

South African Kelp Farming Project (Phase 2 Feasibility study)

Standard Operating Procedure (SOP): Transferring the spools to jars/tanks for incubation

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Compiled by:

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on behalf of BSASA

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Review date: to be adapted and revised by industry

Introduction

The overall goal of the South African Kelp Farming Project (SA KFP) was to gather, analyse and disseminate evidence and research results to a broad stakeholder base, including the existing aquaculture industry and new potential entrants, to lay the foundations toward building a sustainable Kelp Aquaculture Industry in SA and the region.

One of the project objectives of the South African Kelp Farming Project (SA KFP) was to investigate and tailor the hatchery and nursery methods for our local kelp species (based on the kelp farming manuals from elsewhere that are already publicly available and accessible on the [SA KFP webpage](#)), which can then be adapted and revised by industry to suit their own needs. Although the temporary set-ups that were used in Phase 2 of the SA KFP were aimed at achieving the short-term project objectives, it was the first successful attempt to cultivate *Macrocystis pyrifera*, *Ecklonia maxima* and *Laminaria pallida* in South Africa, and also the first successful attempt to cultivate *E. maxima* and *L. pallida* anywhere.

Purpose of SOP:

The purpose of this SOP is to provide a breakdown of steps required to carefully transfer the PVC spools containing the settled spores from the canisters to the jars/tanks for incubation where further developmental stages will take place until the kelps are ready to enter the nursery phase.

Preparation of workspace:

1. While wearing powder-free surgical gloves, clean and sterilise the work surface and make sure enough paper towels are available.
2. Sterilize all utensils and glassware that will be needed for the procedure.
3. Clean the jars/tanks with 70% ethanol/isopropyl alcohol, distilled fresh water and then sterilised filtered sea water (in that order).

Preparation of jars/tanks:

1. Depending on the hatchery set-up, spools can either be placed for the hatchery stage (1st two weeks) directly into tanks, or into jars.
2. Ensure that there are enough clean jars for the number of spools if jars are being used, else ensure that the tanks are big enough to hold the number of spools that will be prepared.
3. Add one LED light bulb in the light fitting on either side of the tanks for the 1st two weeks. Thereafter, additional LED light bulbs can be added as the sporophytes grow bigger.
4. Check that the day:night cycle is set on 16:8, the chillers are set to 15°C and the room's air conditioning is set to ~15-16°C.

Incubation:

1. Add 2ml Germanium dioxide (GeO_2) per 1 litre of seawater into the jars/tanks, and fill it up with filtered sea water to the required level (as per the set-up, it will be different for each hatchery/nursery set-up).
2. Remove the spools from the canisters and place them into the allocated jar/tank and clearly mark the tank/jar indicating which tank/jar contains which species. Ensure that the water temperature in the tank/jar is similar to that in the canister so as to prevent the sporophytes from getting a temperature shock.



In our case, we placed the spools into the jars (containing the GeO_2 and 15°C sterilised filtered sea water) which we then placed into the tanks containing 15°C filtered sea water for the 1st two weeks (when the spores develop into male and female gametophytes to produce a zygote that develops into a sporophyte) after which we removed the spools from the jars and placed them directly into the tanks from the 3rd week onward (when the zygotes develop into sporophytes) and until the kelps reached ~1cm and were ready for out-planting.

3. Optional- Place the corresponding glass slide into the tank/jar, cover tanks/jars with Plexiglass lids to reduce the risk of contamination if you would like to use the glass slides to track the development of the spores into gametophytes and eventually into sporophytes under the microscope (see Figure 1). This provides a rough idea of the progress of the growth of the kelps on the spools.
4. In order to secure the newly settled spores, no aeration is initially required.
5. To minimise the risk of contamination, we have not added growth medium in the first week however this can be added in the first week but is optional. Growth medium was added in the second week.
6. On a daily basis, turn the spools by 90° to ensure that all sides of the spools get equal light exposure.
7. A daily check list should include items such as (but limited to) date, time, air temperature, water temperature, pH, spool rotation, cleaning routine, reporting irregularities and contaminants etc.
8. After one week, continue to SOP7.

Cleaning workplace:

1. Clean the workplace and discard in the appropriate manner all used paper towels and gloves.

Figure 1. Kelp developmental stages during the first four weeks of development: (a) spore with germination tube, when contents are pushed through the germination tube to form the gametophyte (known as the dumbbell stage) (b) gametophyte (male & female) (c) female gametophyte with egg to be fertilised by sperm in order to form the (d) sporophyte which will grow into (e) a bigger sporophyte until big enough to be out-planted (Photo credits: Ms F Hill)

