including the existing kelp industry and potential new entrants to lay the foundations toward building a sustainable Kelp Aquaculture Industry in South Africa (SA) and the region.

## 1.1 Project team & Project Delivery Chain Map:

The project team's roles and responsibilities are briefly outlined below:

### The Project Sponsor/Funder representatives:

Ms Leanne Jones (Team Leader, Southern Africa Research and Innovation Hub [SARIH], FCDO).

Ms Kristin Klose (FCDO Technical Advisor - Science, Technology and Innovation)

Ms Nyameka Mbete// Mr Jaco Louw (FCDO Global Science Lead: Programmes and Finance)

### The Implementation team:

#### Industry:

Mr Vos Pienaar (Chairperson of BSASA as lead implementation and host organisation, Imbaza Mussels)

Mr Meiring Tarrant (BSASA Secretary & Boland Financial Services)

#### BSASA member representatives and project participants:

Mr Tiishetso Maswanganye (Farm Manager at BOM)

Mr Japie Louw/Marais Smith (Paternoster Oyster Company [POC])

BSASA appointed:

- Dr Lizeth Botes (Project Manager)
- Mr Musadiq Schalkwyk (Project Assistant)
- Ms Frances Hill (Research Assistant)
- Ms Nontobeko Xulu (Research Assistant)

Scientific Advisor: Emeritus Prof John J Bolton (Associated with University of Cape Town [UCT])

Government:

- Department of Forestry, Fisheries and Environment (DFFE) Representatives:
  - Ms Andrea Bernatzeder (Director of Aquaculture Innovations & Technology Development– strategic support)
  - Dr Brett Macey (Specialist Scientist: Aquatic Animal Health – scientific input)
  - Mr André du Randt (Scientific Technician: Environmental monitoring)
  - Ms Lisa Mansfield (Scientific Technician: Environmental interactions)
  - Dr Mark Rothman (Specialist Scientist: Inshore & Seaweed research)
  - Mr John Foord (Food Safety Officer)

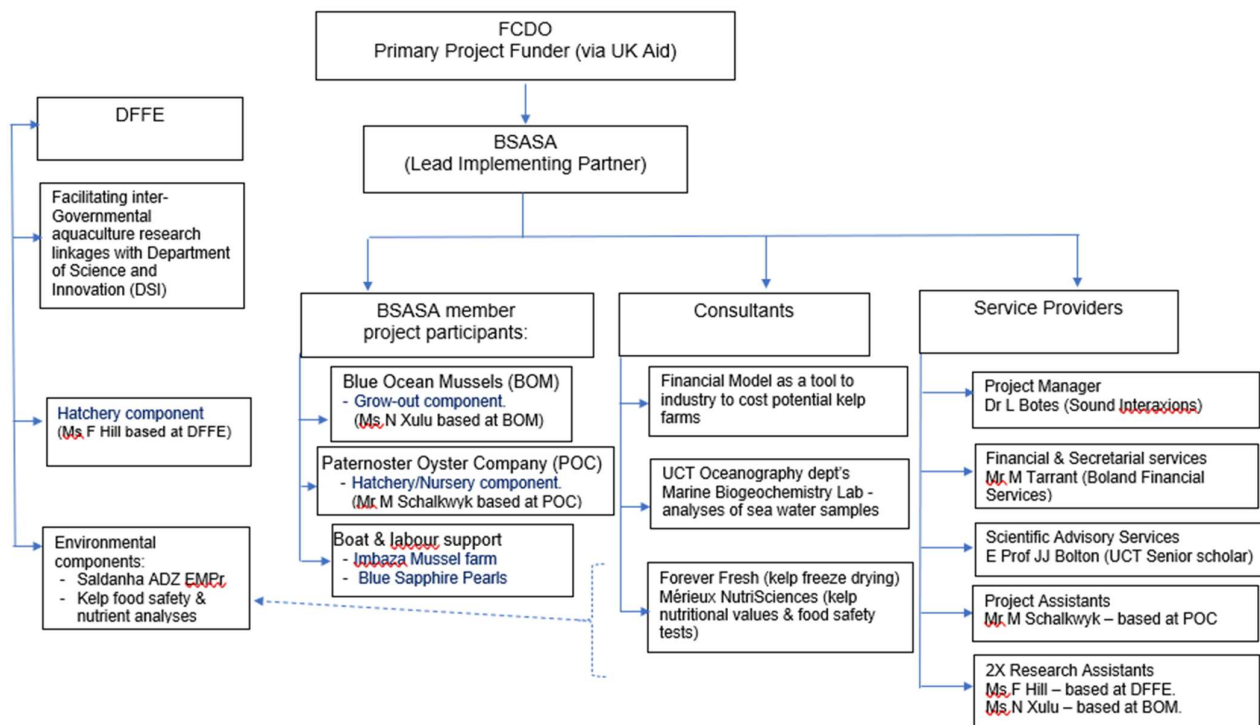


Figure 1. Diagrammatic summary of the Project Delivery Chain Map.

## 1.2 Phase 2: Year 1 (2022-2023):

While the project only gained momentum around November 2022 when the Project Manager and the two Research Assistants were appointed, efforts to successfully establish the project by the FCDO's financial year end in March 2023 were ongoing. Progress during those months were captured in the 2022- 2023 Project year-end Report.

## 1.3 Phase 2: Year 2 (2023-2024):

During 2023-2024, the following milestones were achieved:

~ All three target species (namely *Laminaria pallida*, *Ecklonia maxima* and *Macrocystis pyrifera*) were successfully out-planted, although with varying success, on the grow-out structures within the first year of this project and preliminary data indicates that a seasonal opportunity for kelp farming in Saldanha Bay may exist (though we do not yet know if it will be possible to farm at a profit). This work is still on-going and will continue during 2024-2025.

~ In addition, *M. pyrifera* was grown from wild collected holdfast fragments and out-planted onto rope ladders suspended on mussel rafts and long-lines to evaluate the how the kelps grow on the different grow-out structures. In 2024-2025, two different rope structures (ladders vs droppers) suspended from long-lines will be investigated.

~ *M. pyrifera* was sent for food safety and nutritional analyses including microbial tests. We hope to continue this work to include testing of *L. pallida* and *E. maxima* during the second grow-out season in 2024-2025.

~ Environmental parameters were recorded which is crucial for understanding the site-specific environmental trends that may influence the growth of the kelps in the bay.

~ A Value Chain Analysis, Market Assessment and Roadmap for the development of a kelp farming industry was successfully completed and well received at our annual Kelp Farming Information Session in Mar'24.

~ A collaboration with the United Nations Development Programme (UNDP) has been established which will look at unpacking how best to involve coastal communities in the seaweed value chain. The project "Exploring Seaweed Cultivation and Value Chains for Enterprise Development" will be rolled out in 2024-2025.

#### 1.4 Phase 2: Year 3 (2024-2025) Quarter 1 (Apr-Jun 2024):

With Ms I Meyer now working in the Netherlands, it was our hope that Ms F Hill could conduct the hatchery optimisation experiments as well as maintain the project spools at POC. However, the incubators again malfunctioned, and it was subsequently agreed with the supplier to refurbish both incubators. While doing so, both incubators were upgraded with dimmable white lights to, in the short term, run the intended hatchery optimisation experiments. Both incubators were also fitted with red light fittings to use the incubators, in the long term, as a red-light chamber to keep gametophytes for extended periods of time. It was further decided that a Project Assistant (Mr Musadiq Schalkwyk) be employed at POC as of June 2024, so that Ms F Hill could focus on hatchery tasks at the DFFE based kelp hatchery. On the grow-out side, the success with the 8m long vertical droppers as opposed to the 2m wide ladders, with horizontal ladder rungs at 2m, 4m and 6m, resulted in the decision to move forward by out-planting additional droppers. As well as the collaboration with the UNDP project "Exploring Seaweed Cultivation and Value Chains for Enterprise Development" to unpack the involvement of coastal communities in the seaweed value chain, a further development to collaborate with the University of the Western Cape (UWC) enabled the project to have Ms Waqeebah Moosa look into kelp epiphytes/biofouling and phytoplankton assemblages which may affect the quality of kelp blades and possibly also the price when sold.

#### 1.5 Phase 2: Year 3 (2024-2025) Quarter 2 (Jul-Sept 2024):

Over and above the on-going project activities, the 2<sup>nd</sup> quarter was packed with several successful events which will be elaborated upon in the relevant sections below. During Aug'24, members of the Kelp farming project collaborated with the UNDP's "Exploring Seaweed Cultivation and Value Chains for Enterprise Development" project by participating in the community workshops that were held in Saldanha Bay, Velddrif and St Helena Bay. The Project Manager (PM) was also invited by Conservation SA (local branch of Conservation International) to present at the Blue Carbon Event in the 1<sup>st</sup> week of Sept'24 and organised by Conservation International, the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Union for Conservation of Nature (IUCN) which was immediately followed in the 2<sup>nd</sup> week of

Sept'24 by the Aquaculture Association of Southern Africa's (AASA) Conference [co-hosted by EU Horizon 2020 All Atlantic Ocean Sustainable, Profitable & Resilient Aquaculture (ASTRAL) funded project]. The project website was launched at the event during the PM's presentation. The Conference activities was followed by a visit from the international delegation from the EU Horizon2020 integrated aquaculture project ASTRAL, and soon thereafter, the filming for the project promotional video commenced which will stretch over the 2<sup>nd</sup> and 3<sup>rd</sup> quarters. The UNDP at the same time also commenced with their project video which has a slightly broader objective (i.e. seaweeds in general) but included kelp farming and some of the team members also participated in that. The quarter ended on a high note when kelps from the *Macrocystis* and *Laminaria* droppers were harvested to determine the yields as well as pre-processing options after which samples were sent for food safety testing. During the last days of Sept'24, the service provider for the Kelp financial forecasting model was also appointed and we are positive that this component will be completed by the end of the 3<sup>rd</sup> quarter.

## 2. Progress on project objectives & deliverables

The sections below will build on the findings of the previous quarters to summarise the different project components and provide an overview of progress for the 2024-2025 financial year. The monthly progress reports of the Project Assistant (PA) and the two Research Assistants (RAs), attached as Annexures, provide more details.

### 2.1 Hatchery technologies of targeted species:

#### ➤ **Kelp hatchery/nursery facility based at the DFFE Sea Point Research Aquarium:**

As mentioned in the Q2 report, it was decided to move forward with the different stages (i.e. hatchery stage, nursery stage, weaning stage and the grow-out stage), which led to changes being made at the DFFE kelp hatchery to closely match the hatchery/nursery setup at POC. The main focus was, to reduce the time of the kelps in the DFFE based hatchery from ~4 months (as previously achieved) to ~2 months (which is the time the kelps at POC took to grow to 1cm and the preferred out-planting size in Saldanha Bay). In the new hatchery set-up, Ms Hill and Ms Mansfield managed to grow *E. maxima* and *L. pallida* to 0.5cm in 2.5 months, and *M. pyrifera* to 1cm in 2.5 months. These spools were subsequently moved to weaning (at the BOM grow-out site in Saldanha Bay) on 30 Aug 2024, however a site visit shortly thereafter in Sept'24 confirmed that these spools did not survive the outplant. It should be mentioned that prior to the outplant the kelps already exhibited signs of stress with blades curling onto themselves. This, together with the fact that August is a little late in the out-planting season when nutrients decline to near zero annually during October-December (see figure 12 in Section 2.5 and diagram 2 in Section 3), may have led to the unsuccessful outplant.

Ms Hill's completed most of the hatchery optimisation experiments (i.e. two different growth media, spore stocking densities and temperatures) in the two project incubators and will test the last parameter (i.e. two different light intensities) during Q3 at which point these results will be discussed as part of the Q3 report. For more details on progress to date, please see Annexure A.

#### ➤ **Kelp Hatchery/Nursery Facility based at Paternoster Oyster Company (POC)**

As mentioned in the previous quarterly report, Mr Schalkwyk (under the guidance of the PM) also had set-up spools of all 3 species at POC which all grew to 1cm within 2 months (For more details and progress on these results, please see Annexure B). These spools were subsequently moved to weaning at the grow-

out site in Saldanha Bay on 15 Aug'24 and were unwound onto droppers by 30 Aug'24. Of this particular batch, the spools of *E. maxima* were by far the best that have been produced for this species to date (see fig. 2 a- e).

Unfortunately, as in the case of the Jan'24 *E. maxima* out-plant, which was too early in the season, the timing of this out-plant was also not optimal as it was a little too late in the season when essential nitrogen-based nutrients have already started declining, and biofouling species (in particular hydroids) started covering the juvenile kelps (see figure 2 d-e). During a follow-up visit a month later (on 26 Sept'24), the same observations as the year prior were made in that the kelps below 4m exhibited better survival than those above 4m during the latter part of the year with the onset of upwelling when nutrients become limited above 4m. Ms Xulu will continue to track progress of these kelps during Q3.

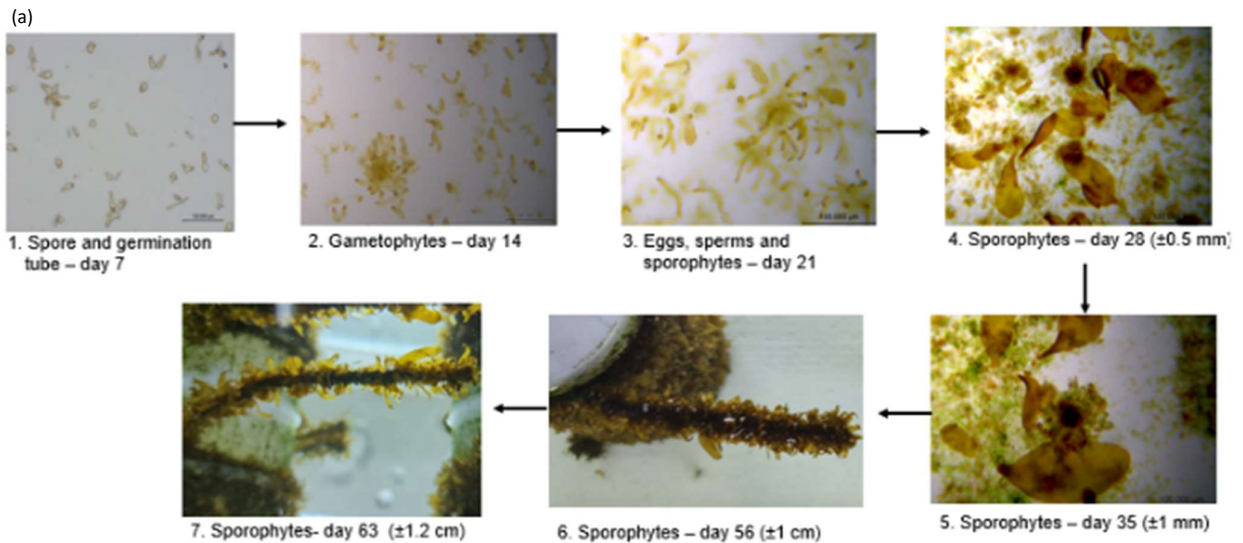


Photo credits: (1) Ms F Hill, (2-5) Mr M Schalkwyk, (6-7) Dr L Botes



Photo credits: (b) Ms N Xulu, (c) Ms L Mansfield (d-e) Dr L Botes

Figure 2. (a) **Lify cycle of *Ecklonia maxima*** as tracked by Mr M Schalkwyk at POC (b) *E. maxima* spool after 2 weeks in weaning with kelps at ~2cm (c) *E. maxima* before being unwound onto droppers on 30 Aug 2024 and (d) *E. maxima* on 26 Sept 2024 covered in hydroids (e) *E. maxima* dropper after being cleaned for the purpose of the photo, reaching upto 6cm in length.

In the upcoming quarter, Mr Schalkwyk will run a trial to further optimise the cultivation of the 3 local kelp species during the hatchery/nursery phases for commercial scale production. For this reason and based on the early findings of the hatchery optimisation experiments done by Ms Hill, all 3 species will be set-up at POC at 15°C (as opposed to 2 different temperatures), f/2 growth media will be used as it is readily available within the industry, kelp blades will be cleaned with distilled water (as opposed to using 3% iodine solution) prior to sporulation, and 2000 spores/ml spore concentration will be used to seed the hatchery spools of all 3 species.

## 2.2 Grow-out trials & Monitoring of environmental parameters:

### ➤ Blue Ocean Mussels' (BOM) grow-out facility.

At the BOM experimental grow-out study site in Saldanha Bay, kelps were initially out-planted on ladder structures attached to mussel rafts, and then onto long-lines at two positions, one closer to the mouth of the Bay (marked in red, see figure 3) and the other further away from the mouth (marked in blue, see figure 3). The ladder structures were 5m wide on the mussel rafts and 2m wide on the long-lines. All ladders were a little over 6m long/deep with ladder rungs at 2m, 4m, and 6m depth.



Figure 3. Blue Ocean Mussels (BOM) study site in Saldanha Bay (SB) indicating the position of the mussel rafts, long-line 1 (LL1) and long-line 2 (LL2)

### Second grow out season (2024-2025):

The project has entered its second grow out season, and we have worked tirelessly to keep the momentum going despite challenges experienced in the hatchery component. Figure 4 provides an overview of the kelps that have been out-planted during 2024, and more detail on the progress of the different cohorts are available in Ms Xulu's monthly reports attached as Annexure C.

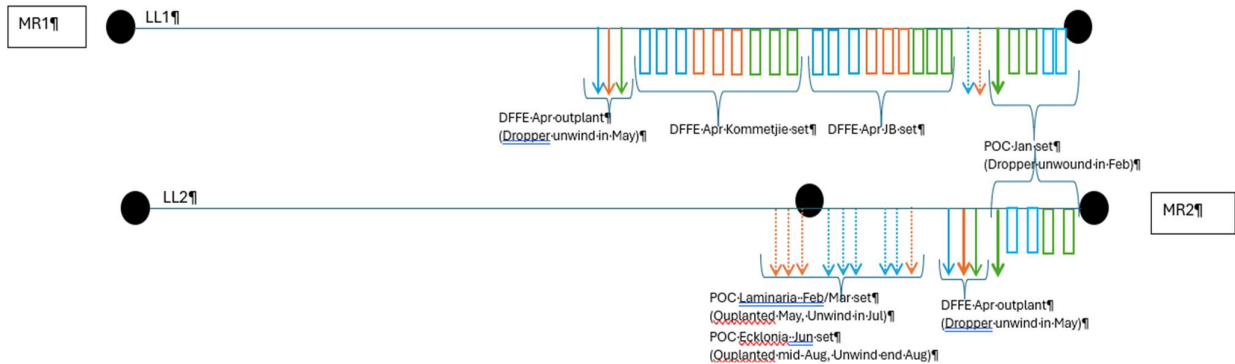


Figure 4. Summary of spools out-planted during 2024 on long-line 1 (LL1) and long-line 2 (LL2) with rectangles depicting ladders and arrows depicting droppers (Green=*M. pyrifera*, Orange=*L. pallida*, Blue=*E. maxima*). MR1 and MR2 indicate the two mussel rafts.

Of the various production structures that have been trialled to date (i.e. mussel rafts with ladders, long-lines with ladders and droppers), we by far had the most success on the droppers in terms of yield. It

should be noted though, that in the case of *M. pyrifera* the blades were generally broader on the ladders than on the droppers which is a morphological adaptation where blades become broader when there is less water movement to increase nutrient absorption, whereas it becomes more slender when there is more water movement (this certainly warrants some further thinking as to how it can be utilised to the benefit of the farmer). The mean total length measurements that were done by Ms Xulu and the Imbaza boat crew provide us with a good indication of the range where the kelps grew best **over the first 5-6 months** (see figure 5). In the case of both *M. pyrifera* and *L. pallida*, the bulk of the yield were between 1-5m after 5-6 months. Note that no kelps survived between 0-1m depth.

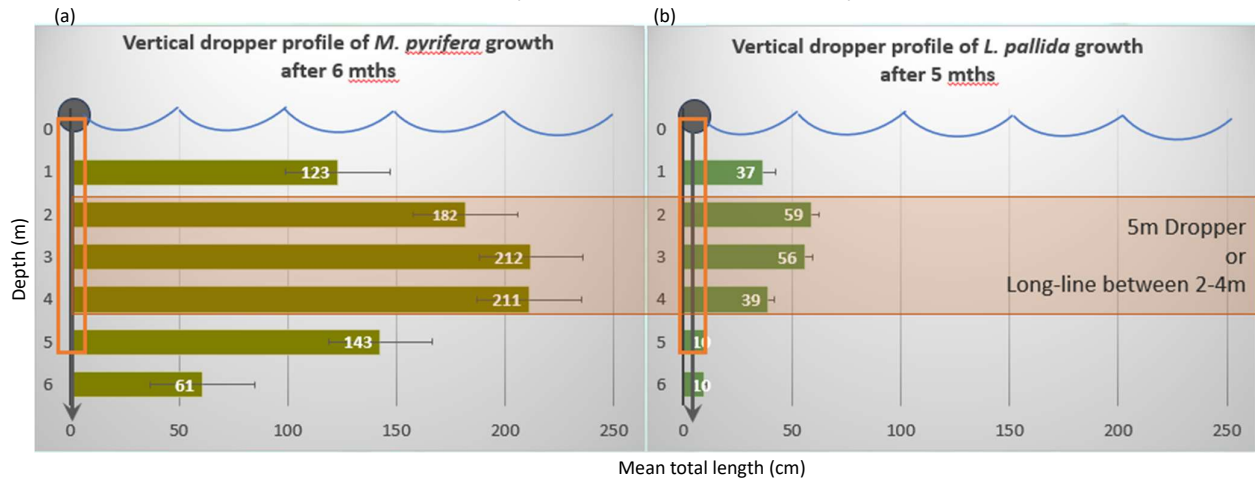


Figure 5. Mean total length of (a) *M. pyrifera* after 6 months and (b) *L. pallida* after 5 months. The arrow with the float on top depicts the actual dropper with the bars depicting the kelps at each depth within the water column. Vertical orange box on both y-axes indicate where the bulk of the yield were thus the likely length that would be required for a dropper and the orange shaded area indicates where the best position for the placement of a horizontal grow-out rope would be (i.e. between 2-4m).

Should industry prefer to move forward with droppers, it would likely not need to be much deeper than 5m (see figure 5 the vertical orange rectangle). One should just be mindful that 5m on a shallow site might not be the same as 5m on a deeper site in terms of (ito) temperatures, light & nutrient availability, so each site would still have to verify the depth of the droppers that would work the best.

Should industry prefer to move forward with horizontal rope structures, then (depending on the site) it would likely be best placed at 3m during the months of April – September (see figure 5 the shaded orange area).

To date, we have unfortunately not been able to outplant *E. maxima* during the months of March/April as planned and as such, we will be tracking the POC spools that have been out-planted in Aug'24 as indicated in section 2.1. However, early indications are that we are seeing a similar pattern as observed last year, where kelps grown on the structures during the latter part of the year survive from 4m downward while degrading fast as October approaches when N-based nutrients decline to near zero, water temperatures start to increase, biofouling settles on the grow-out rope structures and epiphytes on the kelp blades.

### 2.3. Harvesting and yield determination:

By the end of Sept'24, with the onset of the summer stratification when nutrients become depleted higher up in the water column, the kelps growing lower down on both the *M. pyrifera* and *L. pallida* droppers at LL2 increased in length (see figure 6 a & b and compare to figure 5 a & b) and caught up with those growing higher up. This is important from a kelp farming perspective as droppers could in fact be

6m long/deep (as opposed to 5m referred to above) providing more yield uniformly down to 6m, strengthening the case for droppers being more economical in both space and yield than what would be possible on a horizontal rope structure at one depth.

Determining product readiness (the right time to harvest one's product) is crucial for yield and quality. An attempt to delay harvesting to increase product yield can be detrimental to quality, as fouling can set in **within 2 weeks** - as was observed when kelps were harvested on 3 Oct'24 when hydroids settled on the kelp blades during the latter part of Sept'24 which caused the blades ends to wither away (see figure 7). In our case, it would have been better to harvest in mid-Sept'24. Although it would have been possible to clean the blades with a kitchen sponge scourger, we were limited on time and opted to separate the fouled areas from the unfouled areas (see yellow arrow in figure 7d).

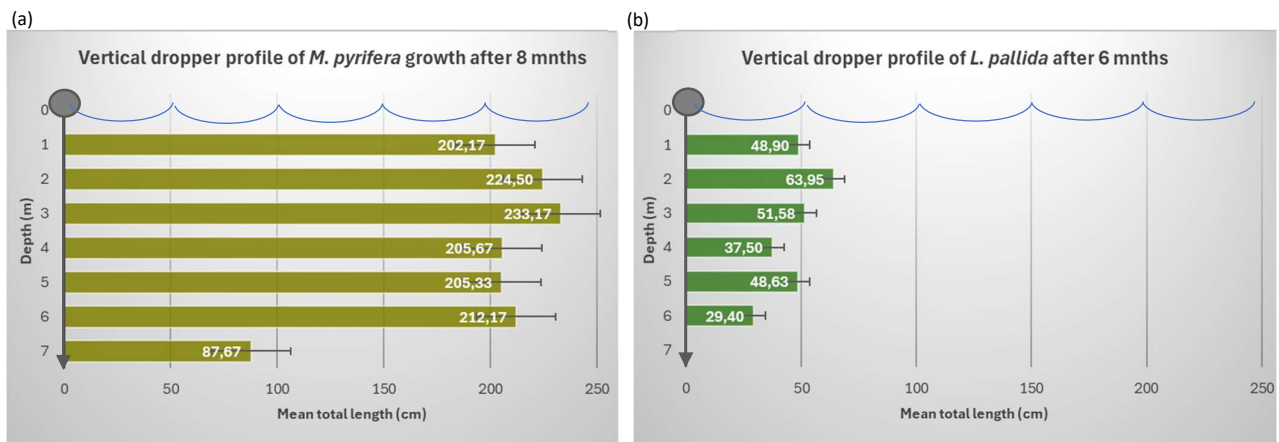


Figure 6. Vertical profile of mean total length of the kelps in Sept'24. (a) *M. pyrifera* after 8 months and (b) *L. pallida* after 6 months on LL2.

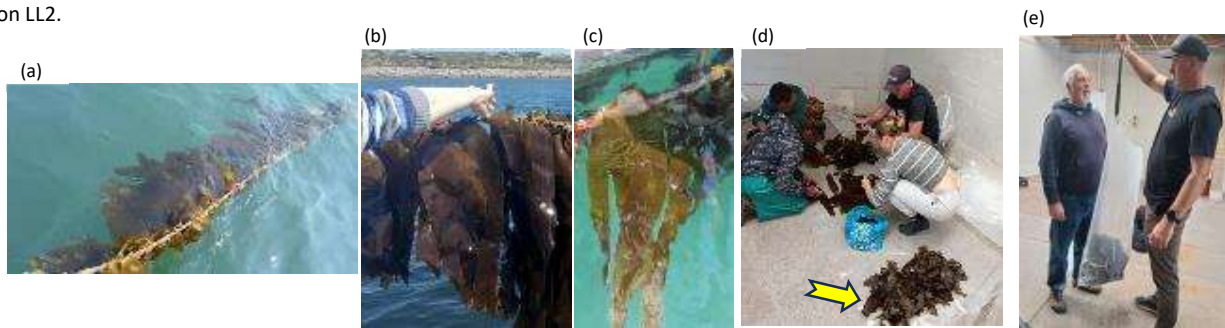


Figure 7. Time-line of blade quality degradation within one month. (a) *L. pallida* dropper at LL2 on 3 Sept'24 (b) *L. pallida* on 14 Sept'24 (c) *L. pallida* on 27 Sept'24 (d-e) *L. pallida* on 3 Oct'24 with the yellow arrow indicating in total 3.6kg of fouled blades due to mainly hydroids. [Photo credit: (d) JJ Bolton (e) N Xulu]

Kelp blades can be used for various products (i.e., some for human consumption, some for animal consumption and some for fertilisers etc.) and therefore each product will have different quality requirements. For this reason, and the fact that abalone prefer the blades to the stipes and floats, we have separated

- (a) in the case of *M. pyrifera*, the fouled areas from the rest of the unfouled parts of the blades, the stipes and the floats.
- (b) in the case of *L. pallida*, the fouled areas from the rest of the unfouled parts of the blades

After separating out the different components (see figure 7d), the wet weight was determined as indicated in figure 7e, and presented in figure 8. **The total wet weight for the *M. pyrifera* dropper on LL2 was 26.55kg and for the *L. pallida* dropper on LL2 was 12.28kg. If one were to add 65 droppers onto a 100m long-line it would amount to just short of 2tons in the case of *M. pyrifera* and just short of 1ton in the case of *L. pallida*. This is comparable to the yields obtained with *Saccharina* (~ 10kg/m thus 1ton/100m long-line) which is being farmed profitably in the USA.**

When looking at the wet weight of various components of the kelps, figure 8 needs to be interpreted with the following in mind; apart from the natural losses during the winter storms:

- (a) there was a time delay of one week between when the mean total lengths were measured (presented in figure 7) and when the wet weights were determined (presented in figure 8) which impacted the yield and the quality.
- (b) in the case of the *L. pallida* dropper, the density of the kelps on the dropper was also influenced by the density of spools coming from hatchery in that *L. pallida* (at both hatcheries) started falling off especially if kept longer than 50 days in the hatchery. In future, this should be considered as it would greatly impact yields in grow-out.
- (c) in the case of *M. pyrifera*, blade samples for assessing biofouling were collected from both droppers at LL1 and LL2 on a monthly basis since May'24. This entails cutting the older blades off at the float while leaving the growth tip intact to allow the plant to continue growing. Thus, while the total mean length increased (as observed in figure 6), the yield presented in figure 8 below would decrease.

The harvest on 3 Oct'24 demonstrated that for both kelps, less than 30% of the total wet weight constituted fouled material (see orange bars in figure 8 a& b). Depending on the type of product, this may or may not negatively impact profits and can be minimised if harvest time is appropriately being monitored. In the case of *M. pyrifera* (see fig 8a), a very small amount of wet weight is attributed to stipes (9.9%) and floats (5.3%), but again even this may or may not affect yields/profits depending on the future of product innovation especially if companies consider a zero-waste approach.

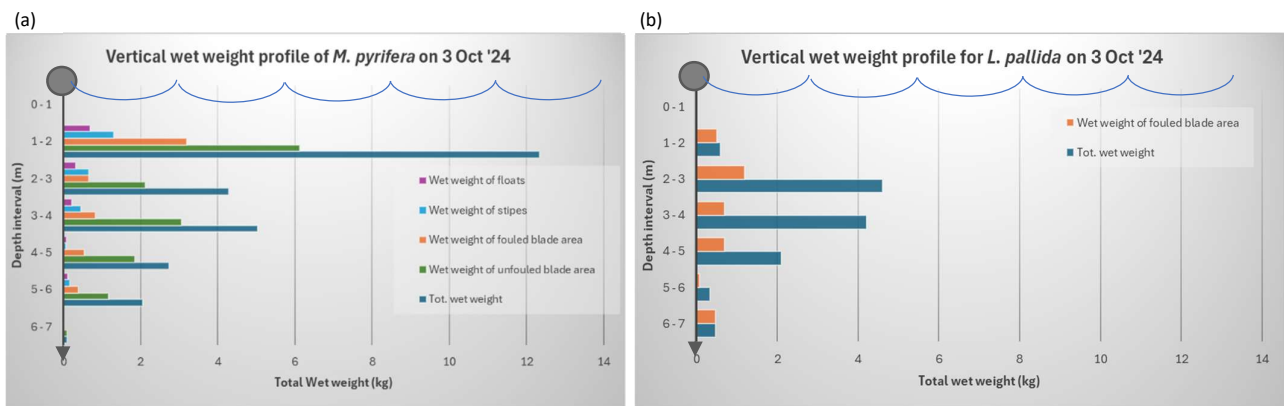


Figure 8. Wet weight profile of the different components of the (a) *M. pyrifera* dropper at LL2 and (the b) *L. pallida* dropper at LL2 on 3 Oct'24.

## 2.4. Pre-processing and food safety testing:

On 2 Oct'24, wild specimens of *E. maxima* and *L. pallida* as well as farmed specimens of *M. pyrifera* (from the LL1 dropper) were collected for a pre-processing experiment. Samples of blades were cut into strips and either

(a) blanched for 1.5mins or (b) steamed for 20mins to determine if blanching or steaming could reduce food safety risks (see figure 9 a-b).

On 3 Oct '24, all *L. pallida* specimens were removed from *Laminaria* dropper on LL2 (see figure 9c) and subsequently all samples were delivered for freeze drying after which it was sent for food safety testing and nutritional analyses. Results are expected toward the end of Q3.



Figure 9. (a-b) Pre-processing experiment to determine if blanching and steaming can reduce food safety risks (c) Collection of *L. pallida* for standard food safety tests (Photo credit: M Schalkwyk, JJ Bolton)

## 2.5. Kelp blade quality (epiphytes, phytoplankton) - [Collaboration with UWC]:

As mentioned in the Q2 report, this component of the project forms part of a collaboration with the UWC (via Prof Gavin Maneveldt) in the form of a Masters (Ms W Moosa) and Honours degree (Ms Z Mfaku), and is aimed at identifying the epiphytic species that grow on the farmed kelps, determining their onset and tracking their overall distribution across the kelp blades over time. Kelp blades are being monitored monthly at various depths (from 1-6m), photographed for the determination of the percentage fouled area using ImageJ, and processed accordingly for the identification of the various epiphytic species. Additionally, the surrounding water column (from 0-6m) is being sampled monthly to survey the presence of toxic phytoplankton species. The results of this study will provide potential kelp farmers with insights into which epiphytes and phytoplankton species may affect the quality of the kelp blades and possibly also the price when sold. For more information on the progress of this work, please see the Ms Moosa's monthly reports attached as Annexure D.

Ms Moosa has been monitoring the two *Macrocystis* droppers since May'24 at both long-lines (which were out-planted in Jan'24 and unwound in Feb'24) as well as two *Laminaria* droppers at both long-lines since Sept'24 (which were out-planted in May'24 and unwound in Jul'24) when the kelps were large enough and started exhibiting signs of biofouling. More recently, she also started monitoring two *E. maxima* droppers at both long-lines (which were out-planted in mid-Aug'24 and unwound at the end of Aug'24).

By the end of Sept'24, it was found that less than 30% of the total blade area (of *Macrocystis* and *Laminaria*) were covered with biofouling (see figure 10 a & b), however in the case of *Macrocystis* there was a much higher diversity of epiphytic species (for details see the photo gallery in Annexure D) present on the blades. This is likely due to the corrugated nature of the *Macrocystis* blades which allows for easy settlement and attachment of epiphytic species on the blades as opposed to the *Laminaria* blades which are much smoother with mainly bryozoans and hydroids present on the blades. Alternatively, it could also be that by September the growth of the *Macrocystis* blades may have slowed more in comparison to that of *Laminaria*, and this slowed growth also reduced the blades self-cleansing ability. Furthermore, in the case of *Macrocystis*, we

observed little difference in % biofouling between the LL1 and LL2 from May - Jul'24, but from Aug'24 to Sept'24 there was a greater difference in the average % biofouling at LL2 compared to LL1 with the difference getting greater in Sept'24.

Worth noting, is that the kelps grew longer and blade quality are generally better at LL2, which is closer to the mouth of the bay where kelps are in reach of nutrient-rich water due to the onset of the upwelling season (see figure 13 a) toward the end of September even though nutrient concentrations are in a downward trend (see figure 13 b-f).

In the case of *Laminaria* though, no difference between the two long-lines have been observed to date (see figure 10 b).

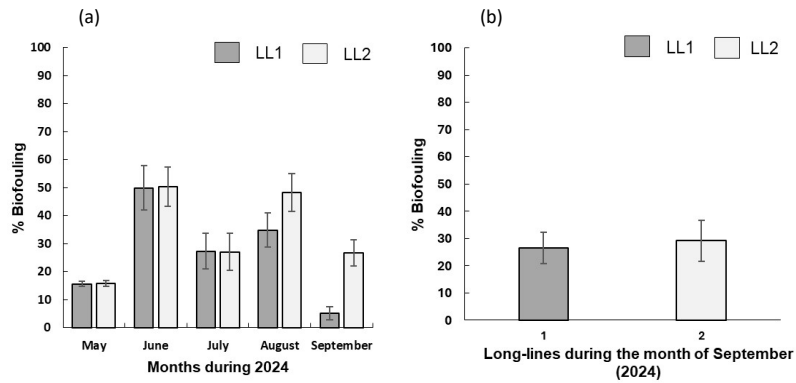


Figure 10. (a) Mean overall percentage epiphyte cover (± SE) across *M. pyrifera* blades at each long-line (LL1 and LL2) for the past five months and (b) *L. pallida* on LL1 and LL2 during Sept'24. (Graph credit: Ms W. Moosa)

While Ms Moosa is still processing her phytoplankton samples, which will provide a glimpse into the presence of phytoplankton in the water column (0-6m), at each long-line on a monthly basis, it is worth exploring the time series of the phytoplankton (dinoflagellates and diatoms) occurring at the BOM site from Jun'23 – Aug'24 (see figure 11) to explore the possible interaction that may play out between kelps and phytoplankton should a kelp farming industry take off in Saldanha Bay. From Jan'23 (and as far back as 2020 when phytoplankton monitoring in Small Bay commenced) up to Jun'24, the phytoplankton assemblage at BOM's site (samples taken as far as possible at 5m depth) consisted mostly of diatoms with generally negligible concentrations of dinoflagellates (see figure 11 and table 1).

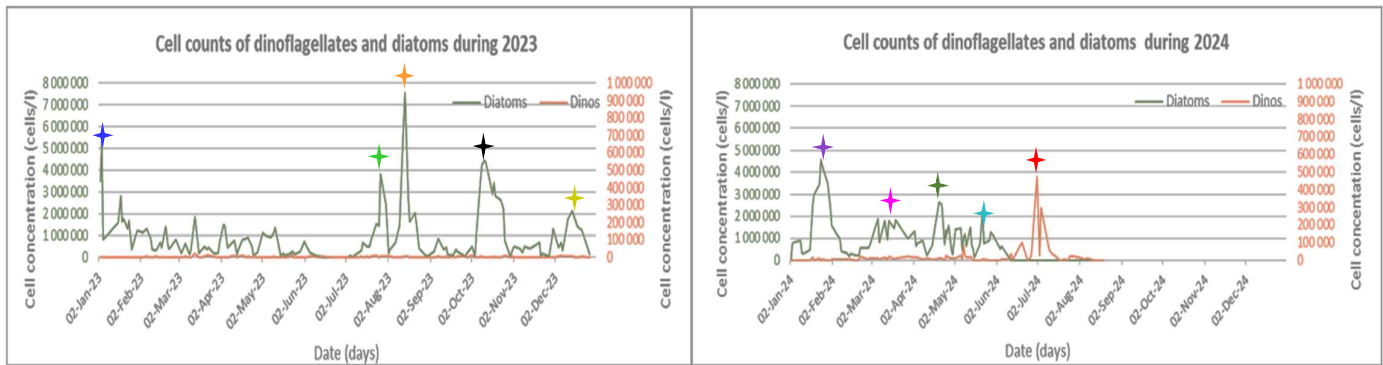


Figure 11. Cell concentration of diatoms (green) and dinoflagellates (orange) from Jan'23 – Aug'24. Note that the y-axis on the left in both graphs have the same maximum for diatoms, and the y-axis on the right in both graphs have the same maximum for dinoflagellates. (Data credit: BSASA-Seawise phytoplankton monitoring programme).

The major bloom-forming species over the last two years have been listed in Table 1 and while dinoflagellate concentrations are generally very low in comparison to diatoms, several other harmful algae species (toxic and non-toxic) like the toxic dinoflagellate species *Alexandrium catenella*, *Gonyaulax polygramma* etc. do occur in the bay (and commonly on the west coast) which can affect not just the mussel and oyster farmers in the bay but also other marine organisms in particular the larval and juvenile stages.

Table 1: List of major bloom events. (#Note-Potentially toxic/harmful species include *Pseudo-nitzschia* spp., *Leptocylindrus* sp. & *Akashiwo sanguinea*)

| Stars indicating bloom peak | Dominating bloom forming phytoplankton species                                      | Possible bloom position based on dip in nutrient concentrations     |
|-----------------------------|---|---|
| Blue star                   | <i>Skeletonema costatum</i> , <i>Pseudo-nitzschia</i> spp.                          | Not relevant to our time series                                     |
| Light green star            | <i>Pseudo-nitzschia</i> spp.  | Across all 3 depths (likely concentrated at 6m due to silicate dip) |
| Orange star                 | <i>Skeletonema costatum</i> , <i>Pseudo-nitzschia</i> spp.                          | Across all 3 depths   |
| Black star                  | <i>Pseudo-nitzschia</i> spp.  | Across all 3 depths   |
| Yellow star                 | <i>Leptocylindrus</i> sp.   | Across all 3 depths (likely concentrated over 2m and 4m)            |
| Purple star                 | <i>Pseudo-nitzschia</i> spp.  | Across all 3 depths   |
| Pink star                   | <i>Pseudo-nitzschia</i> spp., <i>Skeletonema costatum</i> ,                         | Across all 3 depths (likely concentrated over 2m and 4m)            |
| Dark green star             | <i>Chaetoceros</i> sp., <i>Pseudo-nitzschia</i> spp., <i>Skeletonema costatum</i> , | Across all 3 depths   |
| Light blue star             | <i>Pseudo-nitzschia</i> spp.  | Across all 3 depths (likely concentrated over 2m and 4m)            |
| Red star                    | <i>Akashiwo sanguinea</i> (dinoflagellate)  | Across all 3 depths   |

The above have relevance in several ways. Microalgae (like toxic and non-toxic dinoflagellates and diatoms) and macroalgae (like kelps and *Gracillaria*) compete for the same nutrients, can excrete allelochemicals to inhibit the other's potential for growth, can shade each other and prevent photosynthesis etc. While it has never been documented that kelps can/will absorb biotoxins from toxic microalgae, it has been documented that toxin producing micro-algae and bacteria can be present on the surfaces of kelp blades, therefore economic losses due to toxic dinoflagellate species such as *A. catenella*, *G. polygramma* and *A. sanguinea* will likely rather be due to bleaching of kelp blades.

In our case, a bloom of *A. sanguinea* during Jul'24 (see red star on figure 11) dominated much of the west coast (including Saldanha Bay) stretching as far down as the south coast (Hermanus/Gansbaai area). Although this bloom did not reach cell concentrations similar to the diatom blooms during the year, it is noteworthy that (with the exception of some *Ceratium* spp.), almost no other phytoplankton species were present at the time. During this time, we observed a distinct difference in the colour of the *Macrocystis* blades with blades looking much paler/yellower (see figure 12b) than the usual dark brown colour suggesting that the kelps were short of nutrients, however a month later when the *A. sanguinea* bloom dissipated the blade colour was back to the normal deep brown colour (see figure 12c). On the flip side though, we also observed that the blades had much less biofouling during the Jul'24 sampling (see figure 10a, and figure 12b) than in comparison to Jun'24 samples (see figure 12a). This may be due to some epiphytic species which grow on the *Macrocystis* blades becoming nutrient deficient or perhaps as a result of *A. sanguinea* killing many of the larval and juvenile stages of many of the epiphytic species living on the *Macrocystis* blades as it has been well documented in the literature that *A. sanguinea* affect a wide range of organism especially the larval and juvenile stages.



Figure 12. *M. pyrifera* blade in (a) Jun'24 showing dark colouration and biofouling (b) Jul'24 showing lighter colouration and no biofouling (c) Aug'24 showing dark colouration with biofouling starting to appear again (Photo credit: Ms W. Moosa).

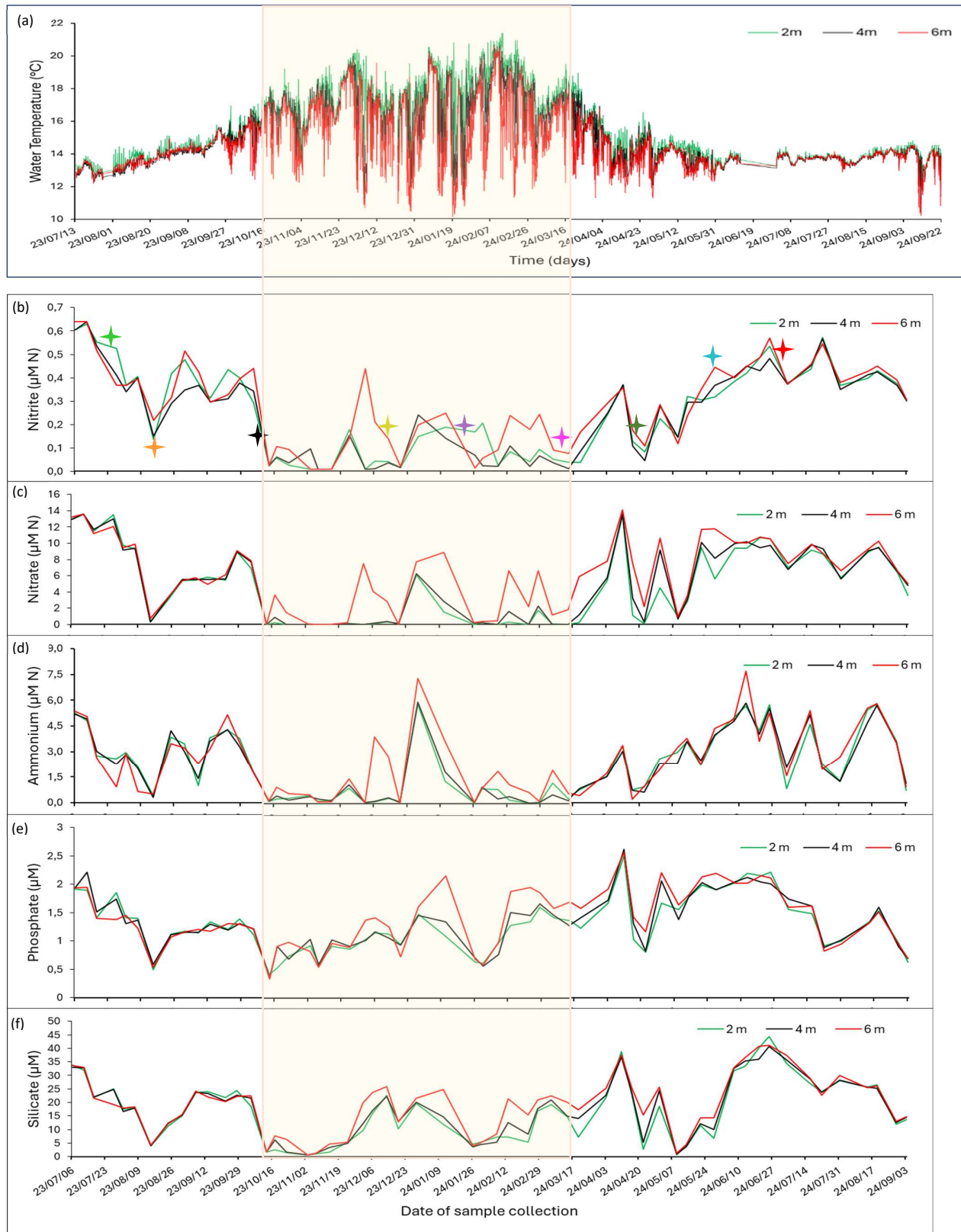


Figure 13 (a) Temporal variations in the water temperature at three depths (2m, 4m, and 6m) in Saldanha Bay from Jul'23 to Sept'24 (b-f) Temporal variations in nutrient concentrations at three depths (2m, 4m, and 6m) in Saldanha Bay from Jul'23 to early Sept'24. The yellow shaded area shows the period when nutrient concentrations are low and posed a challenge to the kelps growing on BOM's site. (Graph credit: Ms N Xulu).

When looking at figure 13, the phytoplankton blooms (indicated in the stars) clearly correspond to the dips in nutrient concentrations on the corresponding dates. Although the current kelp trials are still experimental, consisting of only 2 long lines, there is no denying that should a kelp farming industry develop in the bay in future, that there will be competition with phytoplankton for nutrients.

## 2.6 Updating of Project Plan (containing Research protocols & SOPs):

The purpose of this document is to summarise the overarching project plan and associated research protocols. It also lists the criteria for more project participants to enter. It is a living document that is continuously being updated to reflect the research developments, with particular reference to the Standard Operating Procedures (SOPs). As the Research Assistants (RAs) trial the protocols under the guidance of the project team, the SOPs will be updated to eventually be released with the rest of the deliverables of this project in the hope of establishing a sustainable kelp farming industry in South Africa. Most of the draft hatchery SOPs have already been attached to previous quarterly reports. Since this quarterly report is already heavy in content, the Q3 report will contain the next draft SOPs.

## 2.7 Integrated Financial Forecasting Model for Kelp Aquaculture in South Africa:

This component is aimed at providing those that are interested in starting a kelp farming business with a tool that will assist in making a "go /no-go" decision. The service provider (Mr William Joshua) was appointed in Sept'24 and have met on a weekly basis with the PM and more recently with Mr Vos Pienaar to obtain information required for the 1<sup>st</sup> draft which he aims to have ready by mid-November'24.

# 3. Lessons learned and observation relevant to industry

For the sake of continuity, this section will remain in the report to be updated and expanded upon as data becomes available. For ease of reading, the newly added sections will be in added in blue text.

### ➤ **Production cycle**

In land-based aquaculture farm facilities the Production Cycle is well known to include the following production stages i.e. Hatchery (where parent stock are maintained indoors to produce offspring), Nursery (where offspring are reared indoors until big enough to be introduced to a semi-outdoors area), Weaning (where offspring are being transitioned to better equip them to being grown outdoors ), and Grow-out (where offspring are maintained outdoors until market size is reached).

[Note Processing related activities are not being discussed here as it has not yet been our focus].

Initially, we have taken the approach to move kelp sporophytes which are barely visible with the eye, from the hatchery directly to grow-out and immediately out-planting and exposing them to the outside environmental elements without intermediary stages. While this approach may well work elsewhere, we have found that having all the stages as explained above are more successful in Saldanha Bay. The inclusion of the intermediary stages i.e. nursery (where sporophytes were grown to ~1cm even though we eventually end up having to accept some degree of green algae contaminants) and weaning (where spools were hung for ~3 weeks before being unwound) have allowed the kelps from the nursery to have a better chance to compete with siltation and biofouling when out-planted in Saldanha Bay. The weaning stage has repeatedly proven to be successful providing the kelp sporophytes approximately 2-3 weeks to acclimatize especially if the travel distance between the hatchery site and the grow-out site is far. However, the other school of

thought to outplant the hatchery spools as soon as possible before hatchery contamination sets in and when the sporophytes are less than 1cm in average length, is equally valid thus each potential kelp farmer will have to assess the two options and see which will work the best depending on the distance between the hatchery and grow-out as well the conditions at the grow-out site.

#### **Hatchery/Nursery component**

Although diagram 1 provides a general timeline that will be useful to a future kelp farmer in terms of planning, one should be mindful that differences between hatcheries may exist, [for example, at POC all 3 kelps species grew to 1cm within 2months, whereas at the DFFE Research Aquarium \*Ecklonia\* and \*Laminaria\* grew to 0.5cm in 2.5 months and \*Macrocystis\* grew to 1cm in 2.5 months.](#)

#### **Transporting from Hatchery/Nursery facility to Weaning/Grow-out facility**

When transporting the kelp sporophytes to the grow-out site, temperatures during transit must be kept stable and preferably between 12-15°C. Therefore, when planning to transport one's kelp sporophytes from the hatchery to the grow-out site (and depending on the distance to be travelled) it is important to choose a cool overcast day especially if one does not have access to a vehicle with air conditioning. Care should be taken to maintain the appropriate temperature (which is dependent on the species that are being transported) in the transporting canisters and cooler containers, and to note the sea temperatures where the kelps will be out-planted to as far as possible prevent the kelps from getting a temperature shock either from heating up in the vehicle and then out-planted in cold water or from putting it into canisters and coolers where it is too cold and then being out-planted in water that is much warmer.

#### **Out-planting**

When considering a day to out-plant, it is important to select a day ([www.windguru.cz](http://www.windguru.cz)) that is cool with little to no wind for ease of working on the boat. If the boat has a cabin, put the coolers with canisters containing the spools with sporophytes in the cabin until you reach the out-planting rope structures. It would be advantageous to look at the days prior to the out-plant day and consider which winds are blowing and what the prevailing sea surface temperatures are (and even to obtain a vague idea of which winds may have resulted in a nutrient influx). If possible, overcast days during April with water temperatures between 12-15°C would be ideal. When the coolers with canisters (containing the hatchery spools) arrive, it is worth recording the air temperature inside the cooler, as well as the water temperature inside the canister for record keeping purposes. If possible, all should be between 12-15°C and as closely matched to the sea surface temperature where the unwinding of spools onto the grow-out rope structures will take place if one chooses to unwind the spools immediately. Alternatively, if it is preferred to attach the spools at a certain depth (see weaning paragraph below) for the sporophytes to acclimatise then it would be better to consider the water temperature at the preferred depth to avoid giving the sporophytes a temperature shock.

#### **Weaning/Grow-out component**

We have repeatedly had success with the method of hanging spools at the preferred depth for 3-4 weeks (depending on the size of the sporophytes when out-planted) without unwinding the spools, serving as a weaning stage. As soon as sporophytes reached 2-3cm, the spools were removed and unwound on the desired out-planting rope structures, serving as the grow-out stage. It should be noted though that it is recommended to unwind the spools before the sporophytes reach 3cm and not to wait until they are 4cm or bigger, as at that point the holdfasts of the sporophytes extend over the hatchery twine and when being unwound one run the risk of damaging the holdfasts. Once in grow-out, kelps should be monitored on a

monthly basis. This would be especially important during the month in which the kelps will be harvested in order to get the best quality blades with as little as possible fouling.

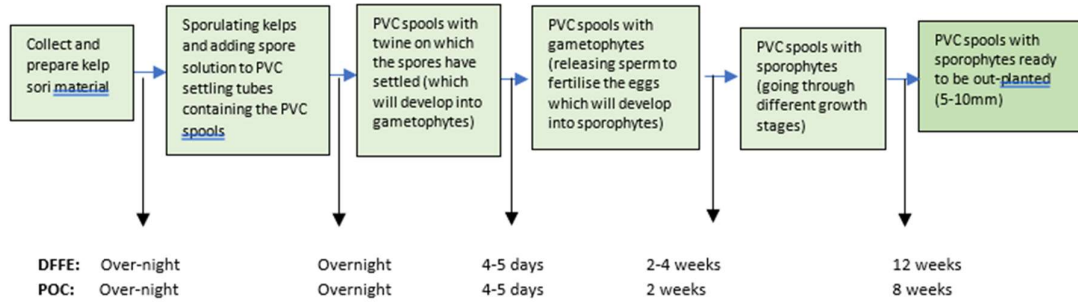


Diagram1: Time-line of all 3 species from collection of kelp sori to sporophytes ready for out-planting (~ 2 months at POC and ~2.5 months at the Sea Point based hatchery).

| Months         | Jan   | Feb | Mar | Apr  | May | Jun   | Jul | Aug | Sept          | Oct  | Nov   | Dec |
|----------------|---|-----|-----|--|-----|---|-----|-----|---------------|--|---|-----|
| Kelp cycle     | 1. Collecting kelp to stock up hatchery <u>spools</u><br>2. Kelp spool care & maintenance (see together with diagram 1) |     |     | 3. Out-planting of hatchery spools (Temps preferably ≤15 °C) |     | 4. Monitoring-kelp growth &-biofouling<br>5. Inspections & infrastructure maintenance (especially after storms) |     |     | 6. Harvesting |  | 7. Removal & cleaning of infrastructure/structures<br>8. Pre-processing & Processing activities |     |
| Possible risks | Biofouling & siltation season   |     |     |  |     |   |     |     |               | Extremely low Nitrogen based nutrient conc's               |   |     |
|                |   |     |     |  |     |   |     |     |               | Biofouling & siltation season                              |   |     |
|                | Phytoplankton blooms & low O2 events  |     |     |  |     |   |     |     |               |  |   |     |
| Benefit        | Decreasing temperatures with ad hoc upwelling events  |     |     | Cooler water temperatures                                    |     |   |     |     |               | Increasing water temperatures with ad hoc upwelling events |   |     |

Diagram 2: Kelp farming cycle time-line (from hatchery spool out-planting to harvesting takes approximately 6 months)

➤ **General time-line**

Diagram 1 & 2 provides a general timeline that will be useful to a future kelp farmer in terms of planning.

~ **In terms of sori collection:**

Although it may be the case that collection of sori material for different kelp species are more successful during certain months of the year, to date we have been collecting sorus material of all three species throughout the year and have had successful sporulation.

~ **In terms of the production stages:**

For hatchery grown sporophytes that will be grown in Small Bay (Saldanha Bay), it is important to establish the time necessary for each of the 3 target species in the hatchery and the time available to grow the target species out in the bay. While one must be mindful that the risk for contamination increase if sporophytes are left too long in the hatchery, one also must be mindful of the fact the high level of siltation and biofouling in Saldanha Bay may prevent the sporophytes from photosynthesizing if out-planted too small even if the sporophytes have self-cleaning mechanisms. It may well be necessary to out-plant the sporophytes at around 1cm in length to ensure that they are able to photosynthesize and

not be covered with siltation before having a chance to grow. For kelp farming site in Big Bay (Saldanha Bay) or a site other than in Saldanha Bay, this may be different.

**~ In terms of out-planting:**

Based on observations on our out-plantings at BOM's grow-out site in Small Bay (Saldanha Bay), from an industry point of view it may be preferable to out-plant after February or as soon as biofouling and siltation subsides (possibly even after March) and water temperatures drop below 15 °C.

However, the above may be different if these three species were out-planted in Big Bay (Saldanha) which is likely to have more water motion. It may well be that *E. maxima* will grow better in Big-Bay (as opposed to *M. pyrifera* that seems to grow well in Small Bay on BOM's site). In areas more exposed to the open ocean such as Kommetjie and St Helena Bay, mean water temperatures may well be cooler in summer than in winter due to upwelling events during the summer months and thus result in a different outcome.

**~ In terms of growth:**

Although our grow-out site at BOM is closely situated to the mouth of Saldanha Bay, it is important to keep in mind that it is based within Small Bay (Saldanha Bay) which is very sheltered with little water flow/circulation during summer resulting in minimal nutrient influx between October and December.

From the data that we have collected to date, it appears that for future kelp farmers wanting to farm with horizontal rope structures, that their main rope-line may have to be between 2-4m during winter while dropping the depth of the rope-line to 6m when heading toward late spring where kelps will be within reach of upwelling events. On the vertical dropper rope structures, initial data confirms that droppers of ~6m long/deep will likely be a better option and certainly more economical in terms of space. Although the droppers were seeded from the surface (0m) all the way down to 7m, no kelps survived between 0-1m thus it will likely only be necessary to seed the dropper from 1m downwards so no hatchery twine with healthy sporophytes goes to waste.

Of the 3 target species, *Macrocystis* (which grew well over the cooler winter months) has on both long-lines grown fast enough to outcompete the biofouling species and be harvested for food safety tests. *Laminaria*, on LL2 closer to the mouth has this season grown large enough for food safety and nutritional analyses to be done. Although *Ecklonia* was successfully out-planted in Jan'24, it was not able to outcompete the competing biofouling species and by Mar'24 very few individuals were present on the rope structures. Unfortunately, we have not been able to out-plant *Ecklonia* spools during March/April as planned and are currently still monitoring the spools that were out-planted in Aug'24.

**~ In terms of nutrients**

Nutrient data from Jul'23- Sept'24 shows nutrient concentrations at 2m, 4m, and 6 meters at the BOM grow-out site. Although site-specific, the data shows how nutrient concentrations decrease from Jul'23 to Oct'23 with extremely low concentrations during Oct-Nov'23 which extends in the case of Nitrate, Nitrite and Ammonium into Jan'24 likely due to the high productivity in Small Bay during this period and certainly creating a challenging environment for kelps to cope with and grow in over that period (as indicated in Diagram 2).

**~ In terms of biofouling/epiphytes on kelp blades and phytoplankton present in the bay:**

Although investigating biofouling/epiphytes on kelps per se was not one of the listed deliverables of the project, it seems that it may well play a very important role. For this reason, we are still in the process of

collecting data on epiphytes and phytoplankton which will run well into Q3 at which point this section will be updated.

**~ In terms of yield:**

The total wet weight for the *M. pyrifera* dropper on LL2 was 26.55kg and for the *L. pallida* dropper was 12.28kg. If one were to add 65 droppers onto a 100m long-line it would amount to just short of 2tons in the case of *M. pyrifera* and just short of 1ton in the case of *L. pallida*. This is comparable to the yields obtained with *Saccharina* (~ 10kg/m thus 1ton/100m long-line) which are being farmed profitably in the USA.

## 4. Networking, Events & Project promotion

### 4.1 Information sharing: Community workshops – [Collaboration with the UNDP]:

The UNDP Project namely: “Exploring Seaweed Cultivation and Value Chains for Enterprise Development” hosted three community workshops on 12 Aug’24 (Saldanha Bay), 14 Aug’24 (Velddrif) and 16 Aug’24 (St Helena Bay) which were followed up by a virtual workshop with a broader stakeholder group on 6 Sept’24.

As part of the project’s collaboration with the UNDP, the PM presented the project’s progress to date at all the 3 community workshops. As part of the collaboration, the South African Kelp Farming project was also included in the UNDP’s promotional project video where Ms Simone Smit had the opportunity to measure kelps with us while footage was filmed with the PM, PA, the two Research Assistants and the two UWC students.



### 4.2 Information sharing: Blue Carbon Event – [Possible collaboration with the CSA]:

The International Blue Carbon Scientific Working Group’s 16th Annual Meeting took place from 2-5 September 2024 in Cape Town which was organised by Conservation International, the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Union for Conservation of Nature (IUCN).

The event included a Kelp Session where Dr Melissa Ward, Dr Maggy Reddy, Dr Lizeth Botes, Dr. Tomohiro Kuwae and Dr Albert Pessarrodona presented. The objective of the session was to consider different aspects with regard to kelp farming and/or kelp restoration as Blue Carbon Initiatives and methodologies/challenges for Blue Carbon research.

Apart from providing information on our project, the PM’s presentation pointed out factors that would need careful consideration for kelp restoration or kelp farming namely:

- From a kelp farming (or even kelp restoration) point of view, sinking one’s kelp would not make economic sense (aside from the many other concerns one might have from an environmental point of view).

- Unlike seagrass and mangroves, kelps do not have roots which would absorb carbon into the soil. The blades absorb the carbon thus hydrodynamic models would have to be used to simulate where kelp material might



be deposited and possibly sequestered into the soil. This might be challenging in our case, as one would have to distinguish between material deposited from the kelps growing naturally in the bay vs those being farmed. Additionally, we don't have many sheltered bays in South Africa thus separate hydrodynamic models would have to be done for Small Bay vs Big Bay vs Open ocean.

- Whether a restoration or farming initiative, one would have to consider energy (fossil fuels vs renewable energy) being used in hatcheries, generators, boats etc.

Similar points were also discussed/confirmed by other speakers in particular Dr Ward that indicated that due to the above factors, there is no methodology to properly address kelp projects and any future initiatives would (a) have to start with a base study prior to the initiative starting and (b) develop their methodology as they go along.

- The PM concluded by saying that kelp-farming would realistically possibly be best placed as a contributor to climate change and/or replacing high-carbon footprint products.

On the positive side, Ms Sarshen Scorgie indicated that they would like to collaborate with the South African kelp farming project on efforts such as this.

#### 4.3 Information sharing: AASA Conference



During the 2<sup>nd</sup> week of Sept'24, the Aquaculture Association of South Africa's (AASA) Conference [co-hosted by EU Horizon 2020 and the All Atlantic Ocean Sustainable, Profitable & Resilient Aquaculture (ASTRAL)] took place in Stellenbosch. The conference had a major seaweed component which was coordinated and chaired by the Scientific Advisor, Prof Bolton and 5 project members (the PM, the PA, the two Research Assistants and Ms W Moosa) presented on behalf of the Kelp farming project. Ms N Xulu also attended a conference side event namely the 'Student speed talk event' where she won the 1<sup>st</sup> prize. This was followed by a visit to the grow-out site by the international delegation from the EU Horizon2020 integrated aquaculture project ASTRAL, organised by BSASA chair Vos Pienaar.

#### 4.4 Information sharing: Kelp project website – [Collaboration with the PSSA]

The project webpage (hosted on the Phycological Society of Southern Africa's [PSSA] website) was launched during the PM's AASA presentation. The website provides a platform where stakeholders and interested parties can access relevant information on the project, research outcomes and reports etc.

The following link can be used to access the project webpage:

<https://www.phycologysa.co.za/kelp-farming-project>



#### 4.5 Information sharing: Kelp project promotional video

The process of shooting footage of the various project components has been under way since Sept'24 and we are hopeful that the promotional video will be finished by the end of the year as another effort to share progress and promoting project outcomes. Once completed it will be available on the project website and the project's Youtube channel (which is still under construction) in order to reach a wider audience.



### 5. Closing remarks & thinking ahead

#### 5.1 Closing remarks:

Despite this project being the first serious attempt to carry out kelp aquaculture in SA, we succeeded in:

- tailoring hatchery culture methods for all 3 local kelp species
- by monitoring environmental parameters and kelp growth, determining the time period/season most suitable for these kelps to be grown in Saldanha Bay
- trialling various grow-out production structures and obtained yields on vertical droppers comparable to that obtained in countries such as the USA where kelps are farmed profitably
- analysing all 3 local kelps to assist with food safety standards and certification

In conclusion, while we are still in the process of gathering some data, we feel that phase 2 sufficiently derisked parameters to justify the continuation to a Phase 3 small-scale demonstration pilot project to determine which of the 3 species can be farmed profitably, and how this may be integrated with other aquaculture activities to inform the development of a financially and environmentally sustainable kelp farming industry.

#### 5.2 Anticipated work for 2024-2025

| 2024-2025  |           |     |      |           |     |      |           |     |     |           |     |     |
|--|-----------|-----|------|-----------|-----|------|-----------|-----|-----|-----------|-----|-----|
| Project deliverable  | Quarter 1 |     |      | Quarter 2 |     |      | Quarter 3 |     |     | Quarter 4 |     |     |
|  | April     | May | June | July      | Aug | Sept | Oct       | Nov | Dec | Jan       | Feb | Mar |
| Hatchery/Nursery trials  | █         |     |      | █         |     |      | █         |     |     | █         |     |     |
| Grow-out trials  | █         |     |      | █         |     |      | █         |     |     | █         |     |     |
| Environmental monitoring   | █         |     |      | █         |     |      | █         |     |     | █         |     |     |
| Epiphyte & phytoplankton monitoring  |           | █   |      | █         |     |      | █         |     |     | █         |     |     |
| Food Safety Testing  |           |     |      |           |     |      |           |     |     |           |     |     |
| 1. Testing farmed kelp - biotoxin analyses                                     |           |     |      | █         |     |      |           |     |     |           |     |     |
| 2. Testing farmed kelp - nutritional analyses                                  |           |     |      |           |     |      | █         |     |     |           |     |     |
| Financial model- kelp farming forecasting tool for industry                    |           |     |      |           |     |      |           |     |     |           |     |     |
| 1. Drafting of TOR   |           |     |      |           | █   |      |           |     |     |           |     |     |
| 2. Sourcing consultant   |           |     |      |           |     | █    |           |     |     |           |     |     |
| 3. Study commence  |           |     |      |           |     |      | █         |     |     |           |     |     |
| Project webpage to be embedded with PSSA website                               |           |     |      |           | █   |      |           |     |     |           |     |     |
| Stakeholder Engagements:   |           |     |      |           |     |      |           |     |     |           |     |     |
| 1. UNDP workshop/meeting with community members to unpack possible involvement |           |     |      |           | █   |      |           |     |     |           |     |     |
| 2. Kelp project Information session  |           |     |      |           |     |      |           |     |     |           | █   |     |
| PM physical check of assets at all sites                                       |           |     |      |           |     |      |           |     |     |           |     |     |
| Reports & Budgeting  |           |     |      |           |     |      |           |     |     |           |     |     |

## 6. General Recommendations

In Q4 of 2023-2024, it was recommended that the partners meet to discuss a co-funding model to further the support for the project. Furthermore, the DFFE engagements with the Global Environment Fund (GEF), administered by the Food and Agricultural Organisation (FAO) has led to funding that has potentially been secured to “Catalysing Sustainable Aquaculture Systems for South Africa” where opportunities for kelp farming have been identified as one of the focus areas. Following the workshop that was held on 18 March 2024, the DFFE has indicated that further engagement with broader stakeholders will be held, and that co-funding would be key to cover all the ‘wish list items’ that require funding support.

To this end, the PM has called a meeting with the project partners to discuss possible co-funding opportunities and a list of possible funders with contact details have been compiled. Since the much-needed data reported on in this report is now available, it is recommended that a workshop be held to conceptualise a Phase 3 small-scale demonstration pilot project. Once there is broad agreement on the concept and objectives of a phase 3 project, a costing exercise should be done in collaboration with the service provider currently working on the kelp financial forecasting model to determine what co-funding will be required over and above the potential GEF/FAO funding that are being worked on.

## 7. Acknowledgements

The PM would like to thank (on behalf of the BSASA and the implementation team) the FCDO for the continued funding support, the entire project team as well as the external consultants for their respective contributions to the deliverables of Q2 which contributed toward the contents of this report. We are also grateful for our collaborating partners (i.e. the UNDP, PSSA and UWC) for contributing to deliverables of the project as outlined in the sections above. Lastly, we sincerely appreciate the access to the phytoplankton data provided by Seawise (responsible for BSASA’s phytoplankton monitoring in Saldanda Bay).

## 8. Annexures

(Note: please double click the pdf icon to access the annexures.)

### 8.1. Annexure A: Ms F Hill monthly reports



F.Hill Jul'24 Monthly Report.pdf



F.Hill Aug'24 Monthly Report.pdf



F.Hill Sept'24 Monthly Report.pdf

### 8.2. Annexure B: Mr M Schalkwyk monthly reports



M. Schalkwyk -Jul'24 Monthly report.pdf



M. Schalkwyk -Aug'24 Monthly report.pdf



M. Schalkwyk -Sept'24 Monthly report.pdf

**8.3. Annexure C: Ms N Xulu monthly reports**



N. Xulu Jul'24  
Monthly Report.pdf



N. Xulu Aug'24  
Monthly Report.pdf



N. Xulu Sept'24  
Monthly Report.pdf

**8.4. Annexure D: Ms W Moosa UWC monthly reports**



WMoosa\_Jul'24  
progress report.pdf



WMoosa\_Aug'24  
progress report.pdf



WMoosa\_Sept'24  
progress report.pdf

**8.5. Annexure E: Project Plan (Research Protocol & SOPs)**

Please note that the SOP's are currently work in progress and thus drafts. All SOPs will be updated and finalised toward the end of the project. The next draft SOPs will be attached to the Q3 report.