HATCHERY CULTIVATION OF MACROALGAE
ÚDARÁS SEMINAR 15/1/2020

Freddie O Mahony

Cartron Point Shellfish Ltd

BIM Ireland's Seafood Development Agency

Cartron Point Shellfish Ltd.

PRESENTATION OVERVIEW

1. Background to our company and our role in the BIM seaweed programme since 2004

2. Hatchery cultivation of *Alaria esculenta*

3. Research into cultivating selected species of red algae

4. Future plans

CARTRON POINT SHELLFISH LTD@ NEW QUAY, CO.CLARE

- Iarfhlaith Connellan/Freddie O Mahony
- Founded 1989
- Aquaculture experience since mid 70's
- Commercial bivalve hatchery …plus R@D
- Collaboration with third level institutions
- Seaweed tank and longline trials

BIM SEAWEED PROGRAMME

- BIM seaweed development programme 2004-present
- Industry led initially funded by BIM later by EFF and EMFF
- 2004 - BIM awarded the contract to operate a pilot scale hatchery in West Cork to CPS
- BIM currently lease the hatchery space from BMRS under open tender
- BIM 2018-2020 contract requires the production of 20 kms of seeded *Alaria* string per annum plus research work on *Porphyra* and *Palmaria* cultivation

OUR LOCATION

CARTRON POINT SEAWEED @BMRS

1. 2004 - CPS awarded the tender to establish and operate a macroalgal unit at BMRS
2. Technology Transfer on *Alaria esculenta.*
3. Growth trials at various sea sites
4. *A*nnually increased the output of seeded string produced for Irish licensed sites
5. Participation in Seabioplas, Mabfuel, Idreem
6. National Programme Sea Change 2009-2015

BROWN SEAWEEDS

- *Alaria esculenta* Atlantic wakame
- *Laminaria digitata* Kombu
- *Saccharina latissima* Sugar Kelp

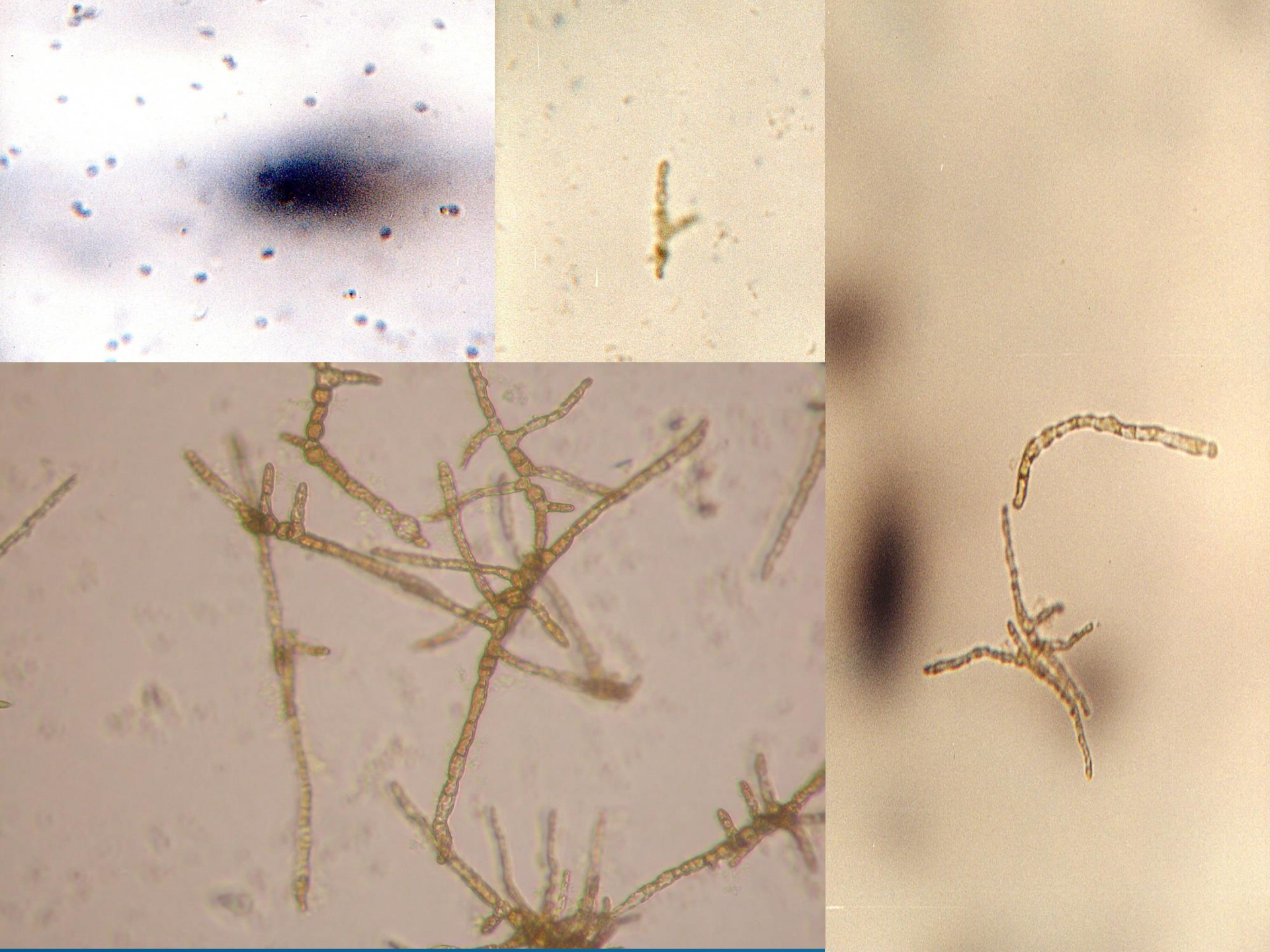
ALARIA ESCULENTA

- Kelp found on rocky exposed shores
- Long thin golden brown frond 2-3 m
- Distinctive mid-rib
- Sporophylls below the blade

CLEANING SPOROPHYLLS

SPORULATION

- After overnight in dark add sterile seawater and agitate
- Sporulation takes 1 hr
- Filter
- Inoculate 3l flasks containing sterile water at 10ºc
- No aeration for 24 hours



CULTURE REQUIREMENTS

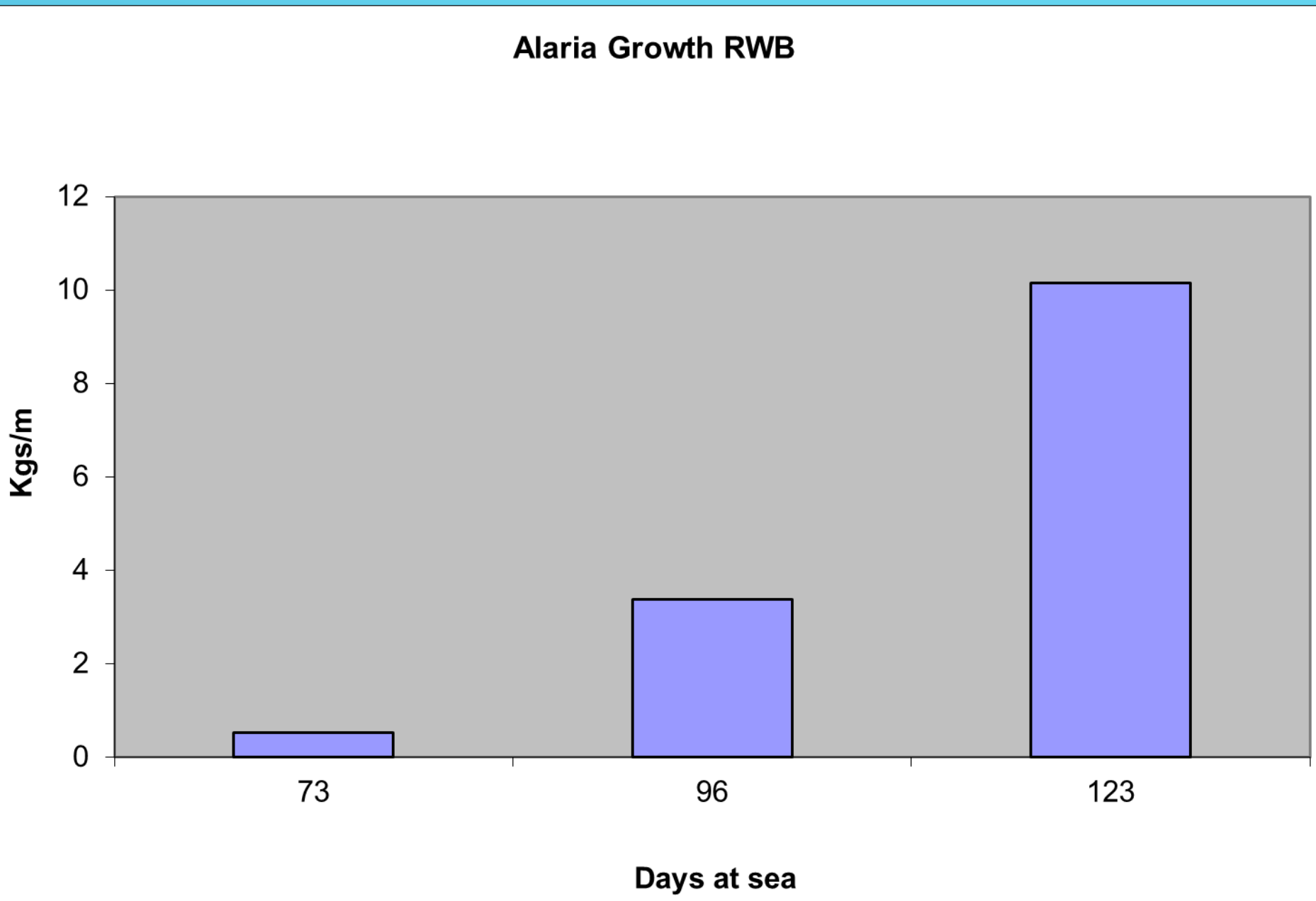
- Minimum 6 weeks growing gametophyte culture pre fertilization
- 24 hours daylight and 14°c inhibits fertilization
- 1 litre culture required to spray 300m string
- Pressure on Autumn sporulations
- Spring window for fertile sori


PYREX
PYREX 6L
5000
4000
3000
2000
approx. vol.
5000
ml


WORKZONE
turbo

FERTILIZATION

EARLY PLANT DEV


Alaria Growth RWB
12
10
8
6
4
2
0
Kgs/m
73
96
123
Days at sea

CURRENT STATUS OF *ALARIA* PRODUCTION IN THE HATCHERY

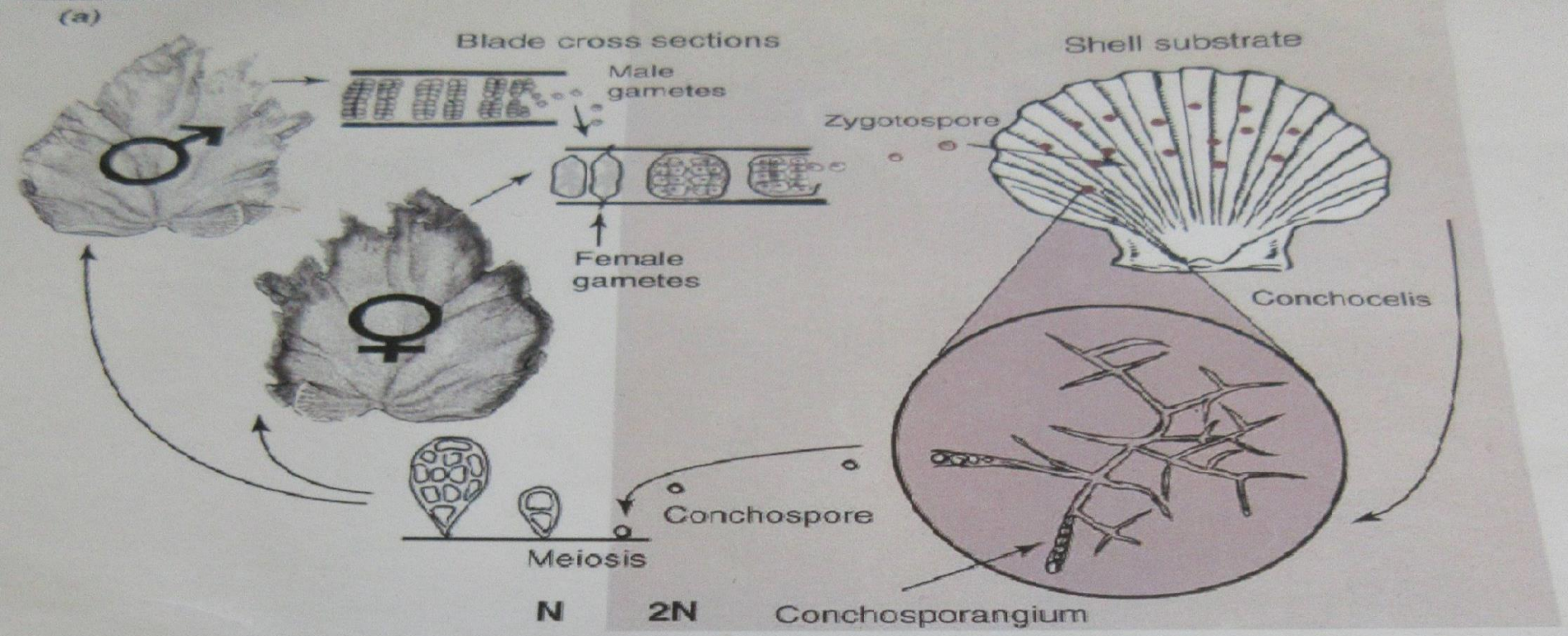
- Annual production of 20,000 metres of seeded *Alaria* string
- Ability to produce substantial amount of gametophyte culture
- Spring sporulation increases flexibility and deployment times
- Currently no demand for seeded string of other kelp species

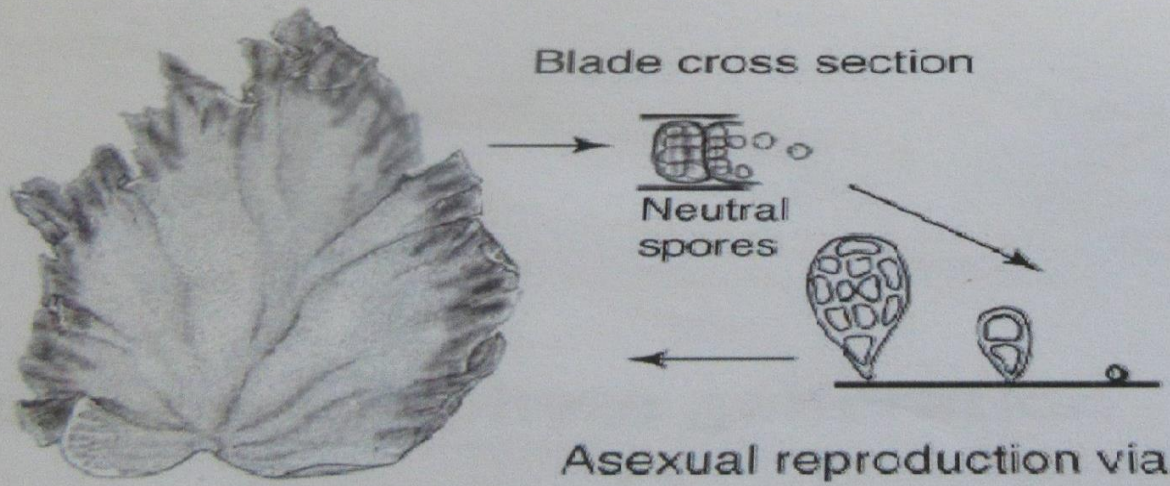
R@D RED SEAWEEDS @BMRS

- 2 species red seaweed- BIM programme
- Asexual *Porphyra umbilicalis*
- *Palmaria palmata*

BIM Ireland's Seafood Development Agency

Cartron Point Shellfish Ltd.





Asexual reproduction via neutral spores

ASEXUAL PORPHYRA UMBILICALIS

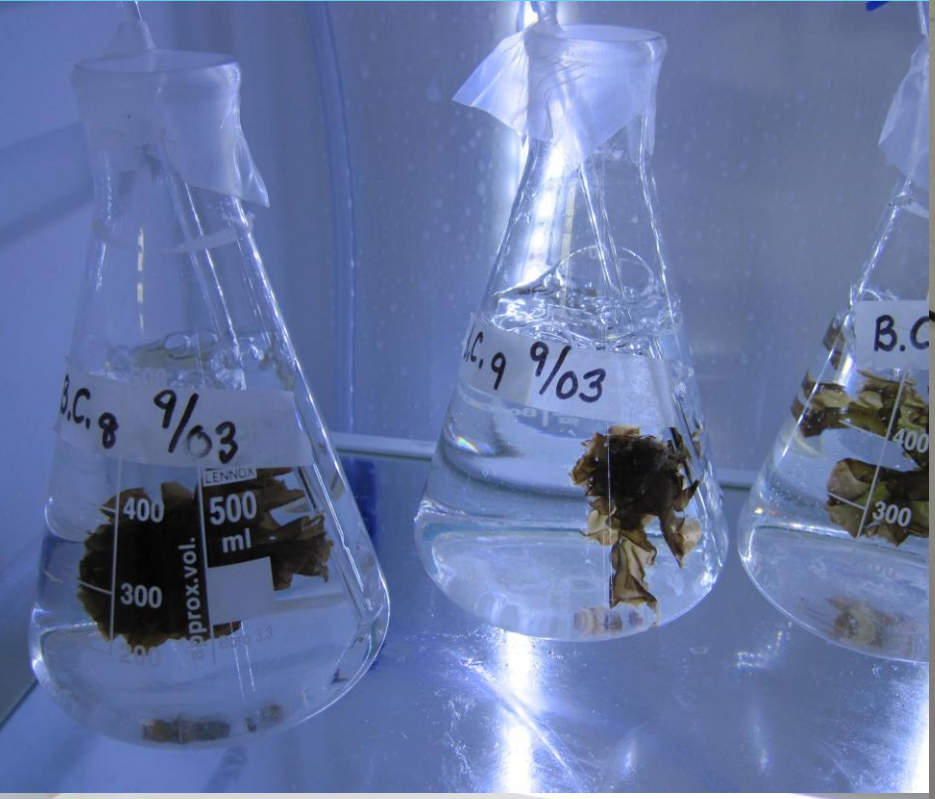
- BIM Seaweed Conference 2014 Limerick
- Prof. Susan Brawley, Maine
- Visit to Maine 2015
- Survey on Devon coast 2016
- BIM Workshop- Feb 2016 with Prof.Juliet Brodie
- Irish coastal survey with BIM regional officers

FINDING ASEXUAL *PORPHYRA UMBILICALIS*

- Irish coastal survey
- 2 locations in south west

FINDING ASEXUAL PLANTS

1. Asexual and sexual *P.umbilicalis* look similar
2. Asexual plants may occur higher on the shoreline
3. Open energetic coastline
4. New sea defences, piers and jetties
5. Differentiate microscopically in cross-section
6. Neutral spore margin most evident Jan to Mar

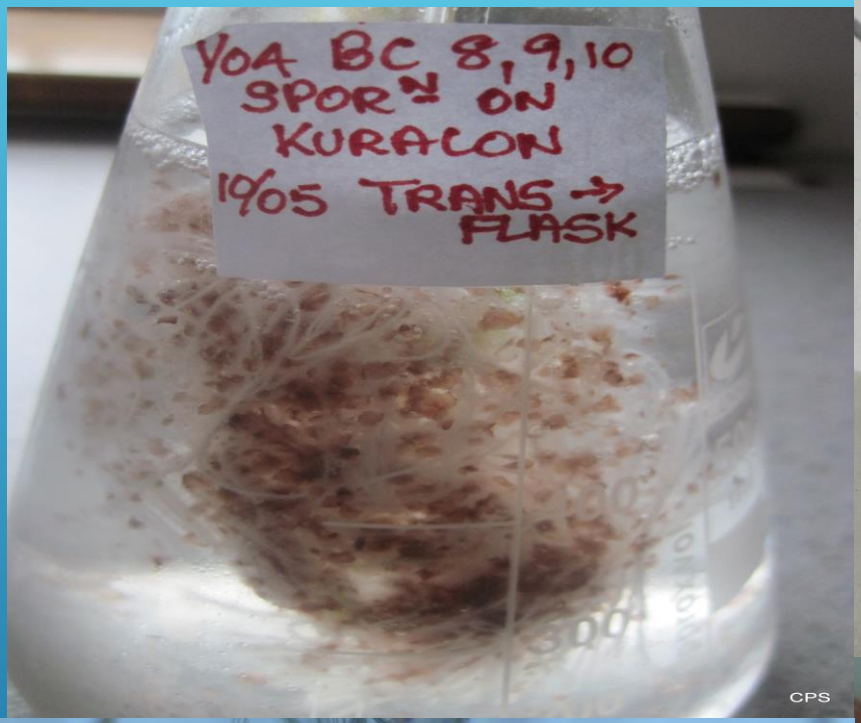

B.C. 8 9/03
B.C. 9 9/03
B.C
400
300
500 ml
approx.vol.
LENNOX

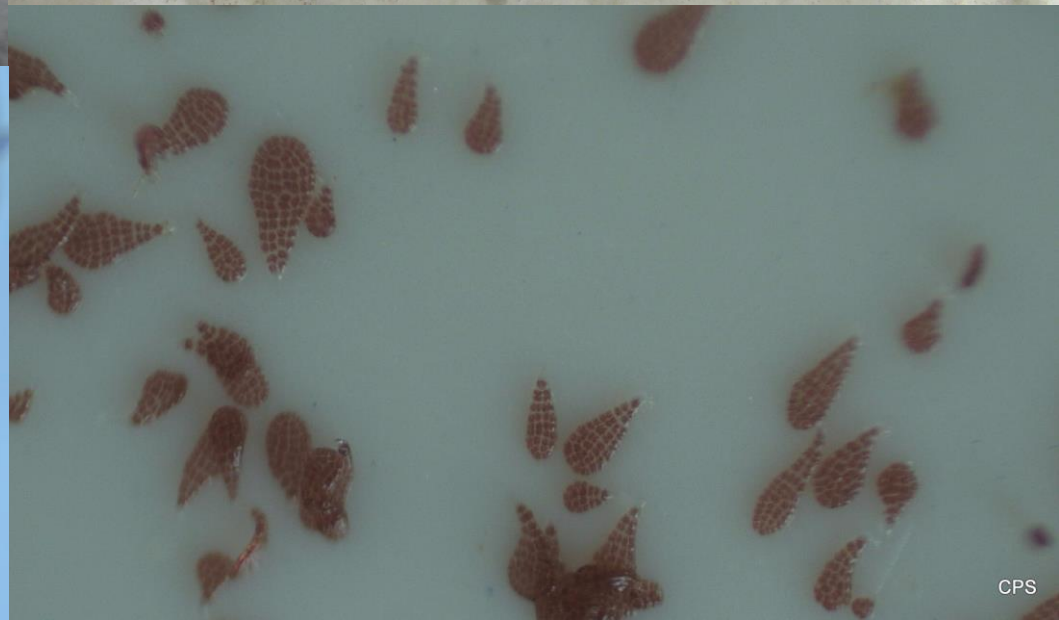
ASEXUAL *P.UMBILICALIS* CULTIVATION CONDITIONS

- Modified West Mc Bride medium
- 12:12 light: dark
- 10 to 12 °c
- Vigorous aeration
- Weekly renewal
- Sporulate at intervals using fertile trimmed margins

SPORULATION

SEEDING EXPTS





SEEDING NETS

- Air dry approx. 1 kg of blades with good spore margins for 2 hours
- Place in 20 litres of seawater and agitate well for 1 hour to help release the spores
- Pour spore solution into the wheel reservoir
- Attach net and rotate for 15 mins
- Keep net folded in illuminated bin for 3 days
- Freeze, grow on in raceway or deploy to sea
- Blouin et al. Aquaculture; 270(2007)77-91


CPS


CPS

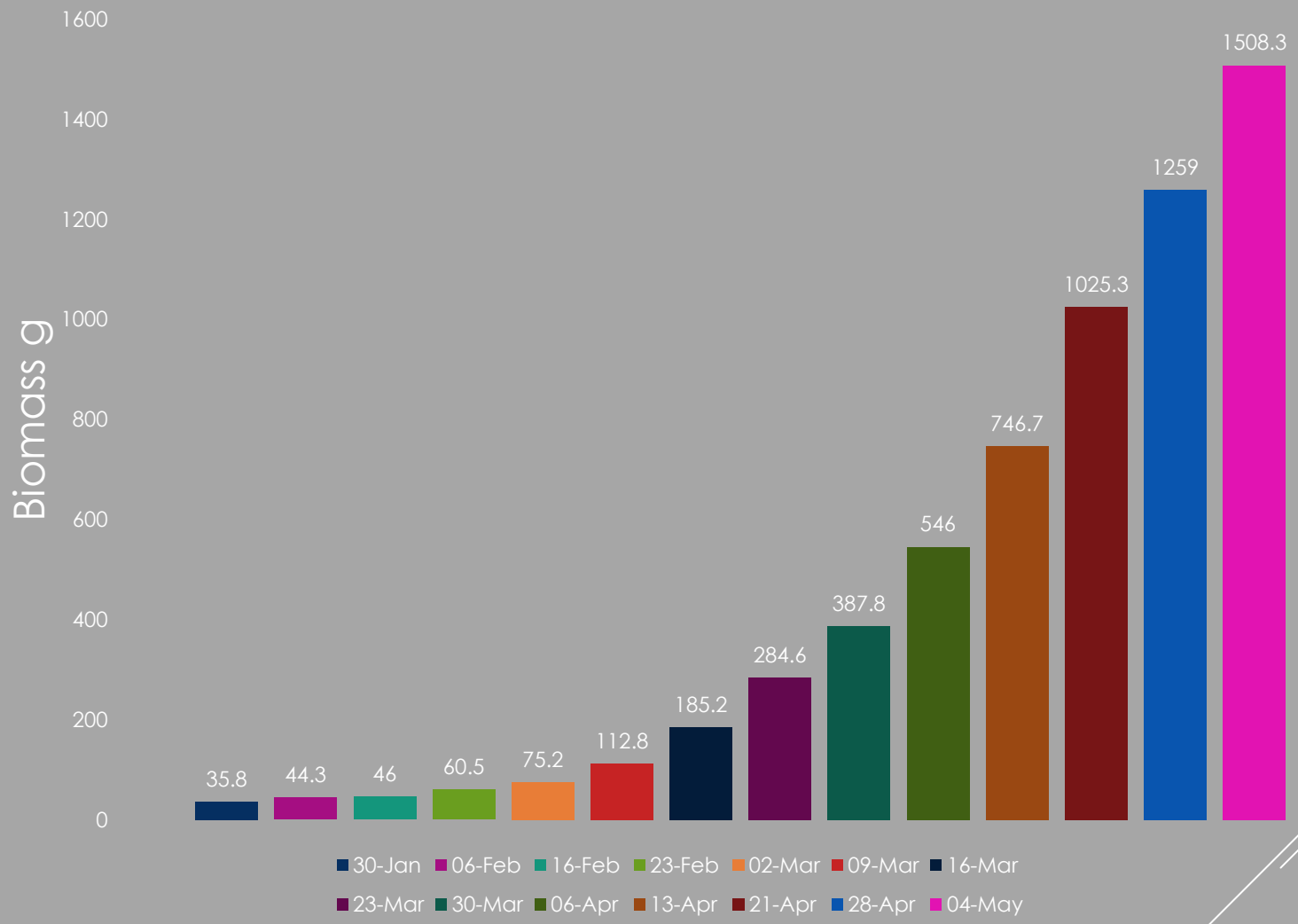
ASEXUAL PORPHYRA UMBILICALIS THE STORY SO FAR……

1. Successfully found and isolated strains of asexual *P.umbilicalis* from 2 locations in the south west
2. Cultivated through 4 generations of 1 strain
3. Maintaining a collection of asexual plants at BMRS
4. Seeded spores on glass beads, Kuralon string and nets
5. Deployed seeded nets to sea in Kerry and Clare late April
6. Large nets were only seeded 3-5 days prior to deployment
7. Plants have been observed on longlines in New Quay and Blacksod Bay

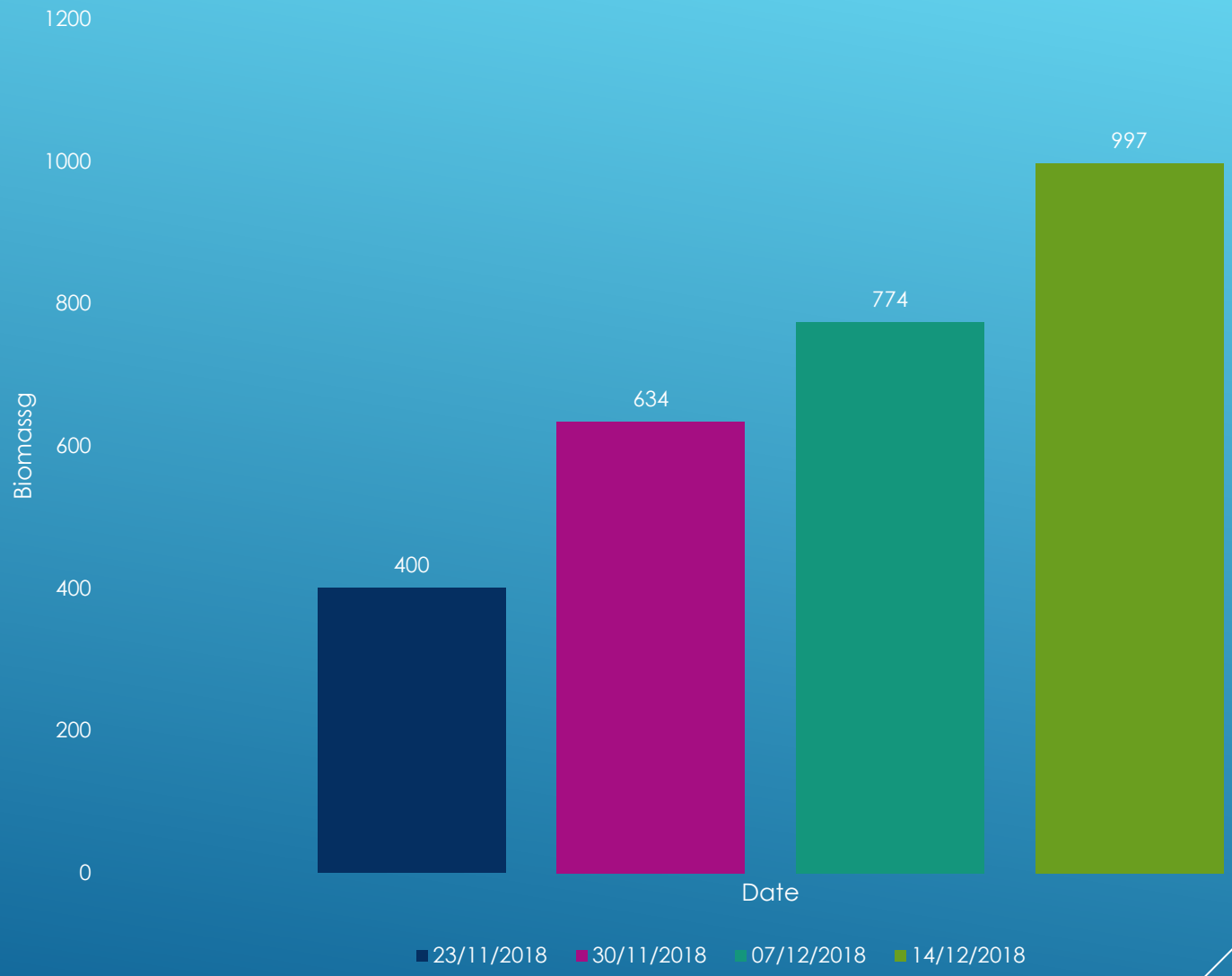
PALMARIA PALMATA TANK CULTIVATION

1. Preliminary outdoor trials at New Quay and BMRS using plants collected at low tide
2. Compared various stocking densities and flow rates
3. Initial results promising
4. Issue with epiphytes
5. Focussed attention on initial algae used in tanks
6. Plant material cleaned and grown indoors

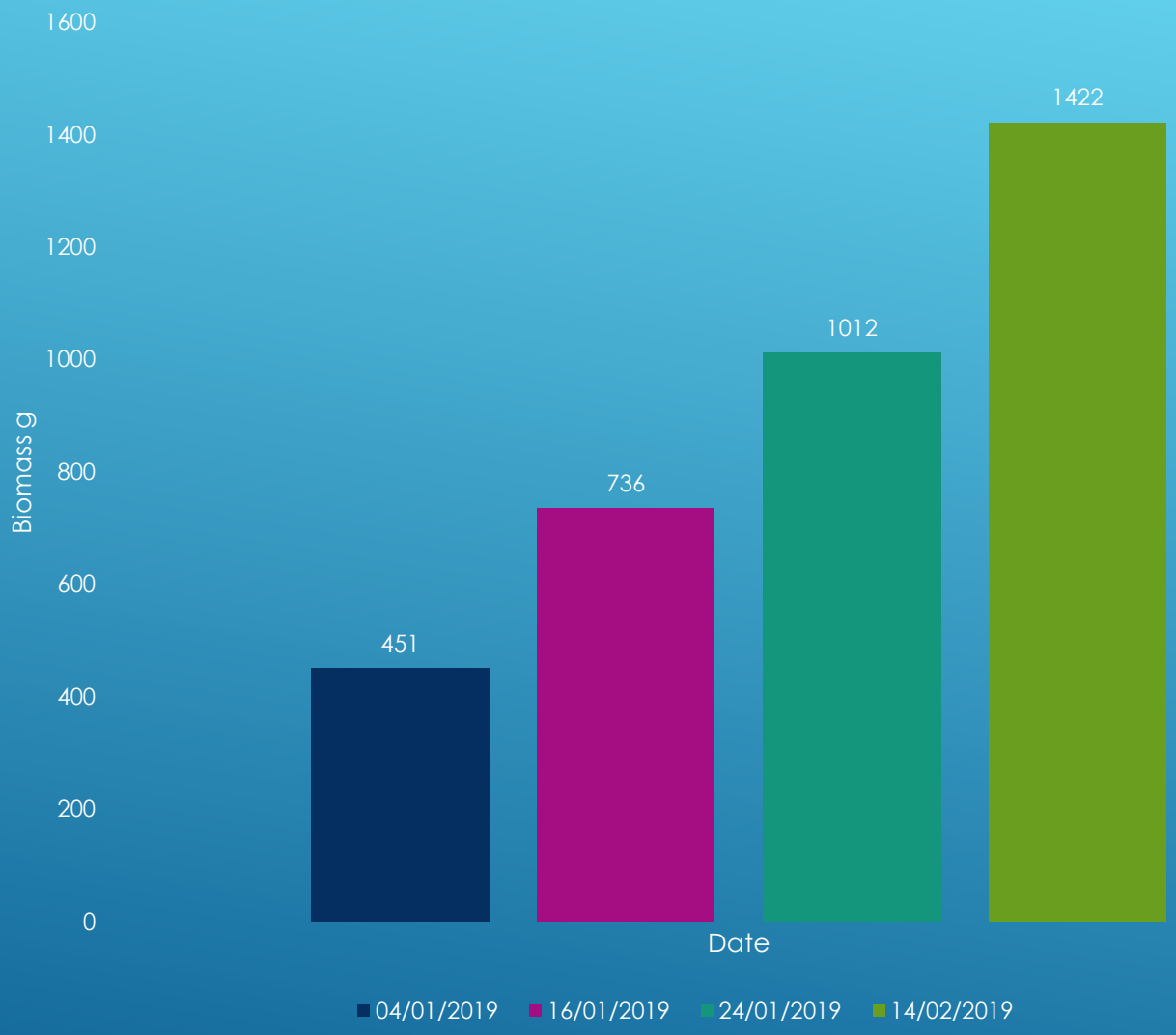
Indoor *Palmaria palmata* cultivation



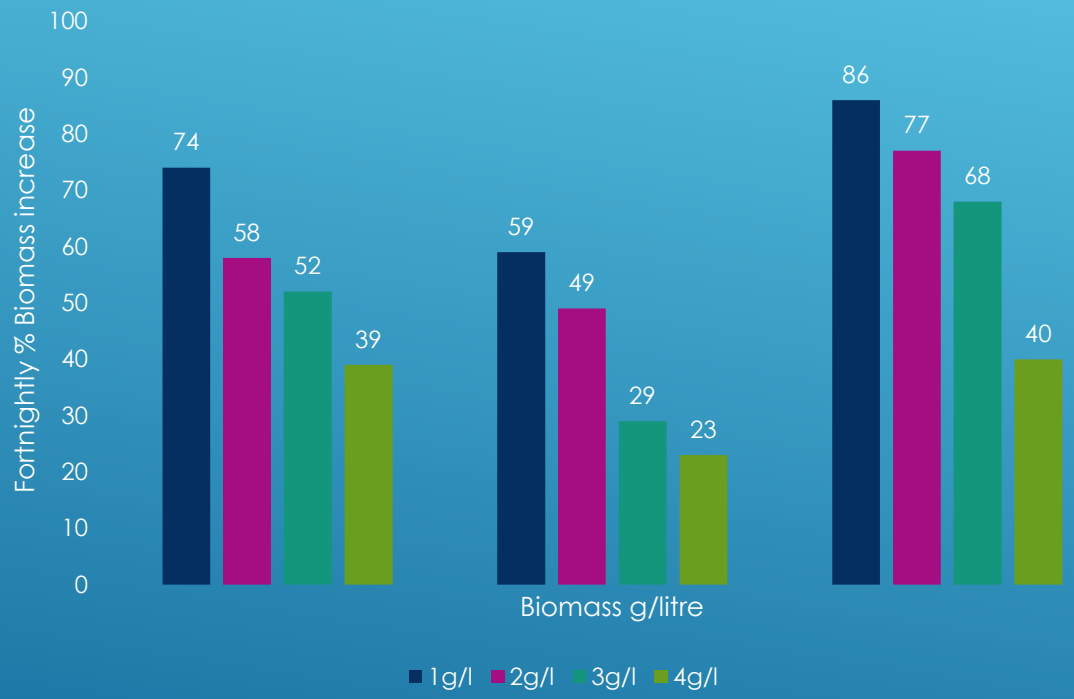
Outdoor Palmaria palmata trials



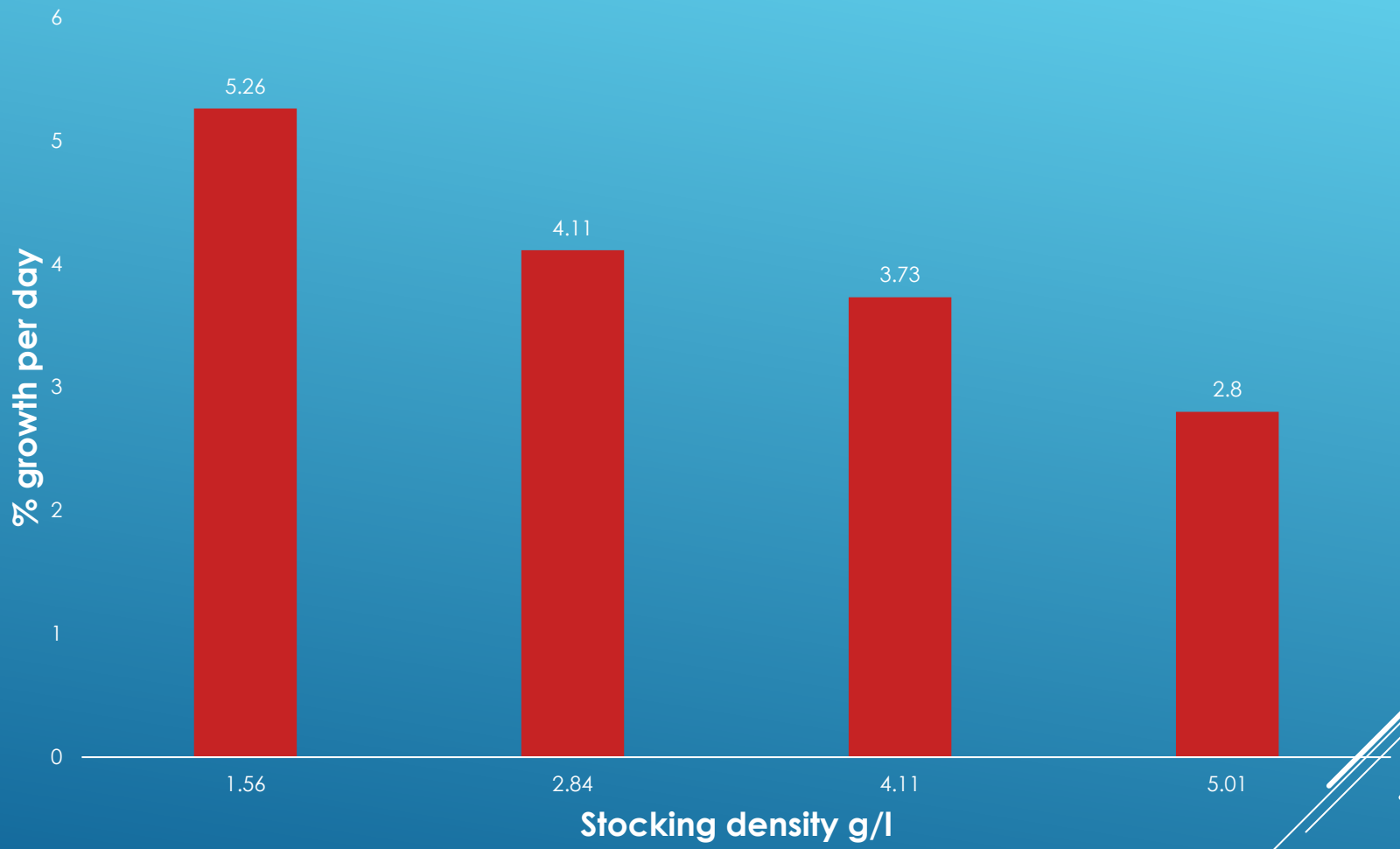
Outdoor Palmaria palmata growth



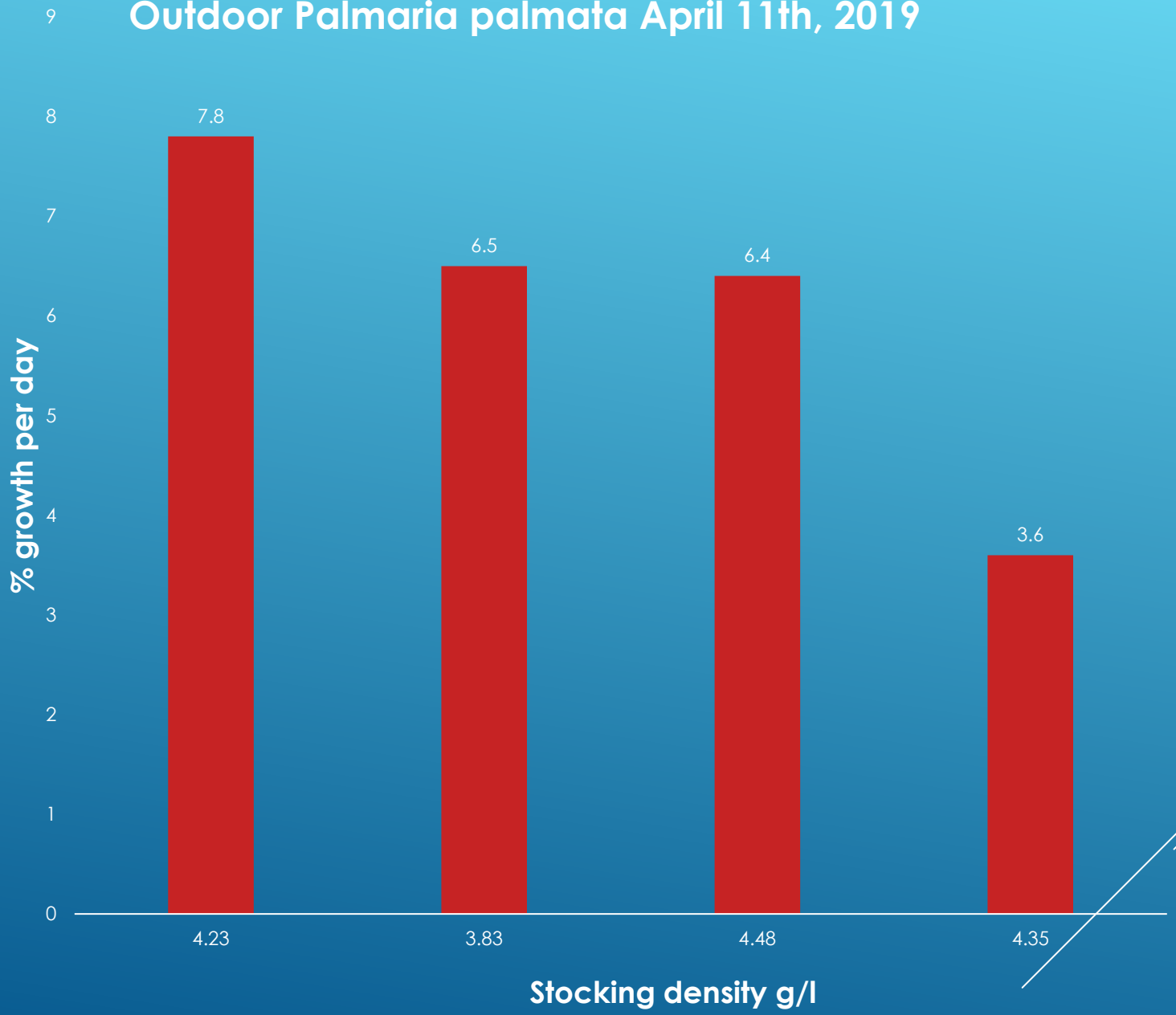
Indoor Palmaria Density Trials



Outdoor Palmaria palmata Feb 2nd 2019



Outdoor Palmaria palmata April 11th, 2019



FUTURE PLANS

1. Improve outdoor *Palmaria* filtration system
2. Continue study on *Palmaria* stocking densities and shading
3. Keep large Japanese *Porphyra* nets in hatchery holding system until plants are well established before deployment
4. Conduct smaller *Porphyra* sea trials to establish optimal deployment time

- BIM
- Iarfhlaith Connellan
- Prof.Susan Brawley and Prof. Juliet Brodie
- BMRS

THANK YOU

BIM Ireland's Seafood Development Agency
Cartron Point Shellfish Ltd.