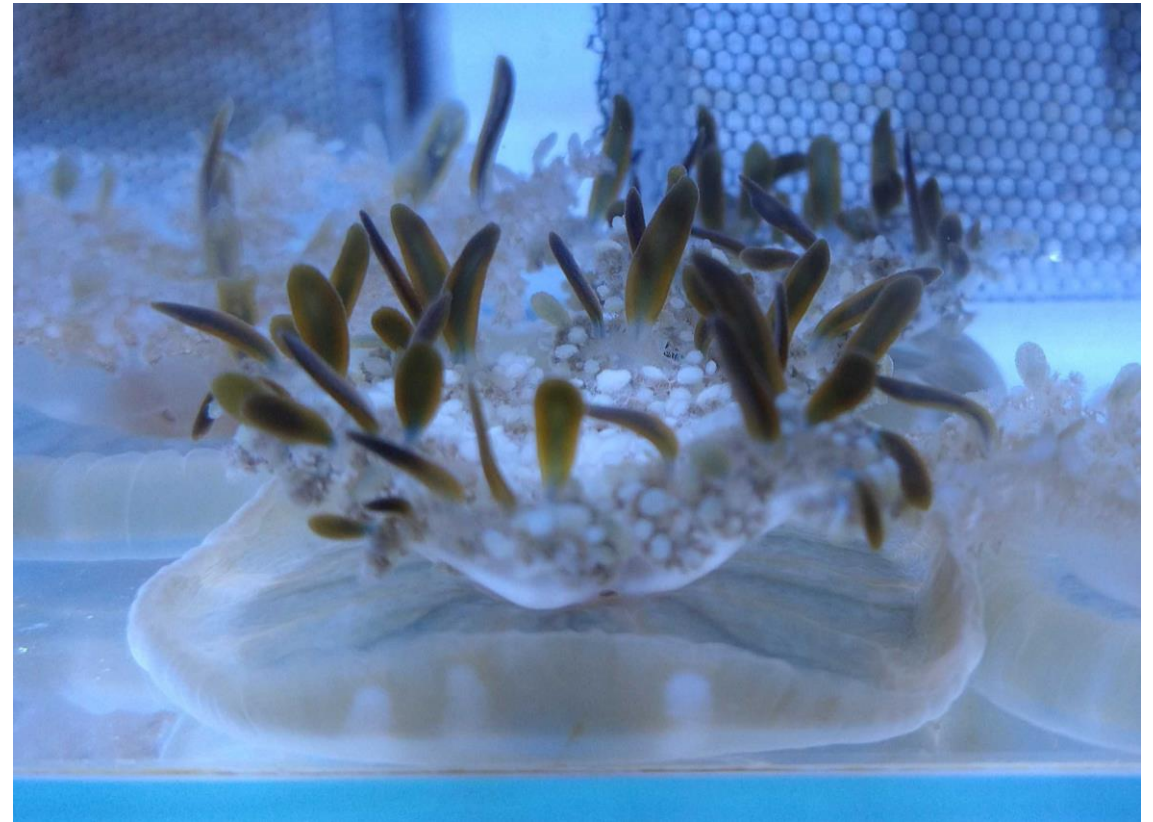
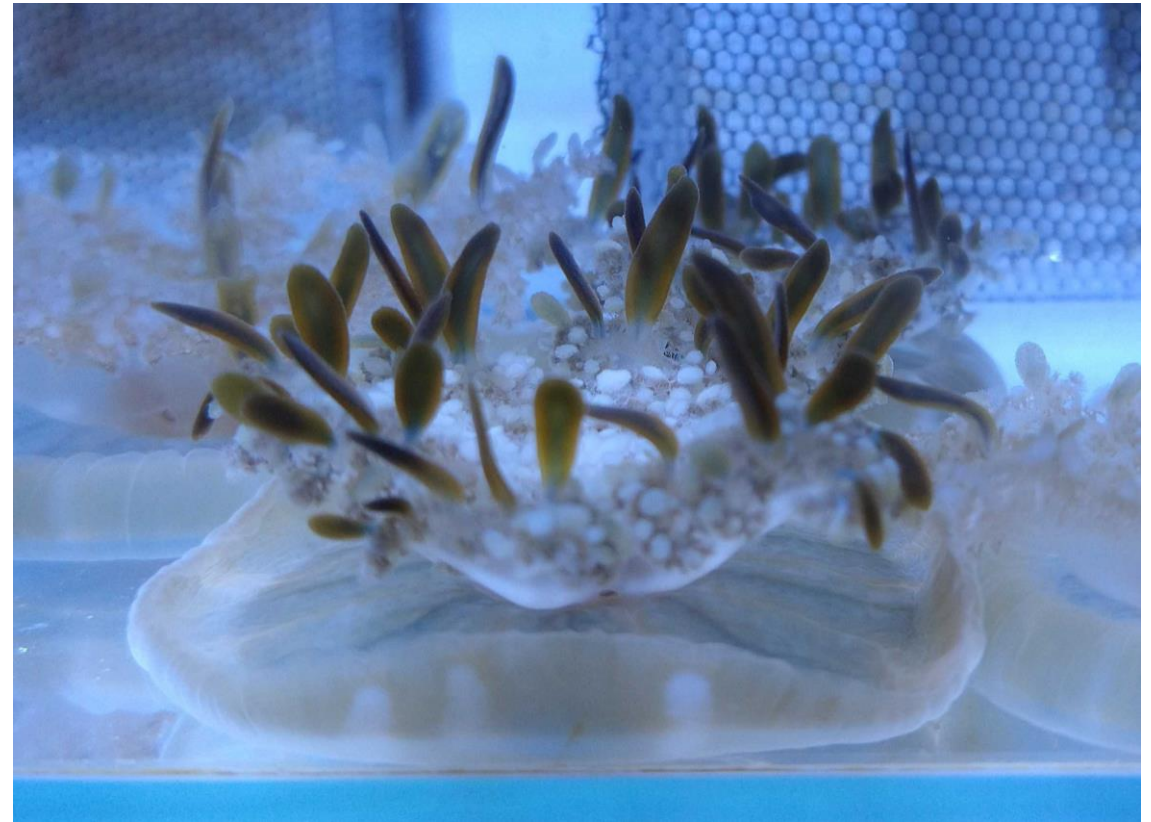


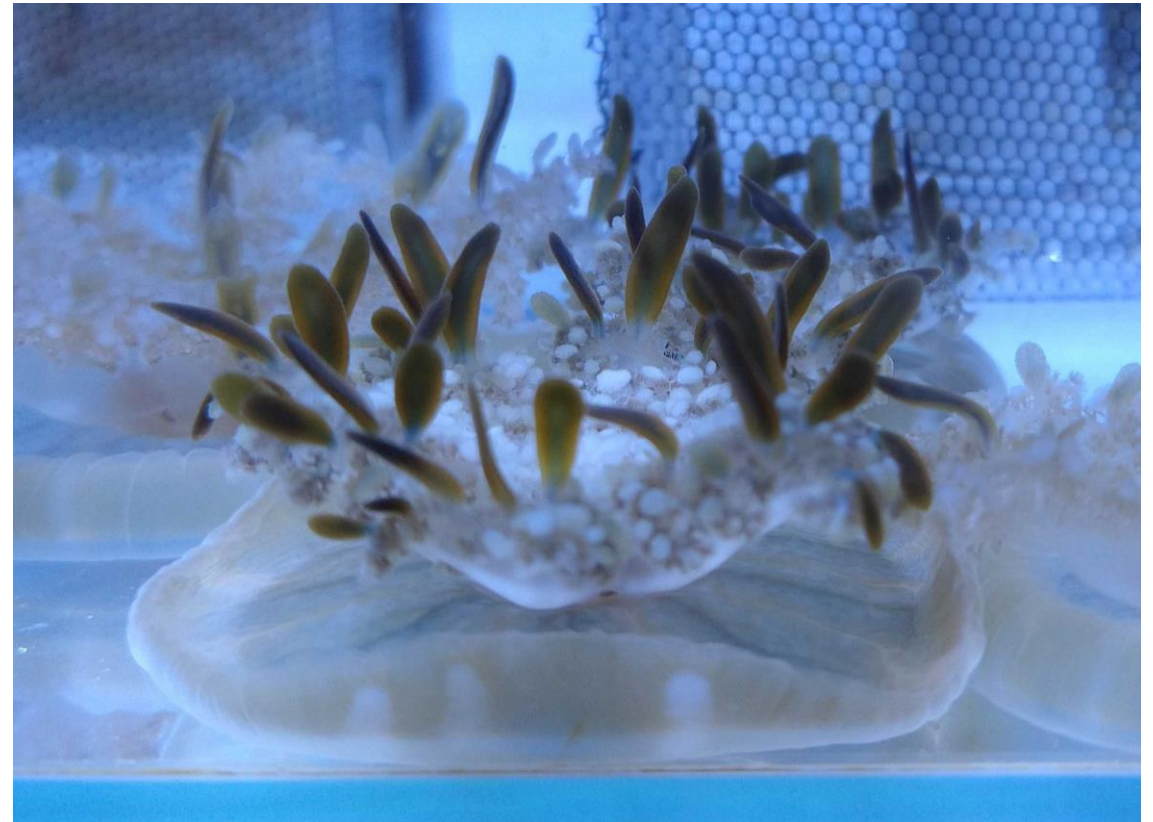
Tolerance of
Cassiopea
andromeda and its
symbionts
Symbiodinium
microadriaticum to
mild and long-
lasting **heat stress**



Cassiopea andromeda

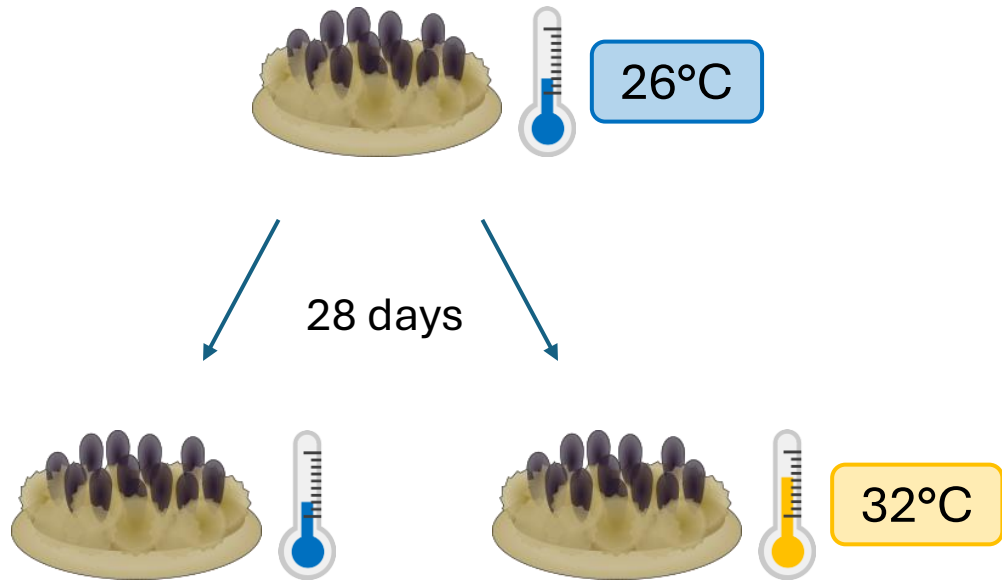


Cassiopea andromeda

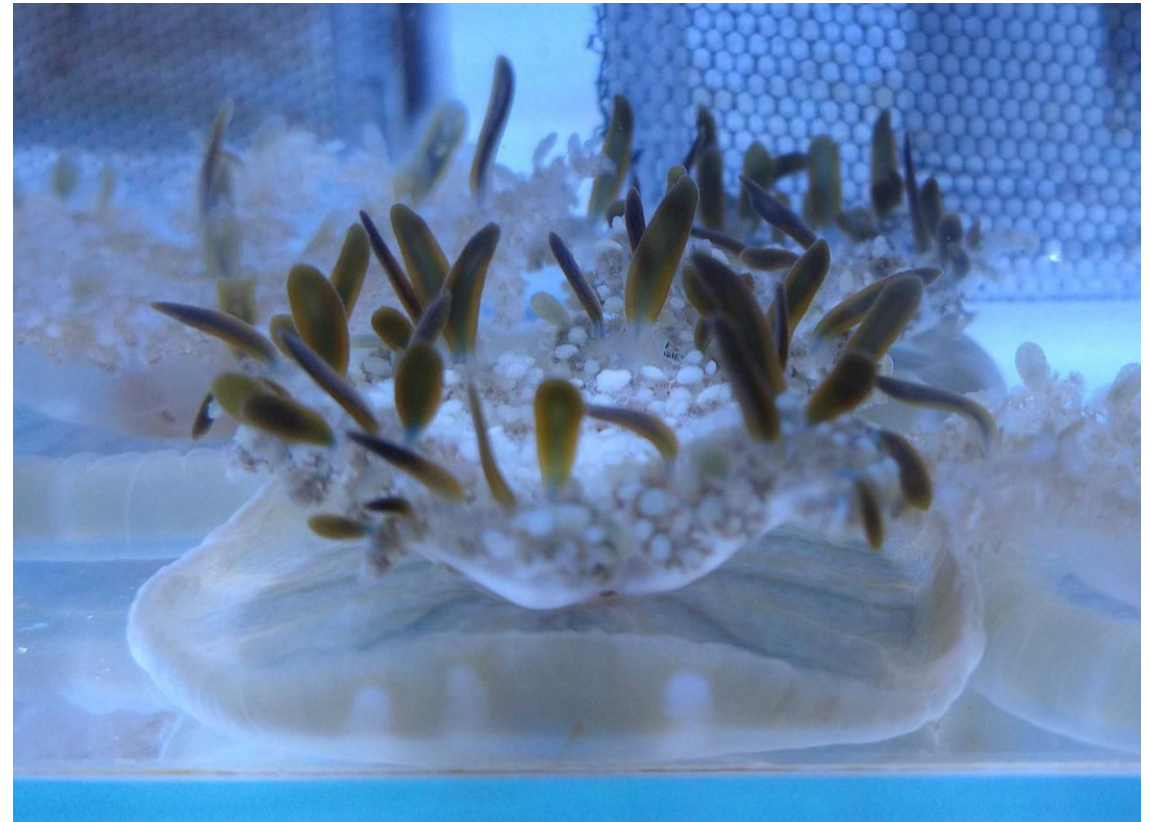


- Cnidarian forming symbiosis with Symbiodiniaceae
- Easily culturable
- Large biomass

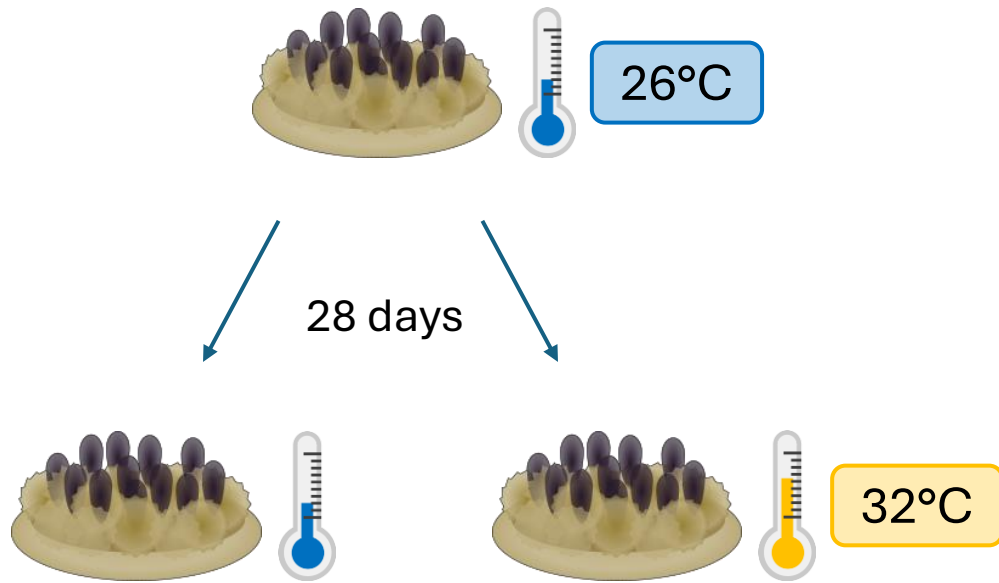
1. Context



Cassiopea andromeda

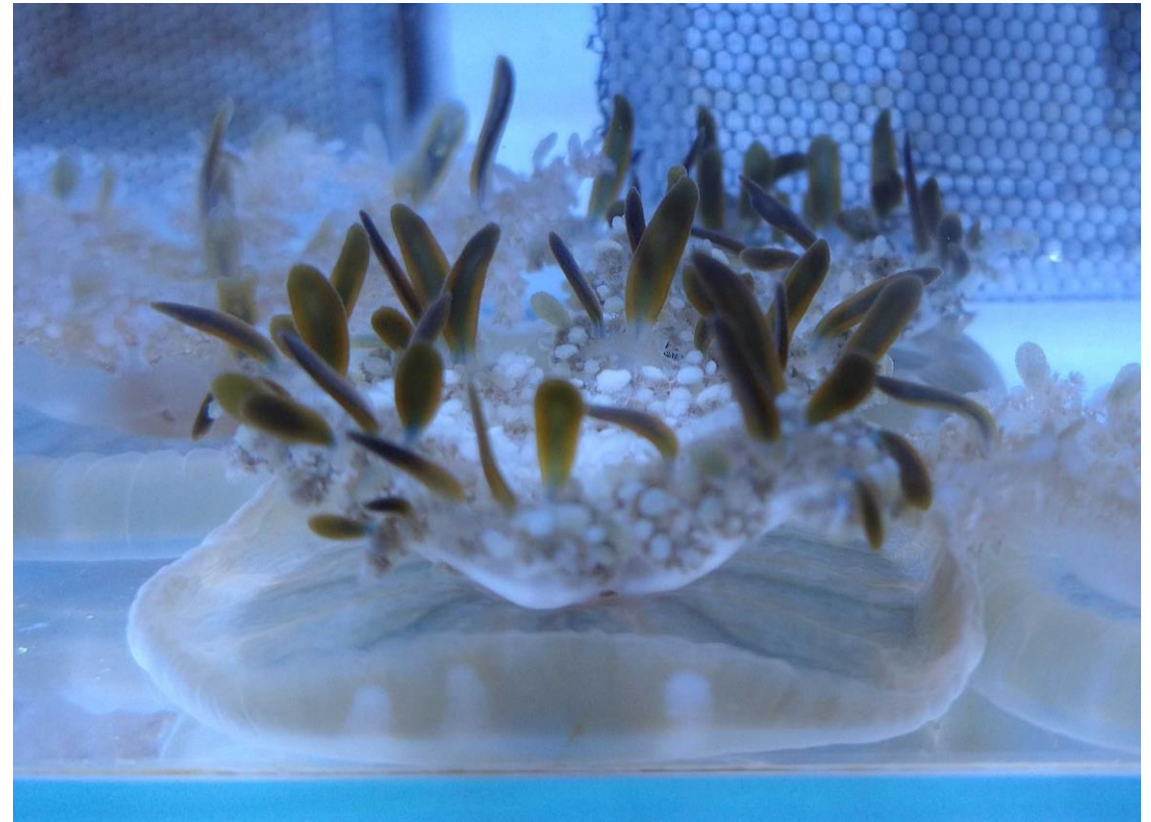


- Cnidarian forming symbiosis with Symbiodiniaceae
- Easily culturable
- Large biomass

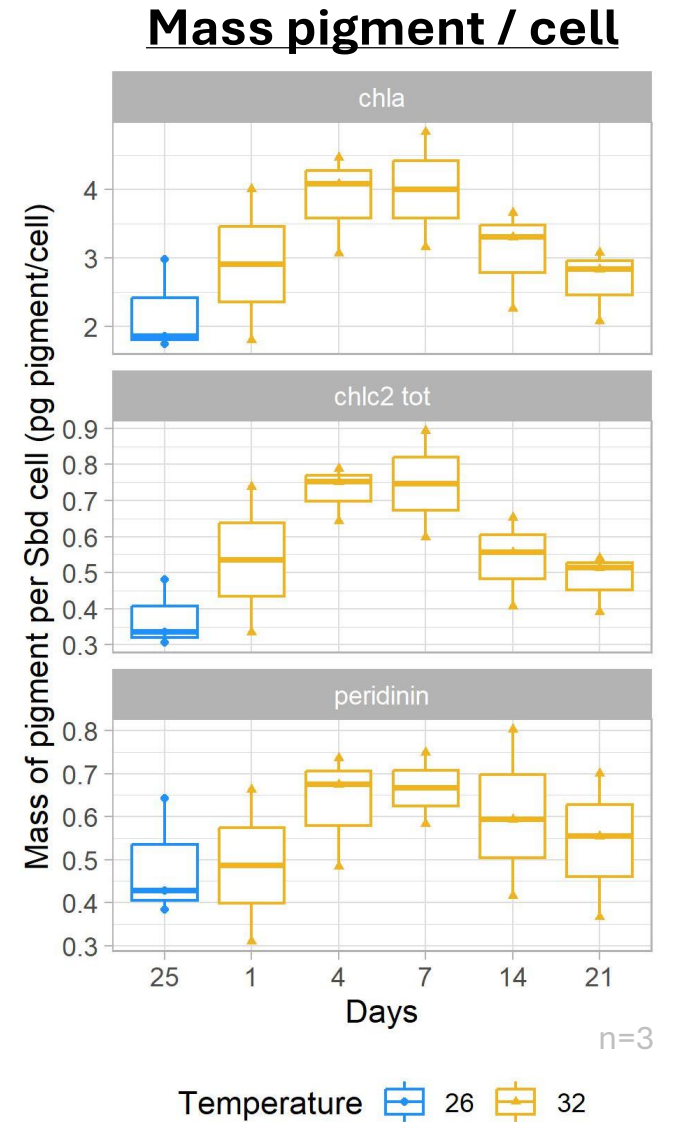
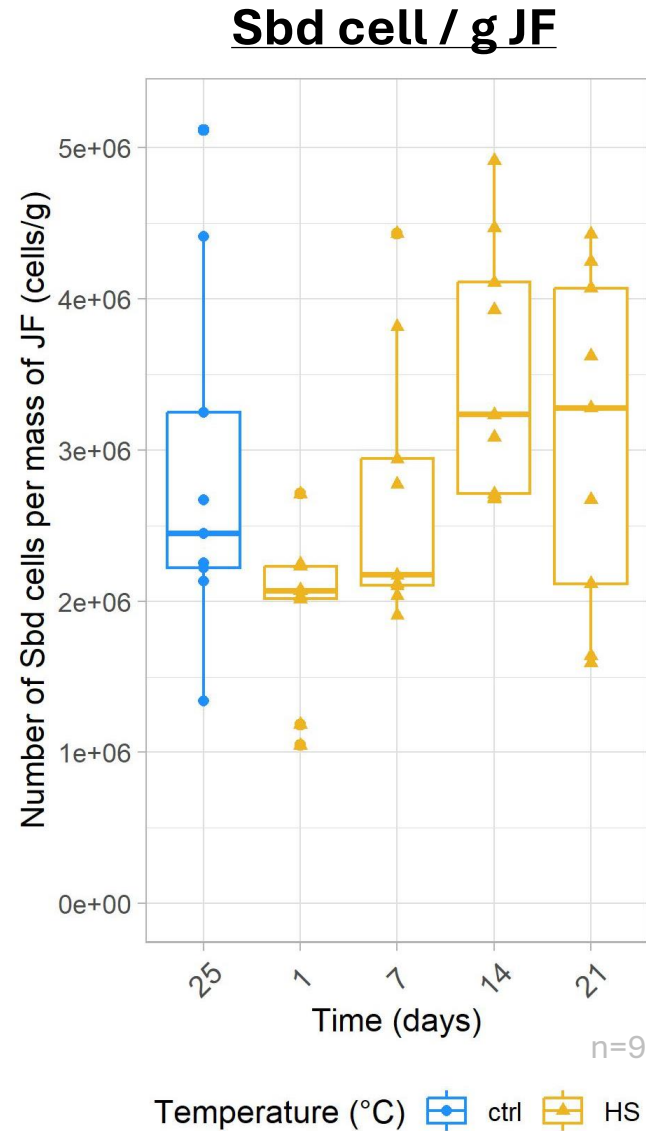
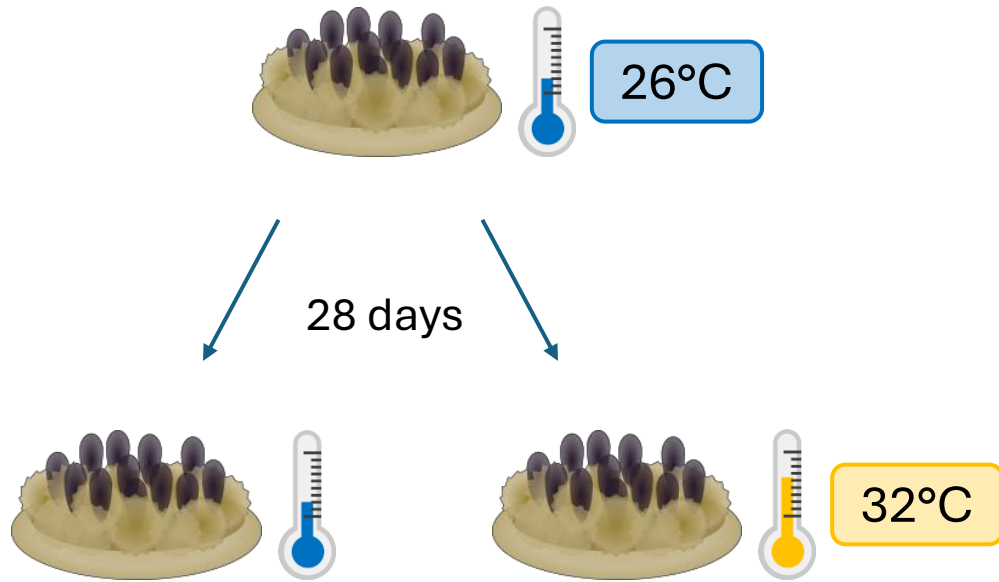


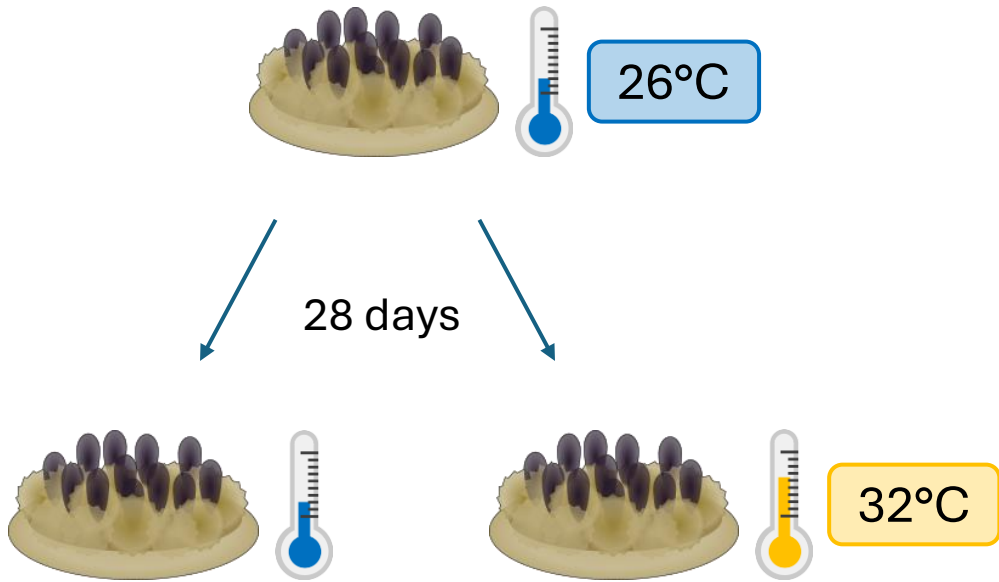
-
- Size
 - Pulsation rate
 - Pigments proportions
 - Fluorescence emission spectrum
 - Activity of PSI & PSII
 - Respiration

Cassiopea andromeda

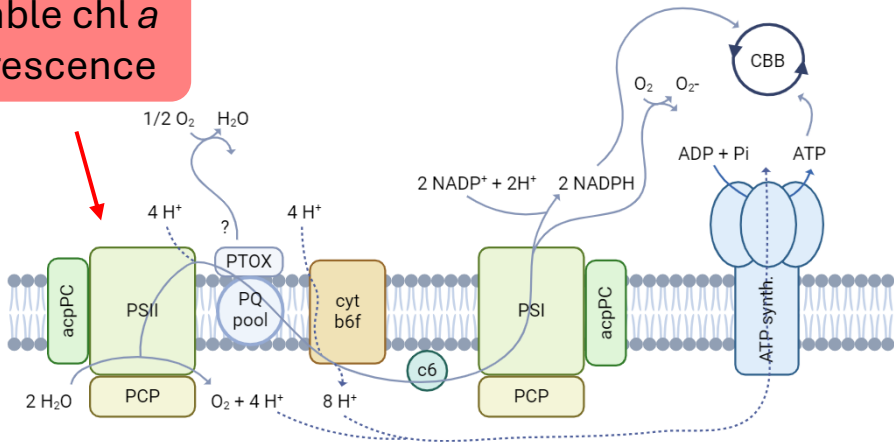


- Cnidarian forming symbiosis with Symbiodiniaceae
- Easily culturable
- Large biomass

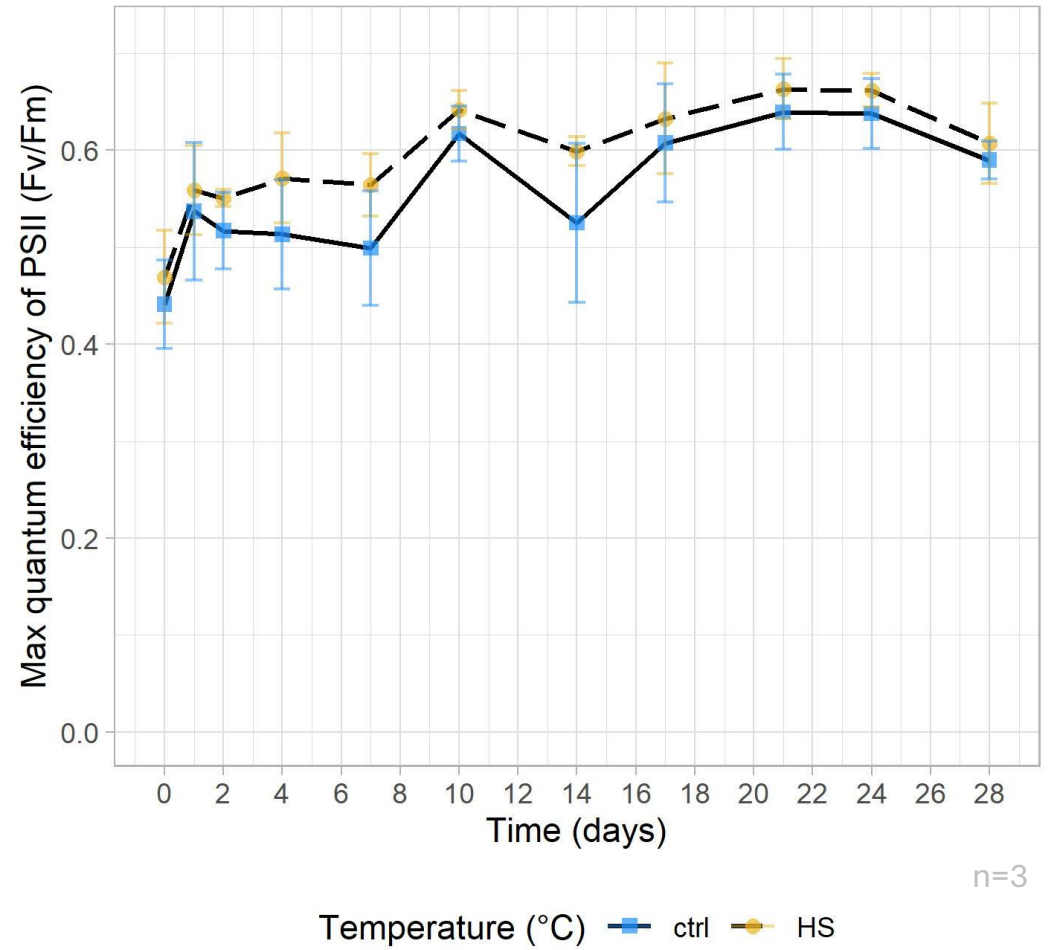


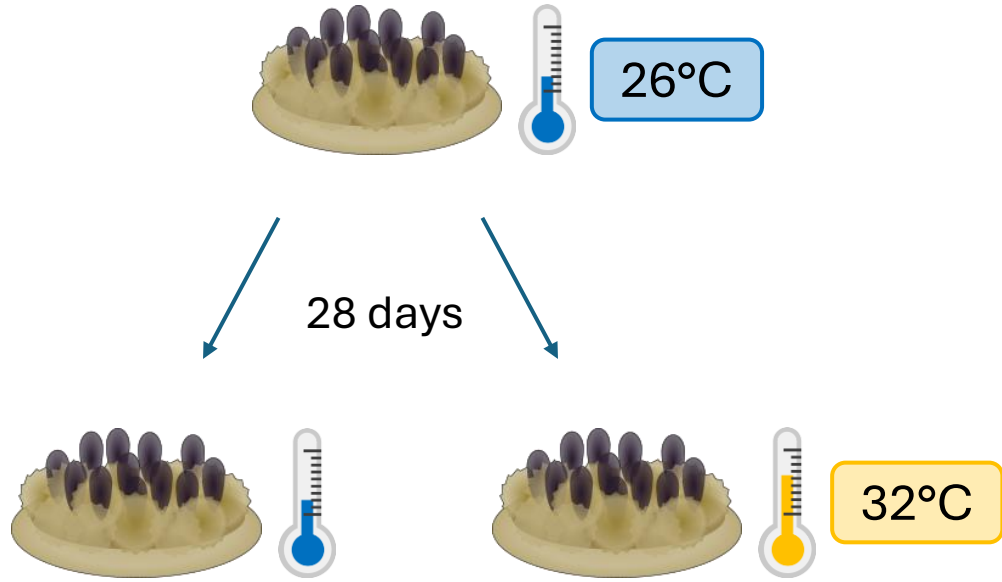


Variable chl a fluorescence

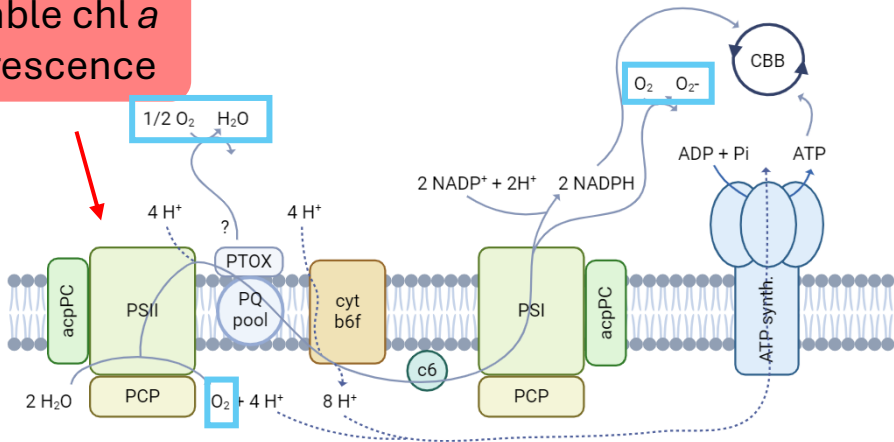


Maximum quantum yield of PSII (Fv/Fm)

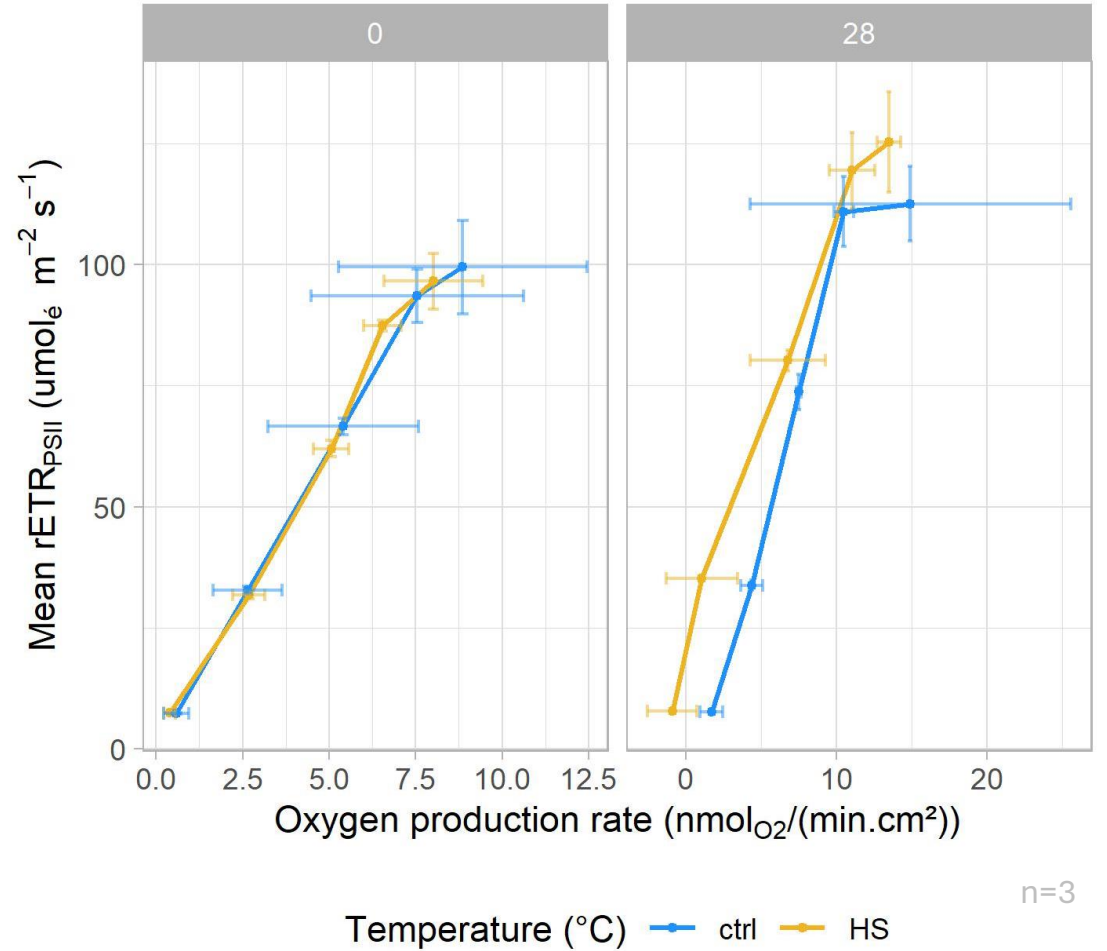


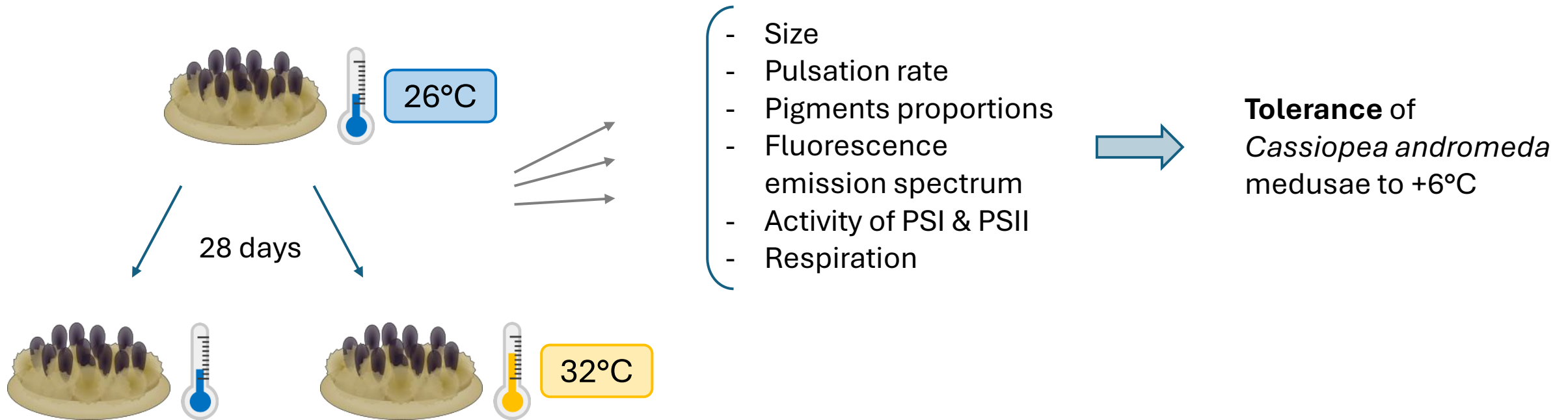


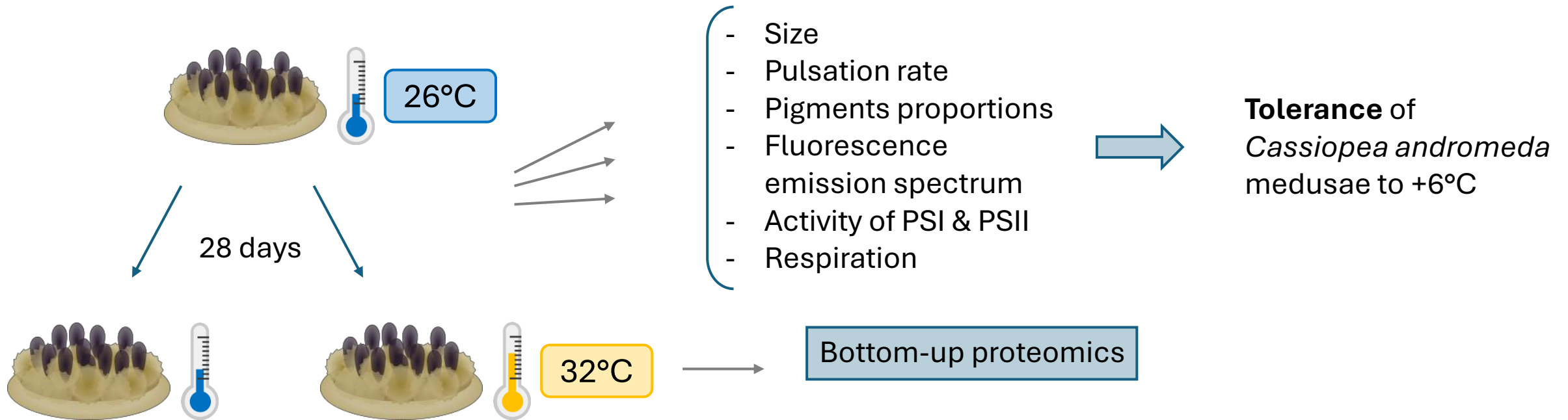
Variable chl a fluorescence

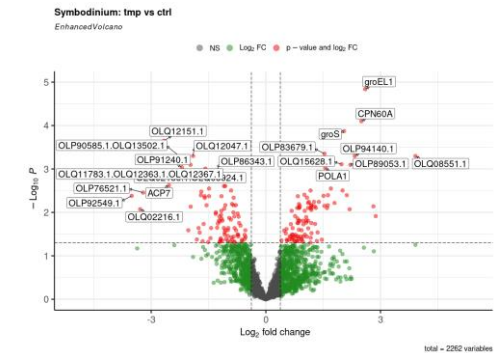
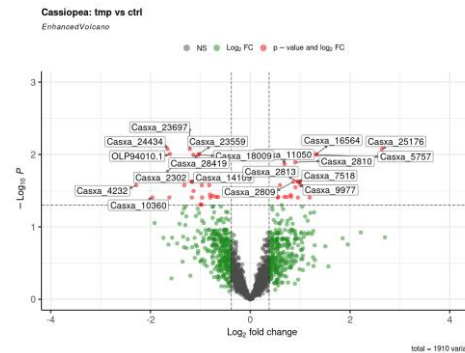
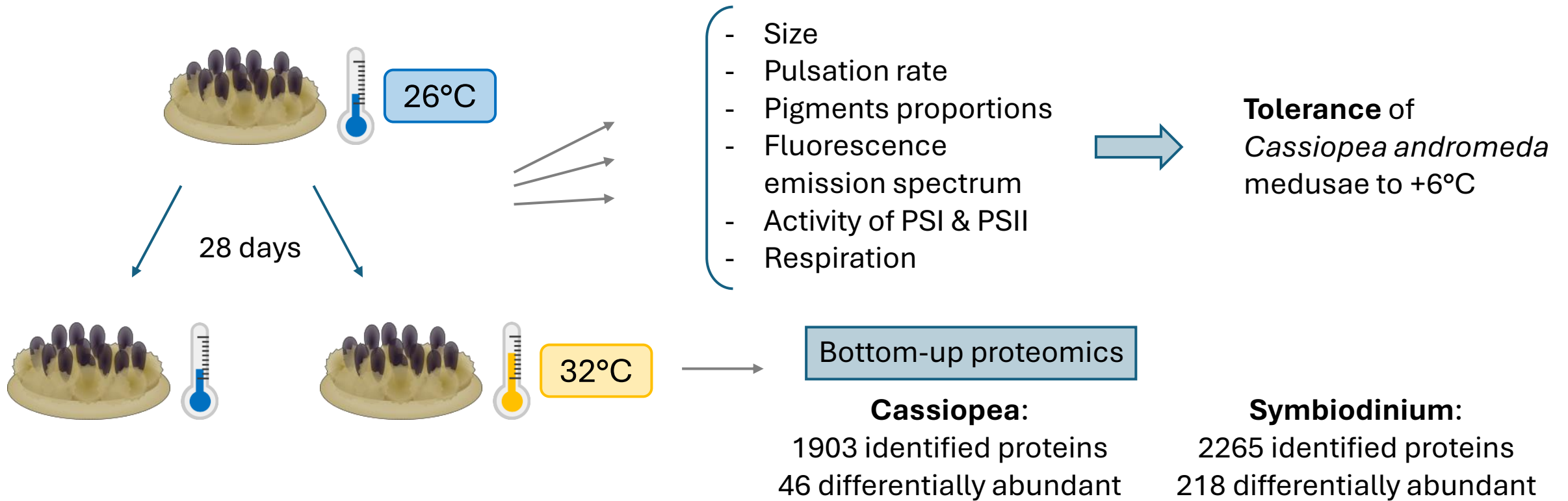


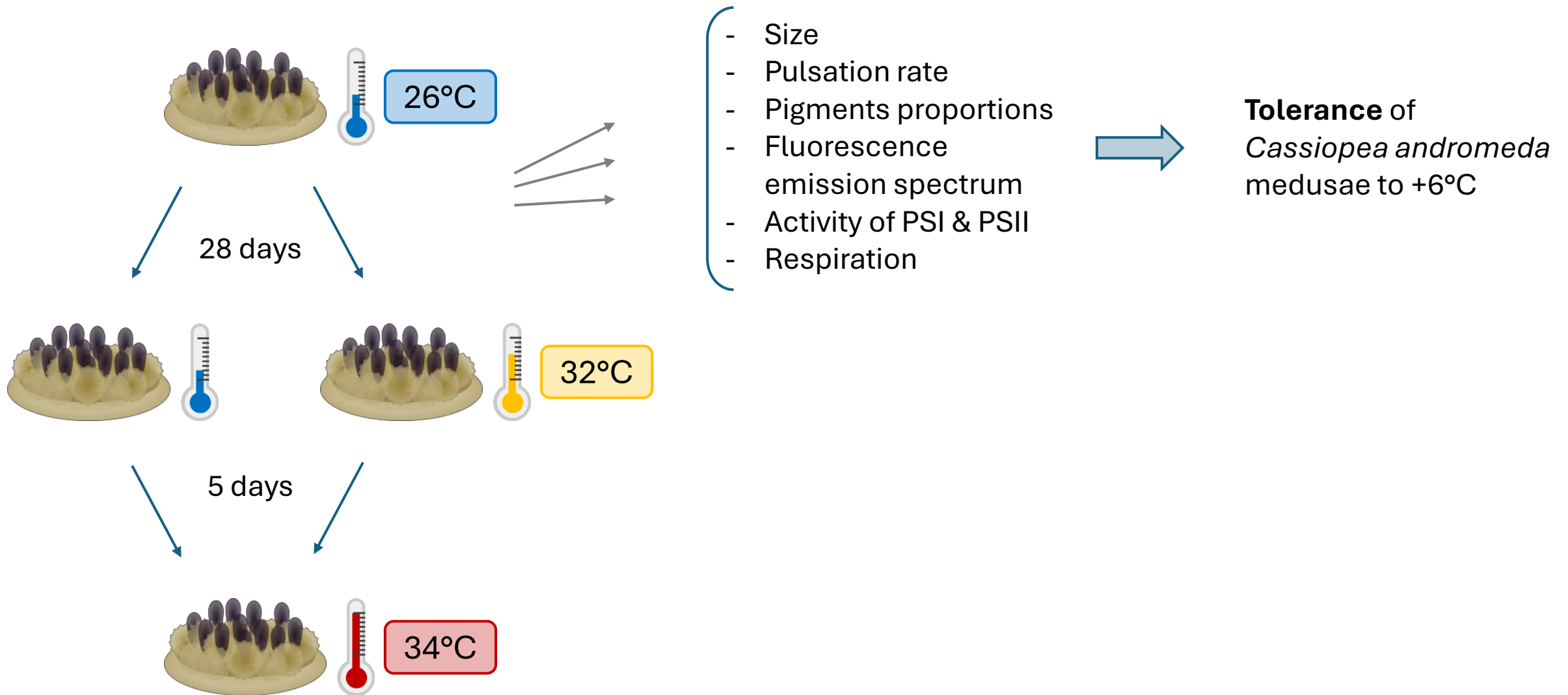
Activity of PSII ~ oxygen production

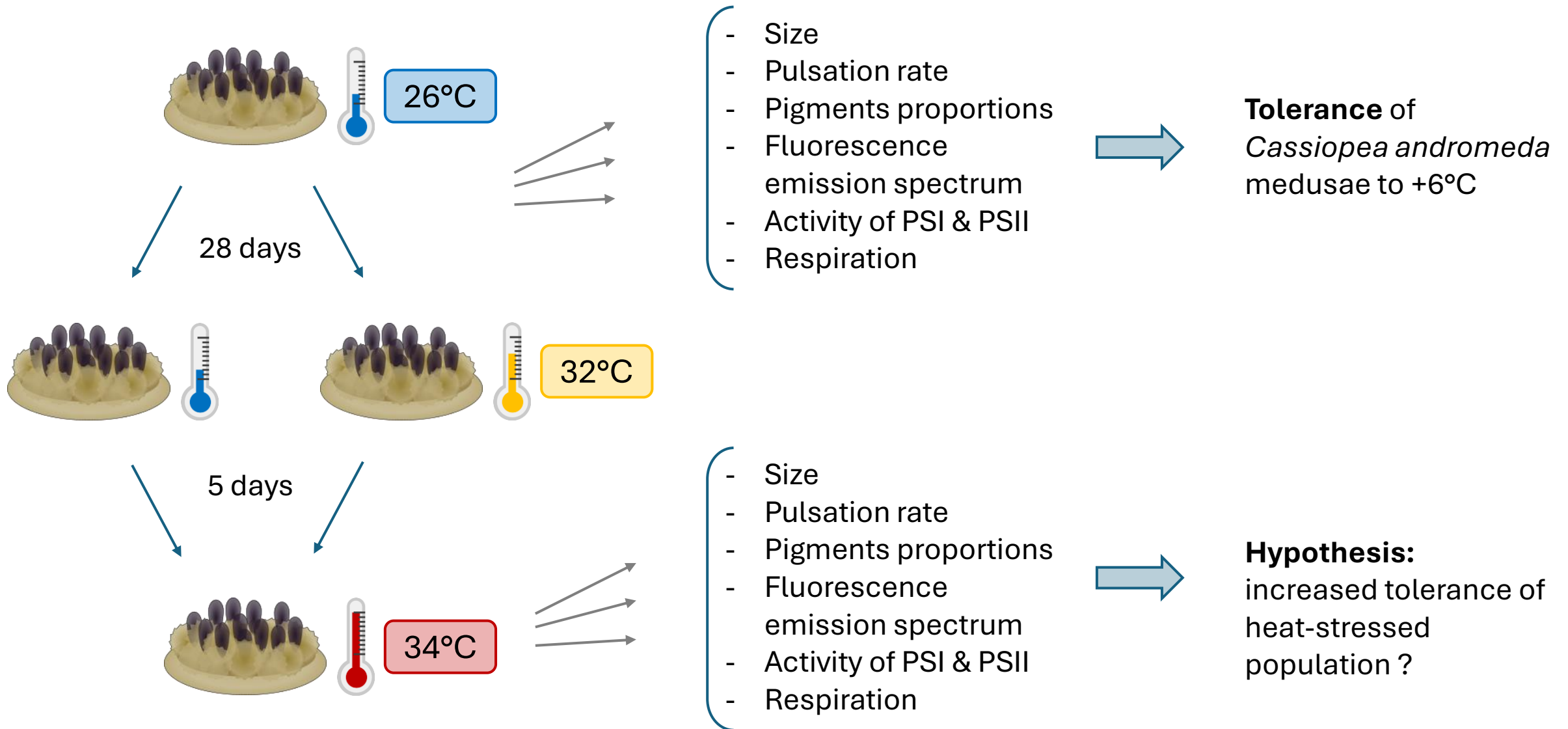


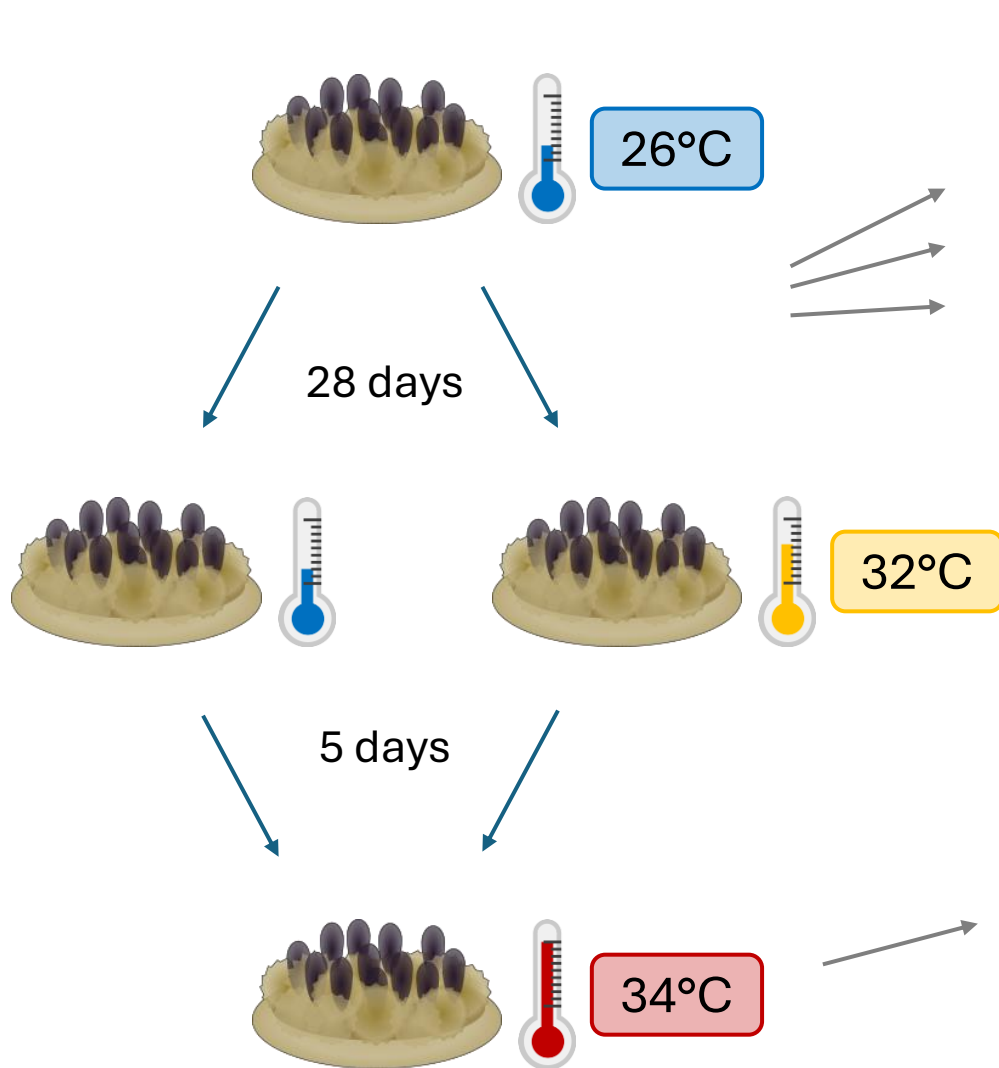








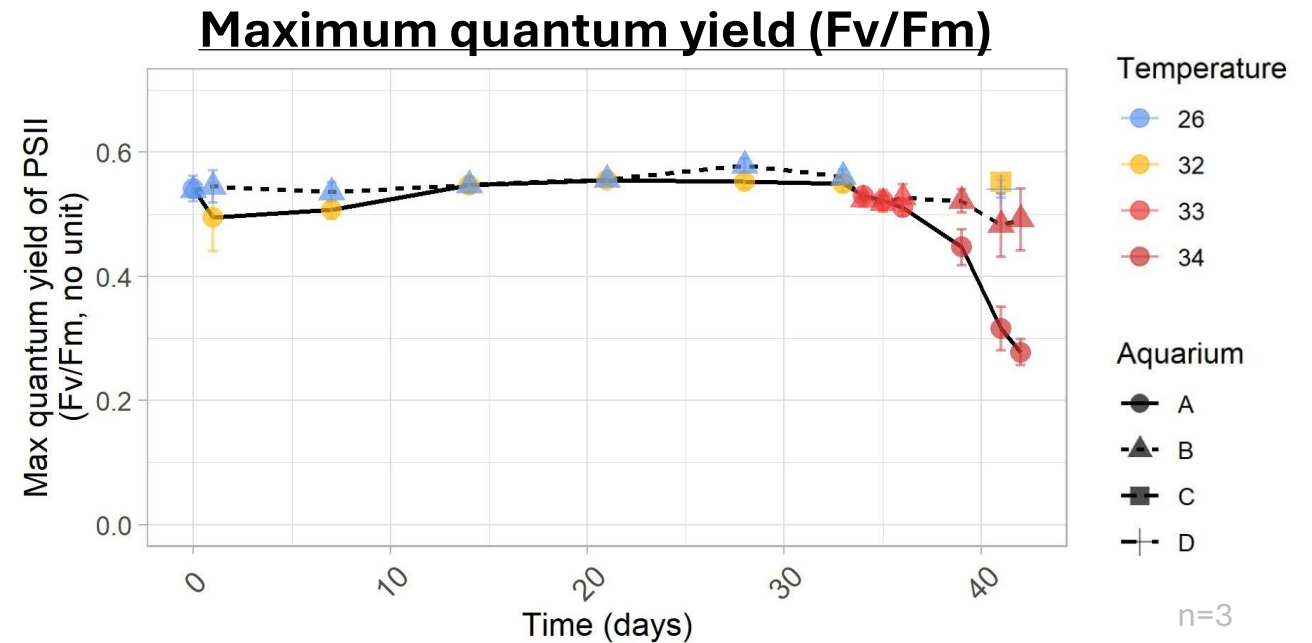




- Size
- Pulsation rate
- Pigments proportions
- Fluorescence emission spectrum
- Activity of PSI & PSII
- Respiration



Tolerance of
Cassiopea andromeda
medusae to +6°C



Thanks to my colleagues

Pierre Cardol

Sarah Joly

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Yanis Aoudache
Tom Feller
Hadrien Forêt
Alain Gervasi
Antoine Kairis
Pablo Perez

Félix Vega de Luna
Stéphane Roberty



Thanks for your attention!

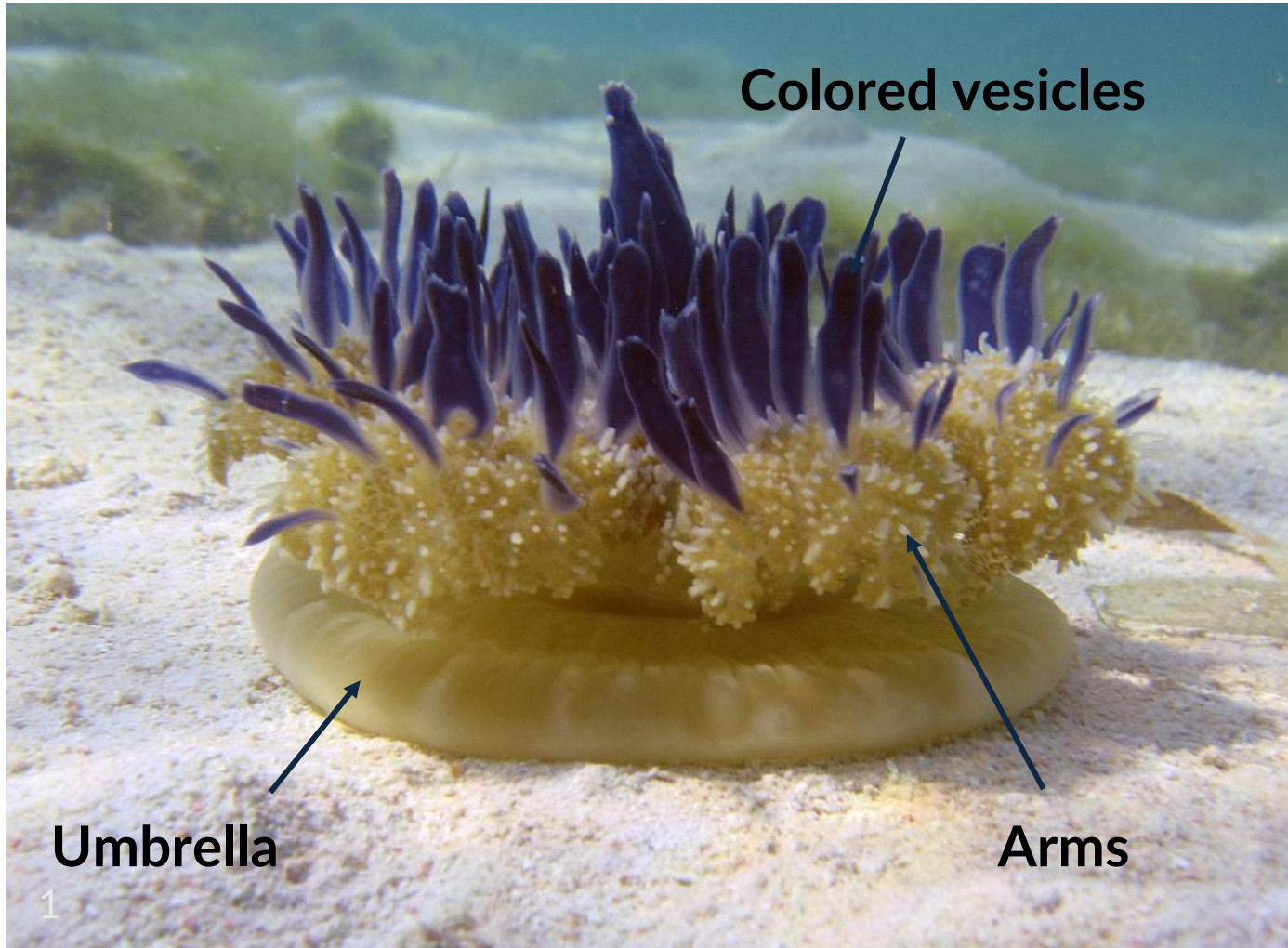
Edmee.Royen@doct.uliege.be

Images references

1. Baums, Iliana & Devlin-Durante, Meghann & LaJeunesse, Todd. (2015). Baums et al. 2014 MOLECECOL.

4. Getting to know *Exaiptasia* and *Cassiopea*

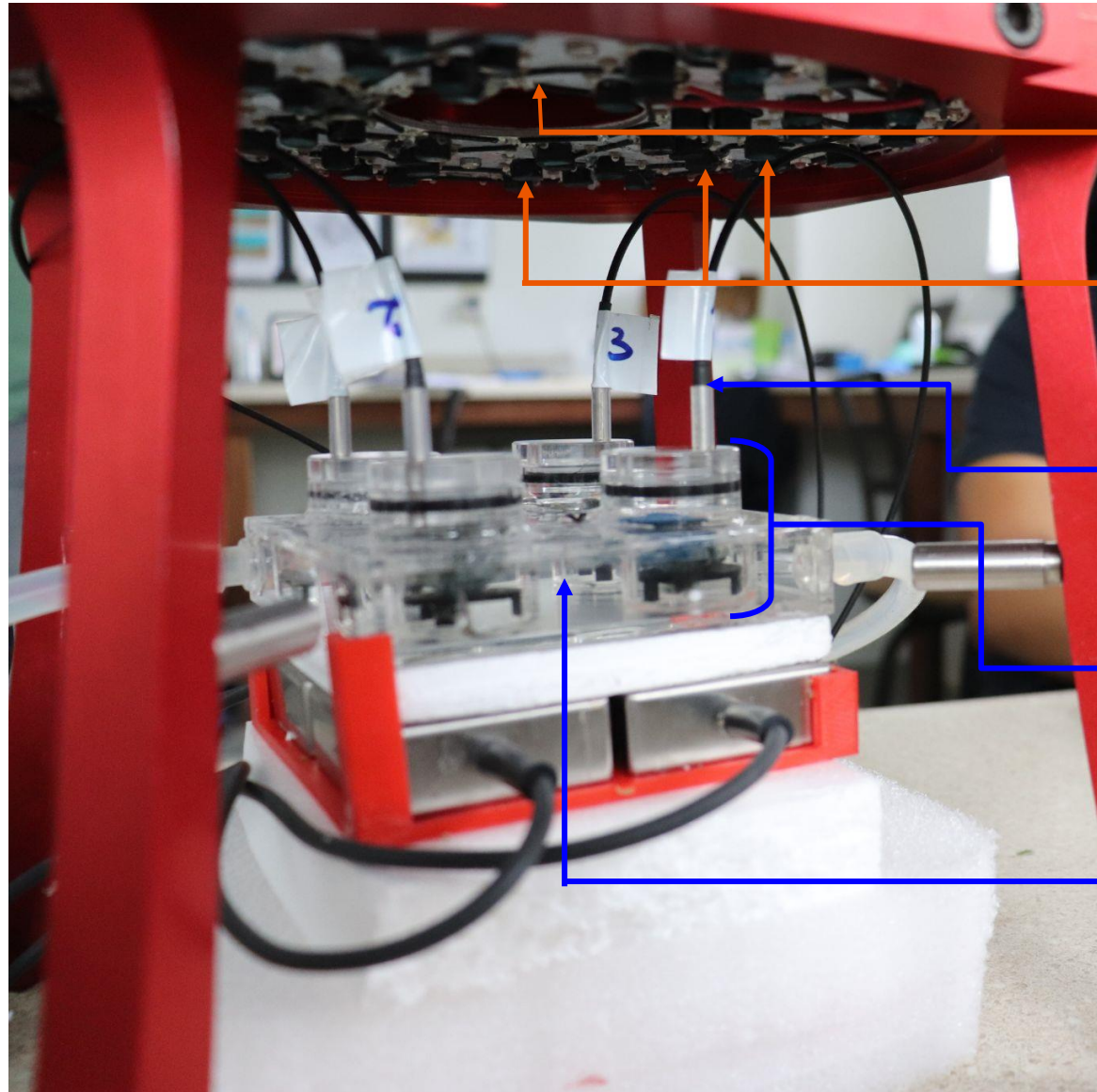
Cassiopea sp. (Schyphozoa, Rhizostomeae)



Model organism for:

- Symbiosis with Symbiodiniaceae (+ resistance to environmental fluctuations)
- Cnidome
- Quiescence-like stage
- Biomonitor and bioindicator
- Fluid dynamics

2. Heat stress in Cassiopea - Methods



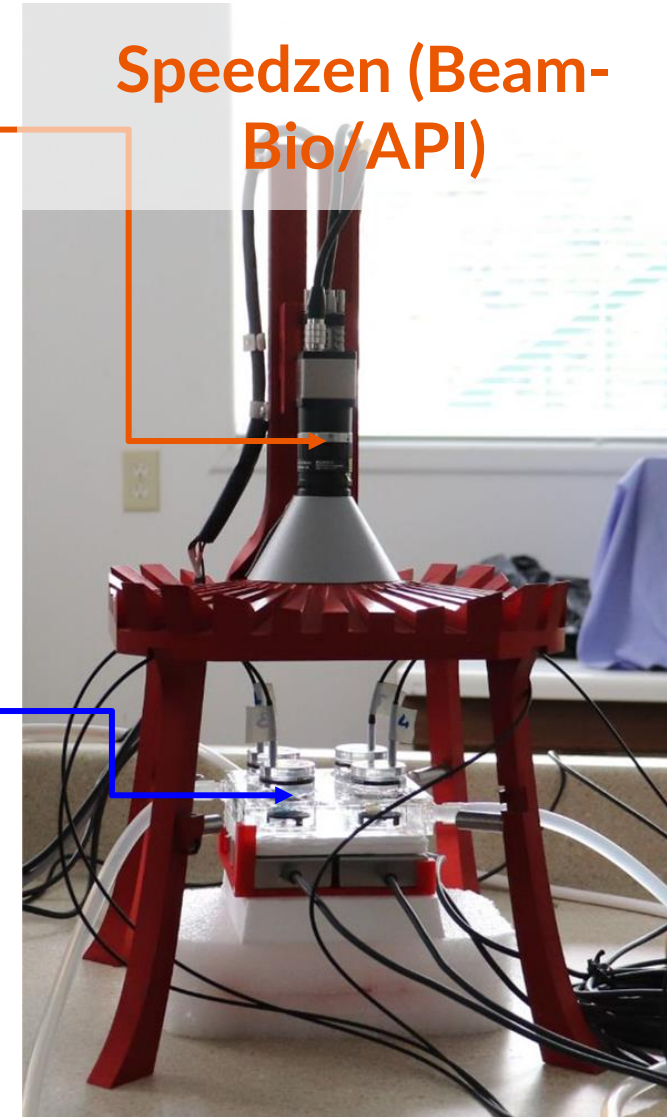
CCD camera

LEDs

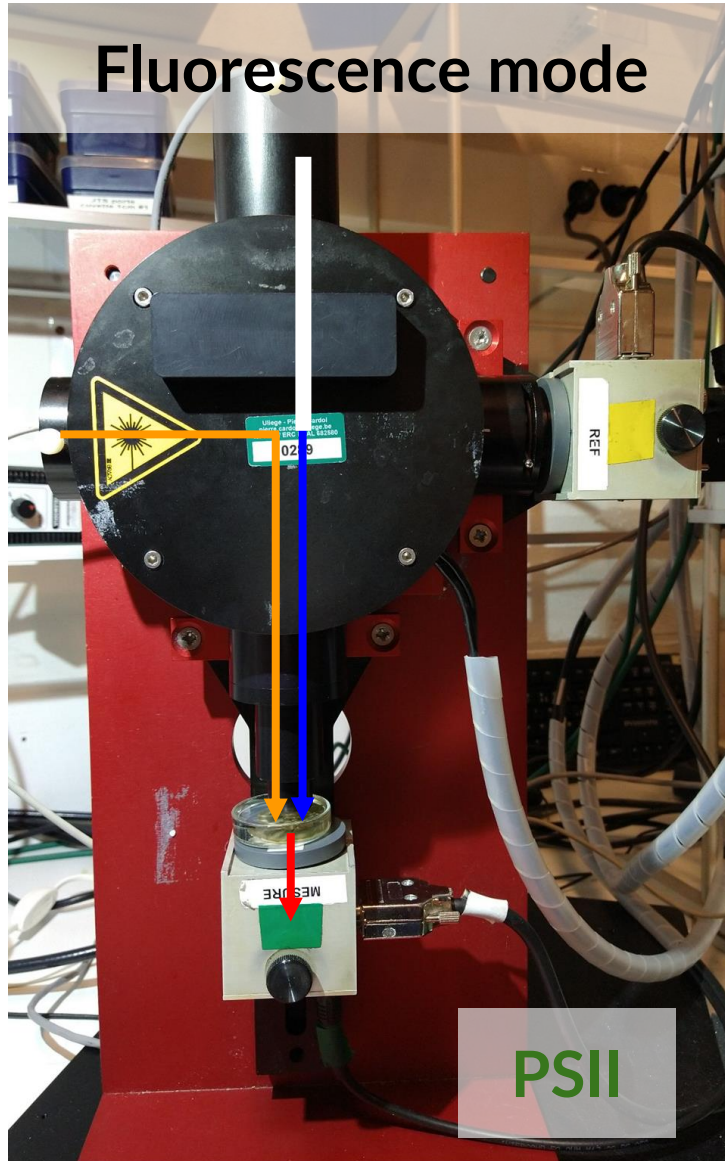
Optical O₂ sensor
(Firesting O₂)

Oximetry
chamber (with
water mixing)
Water bath
(control of T°)

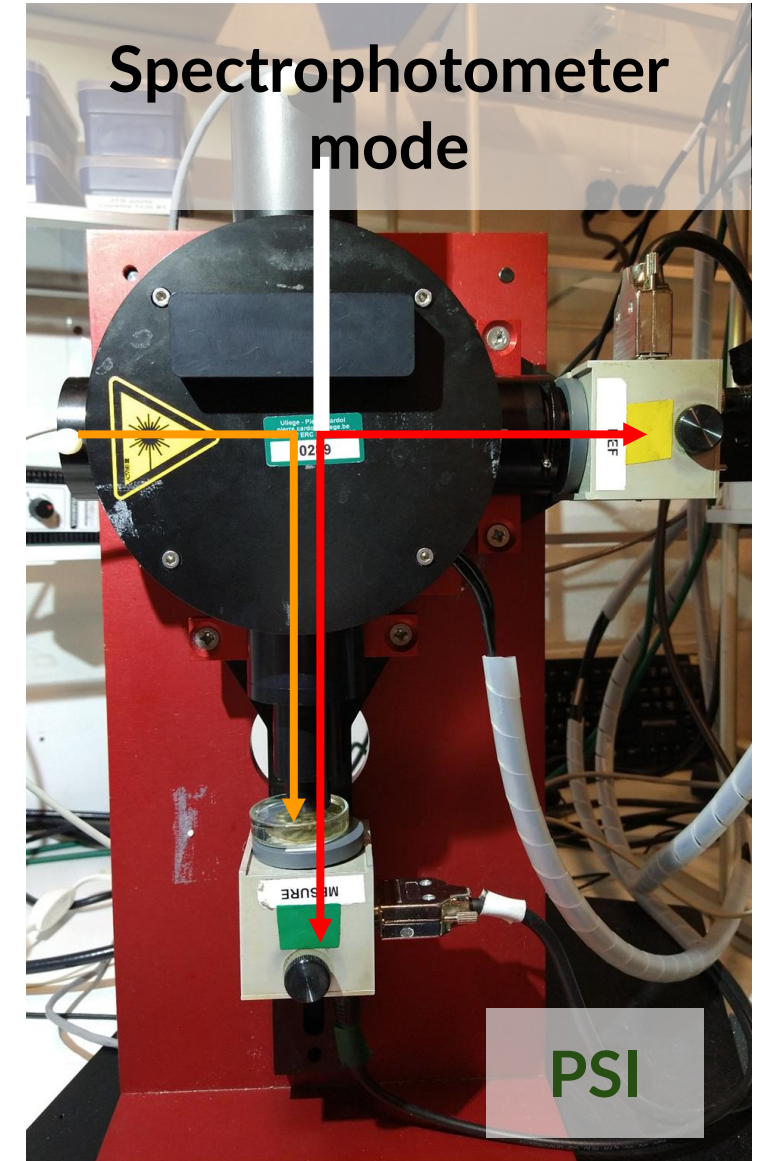
Speedzen (Beam-
Bio/API)



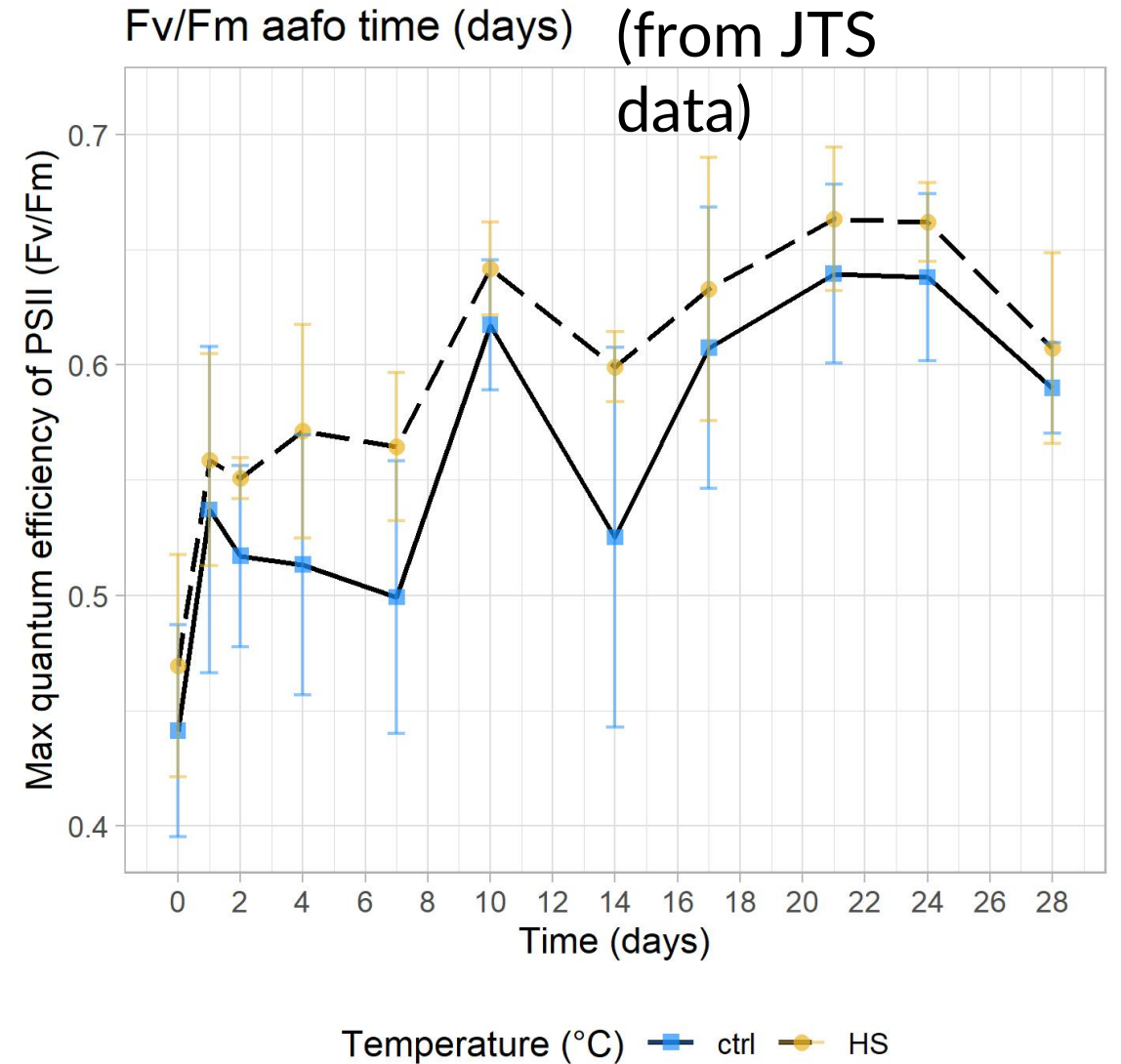
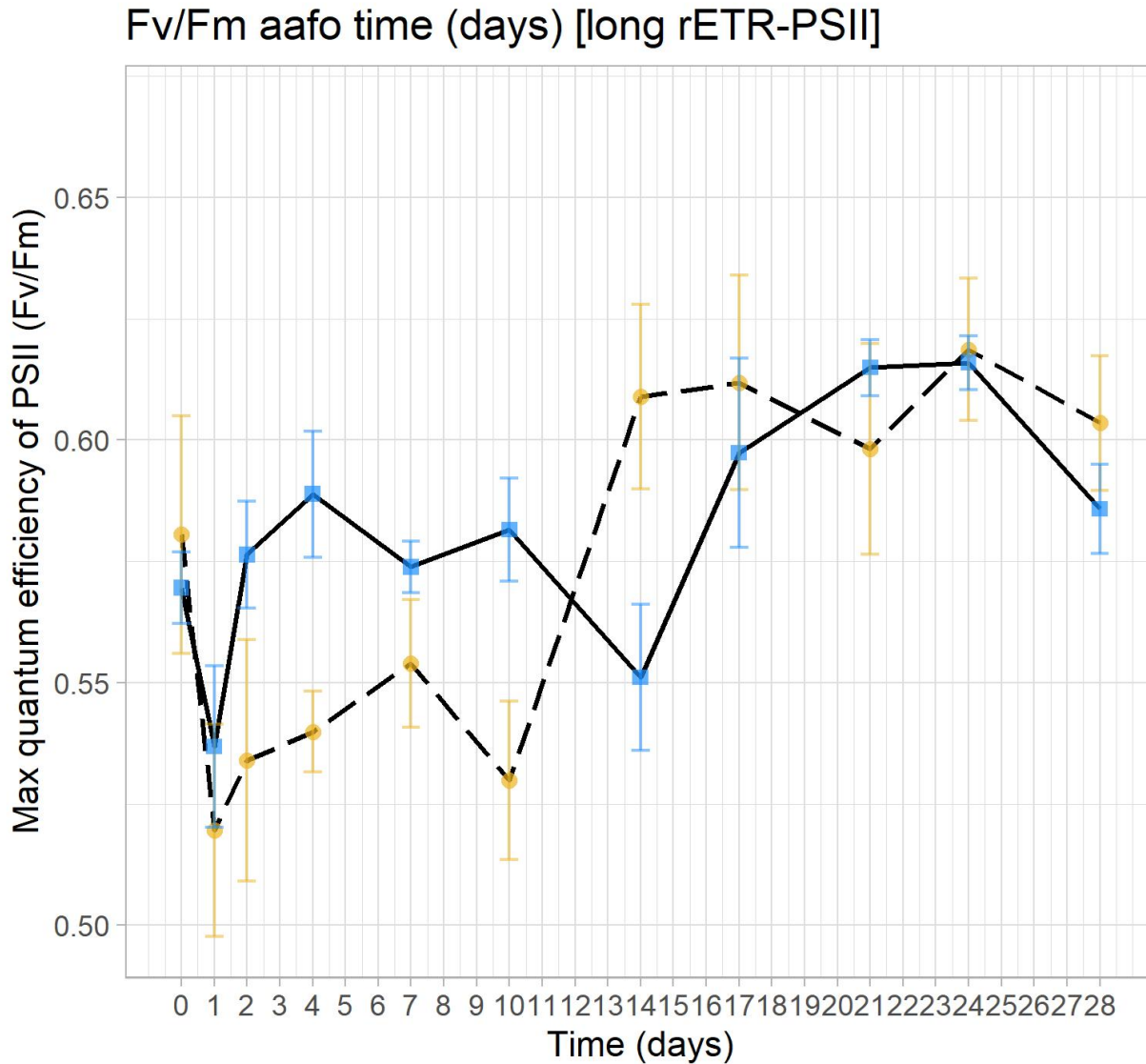
2. Heat stress in Cassiopea - Methods



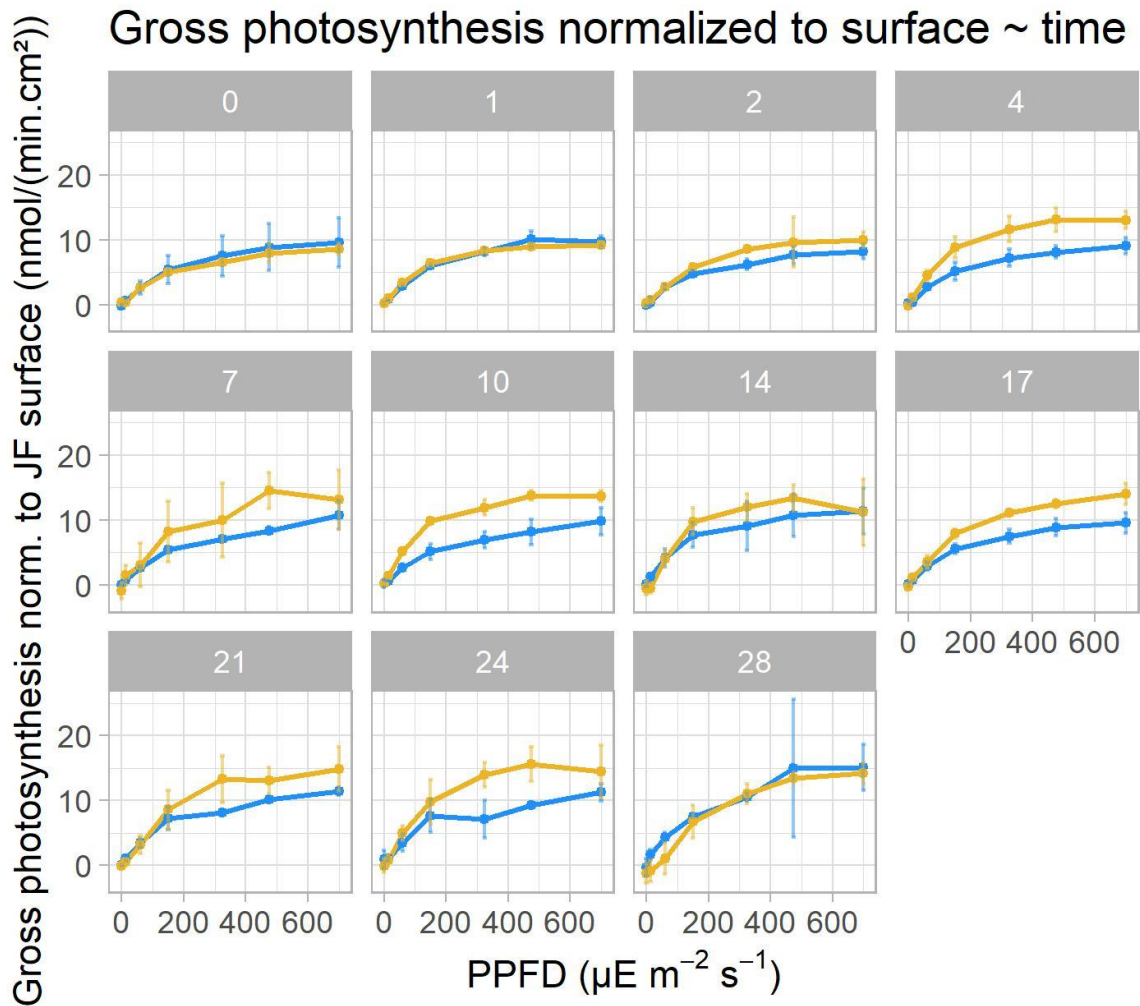
JTS-10 (BioLogic)



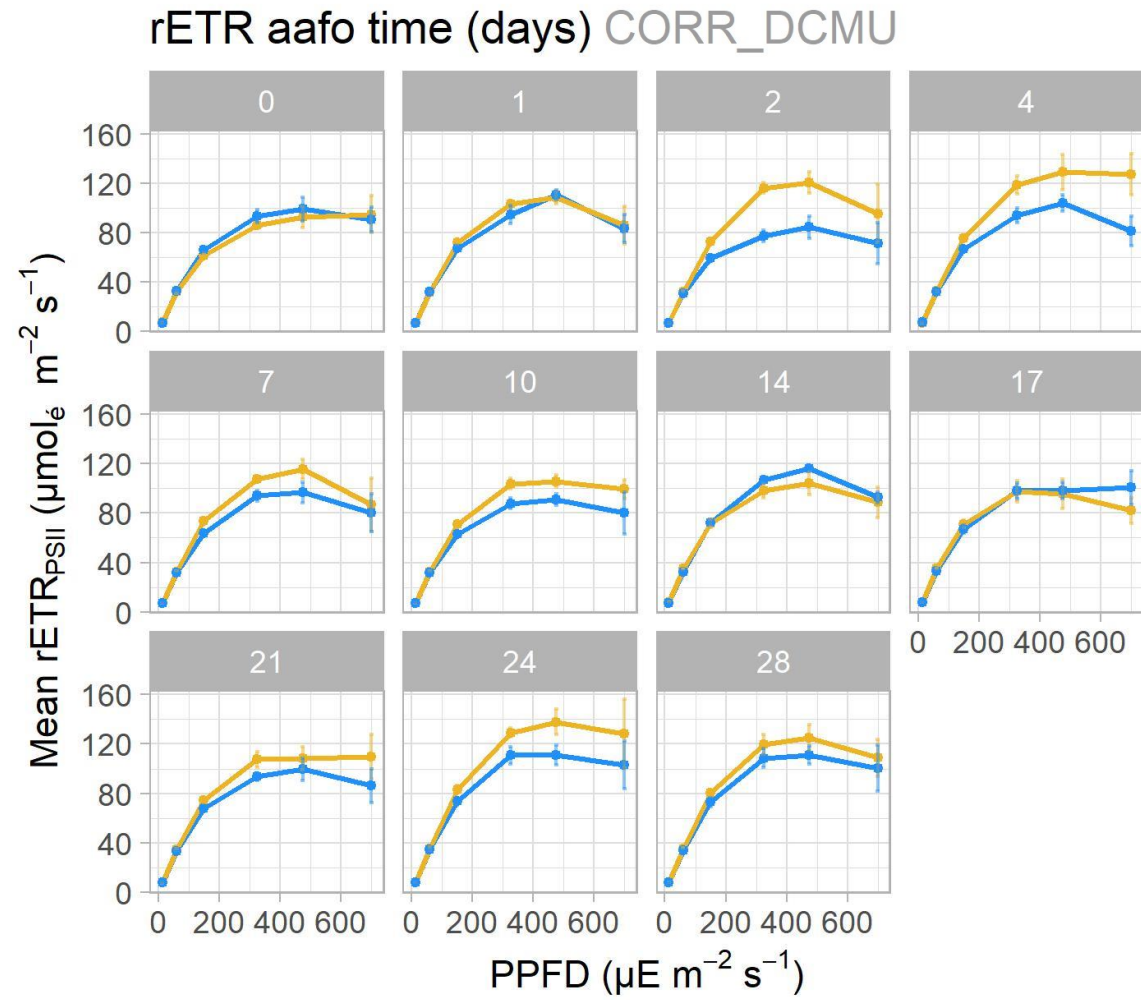
2. Heat stress in Cassiopea - Fv/Fm



2. Heat stress in Cassiopea - PSII activity



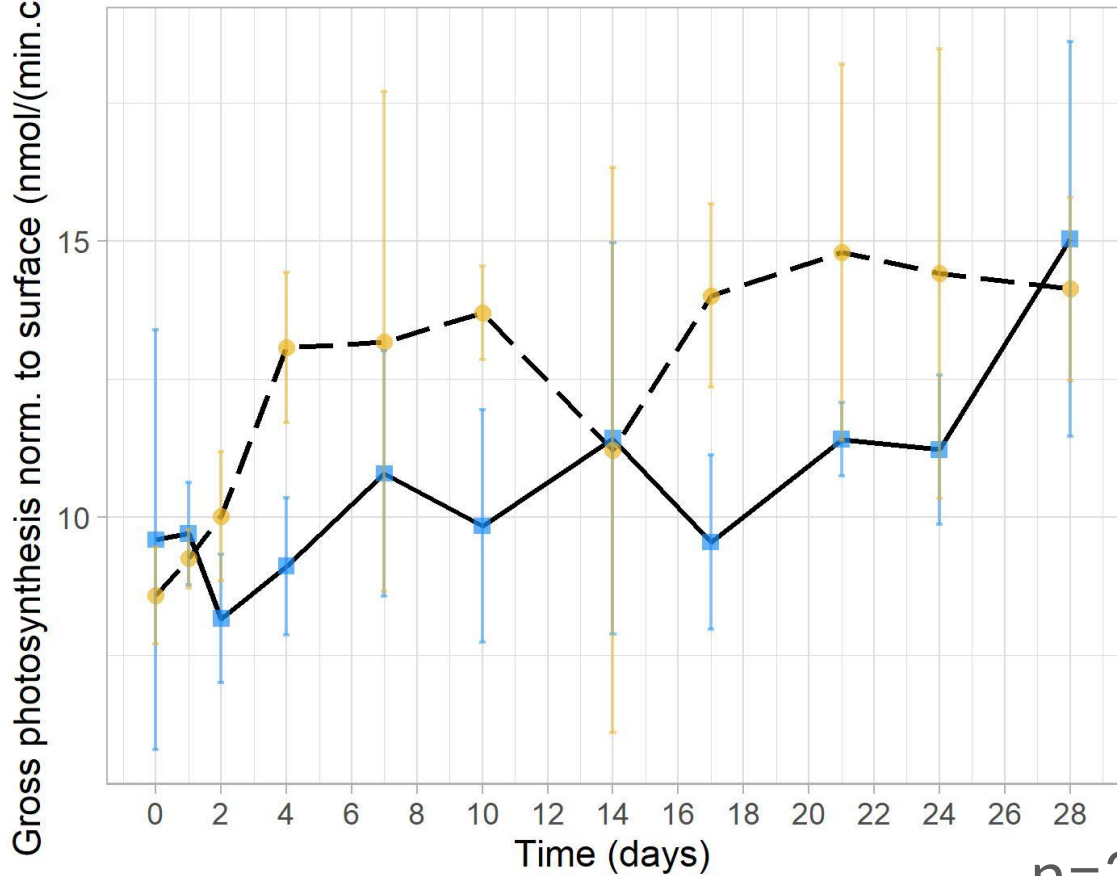
n=3-4



n=4

2. Heat stress in Cassiopea - PSII activity

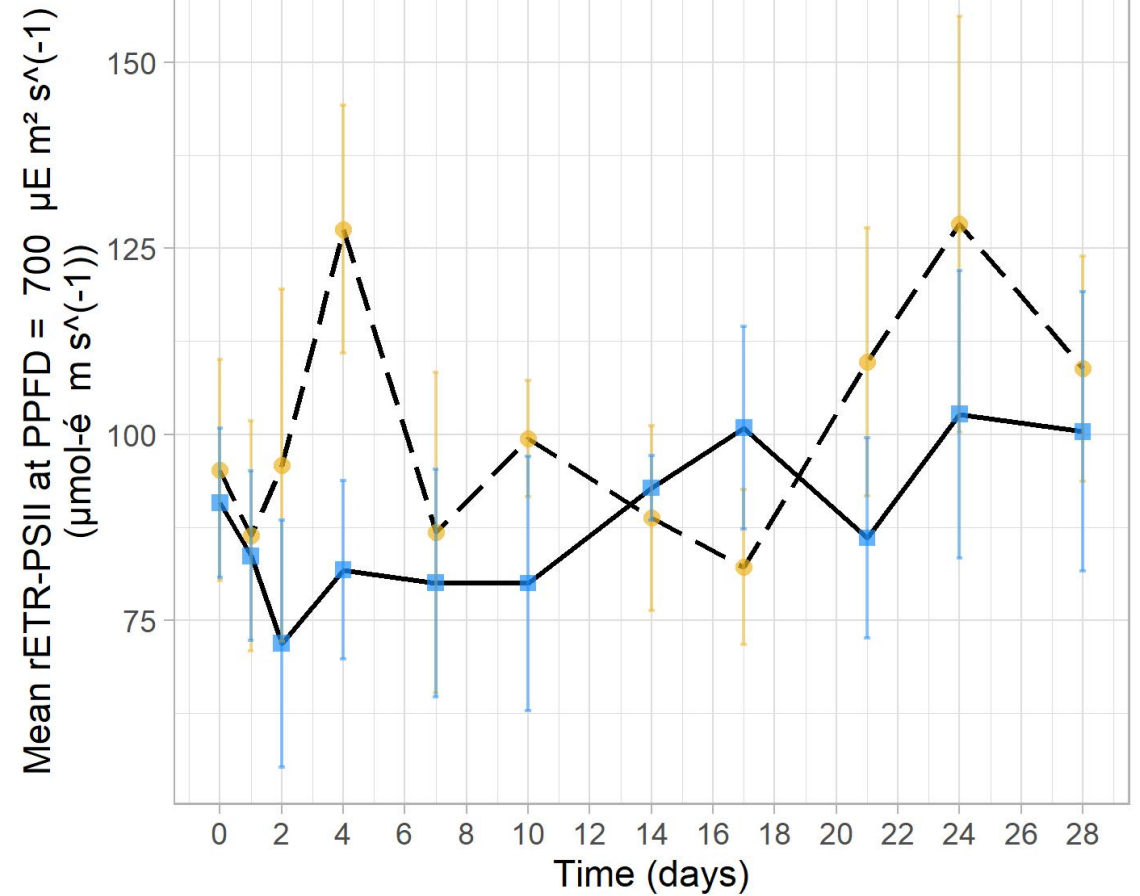
Gross photosynthesis normalized to surface ~ $t_{ir} = 700$
at PPFD = 700



Temperature (°C) — ctrl — HS

n=3-4
signif ↗
no signif ≠

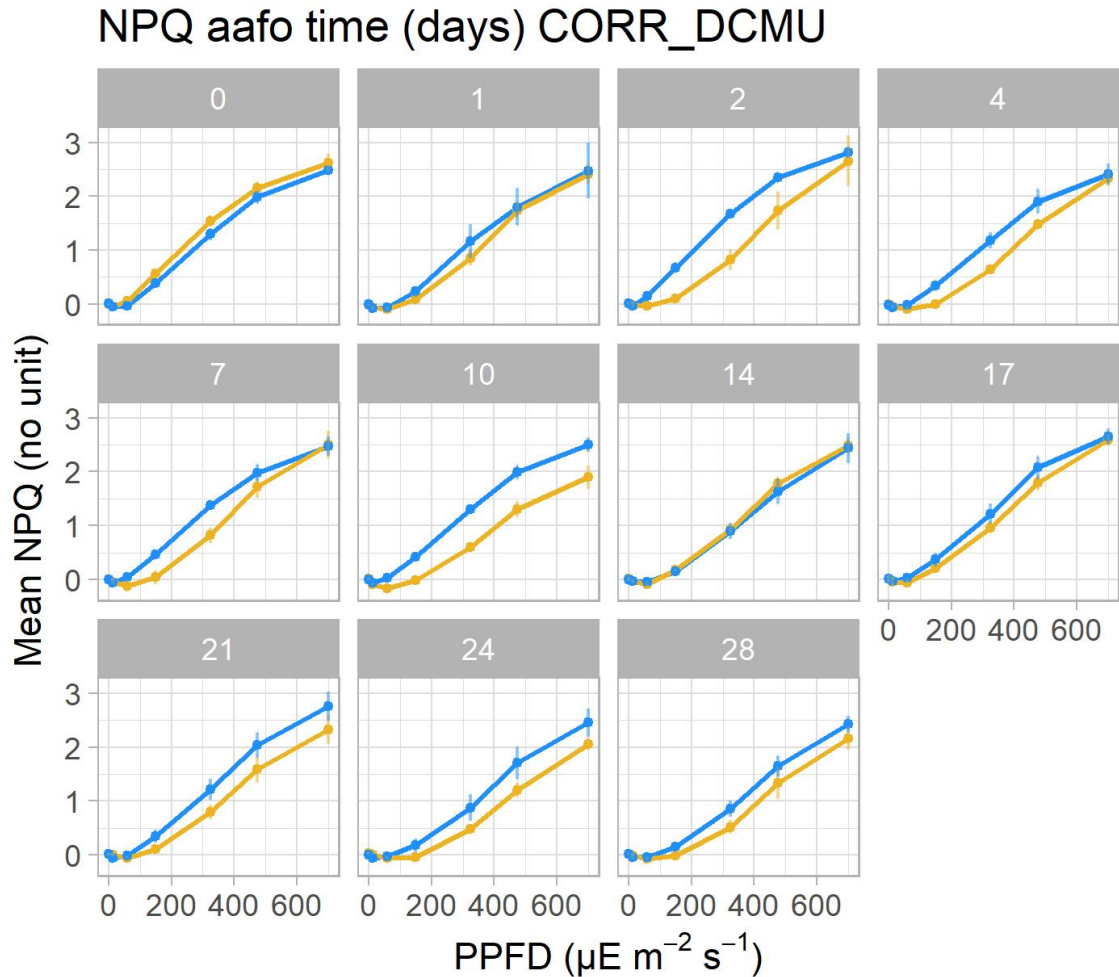
rETR aaf0 time (days) CORR_DCMU



Temperature (°C) — ctrl — HS

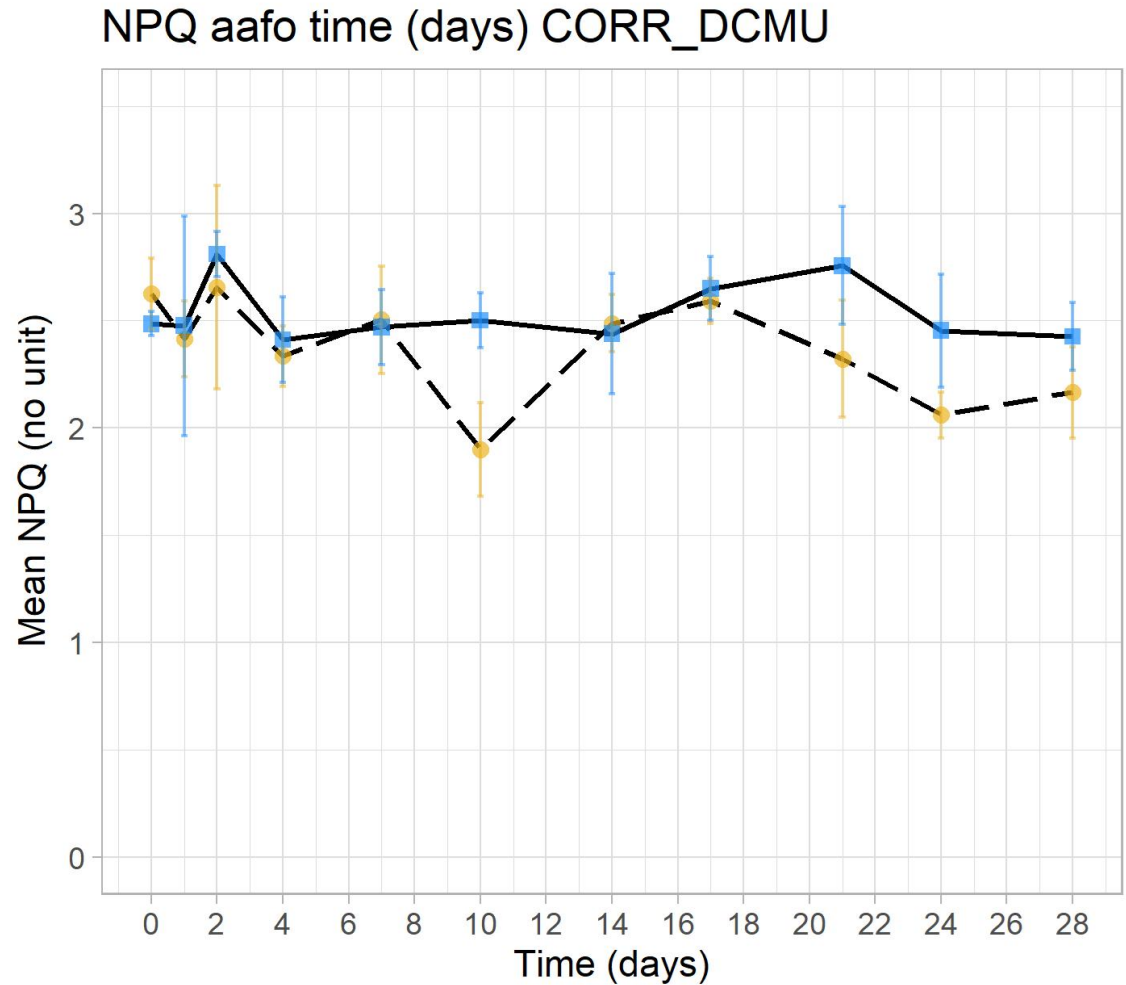
n=4
no
signif ≠

2. Heat stress in Cassiopea - Non-Photochemical Quenching



Temperature ($^{\circ}\text{C}$) — ctrl — HS

n=3-4

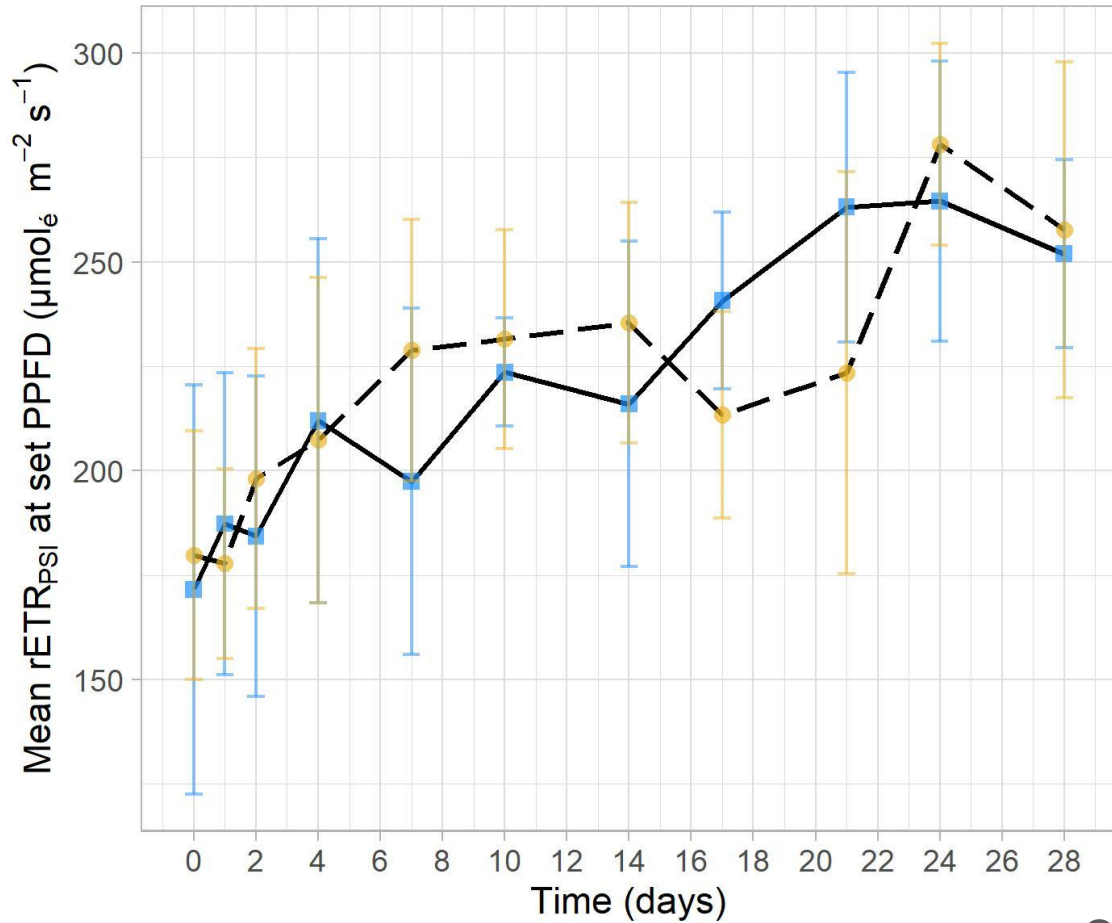


Temperature ($^{\circ}\text{C}$) — ctrl — HS

n=3-4
no signif
≠

2. Heat stress in Cassiopea - rETR-PSII and PSI

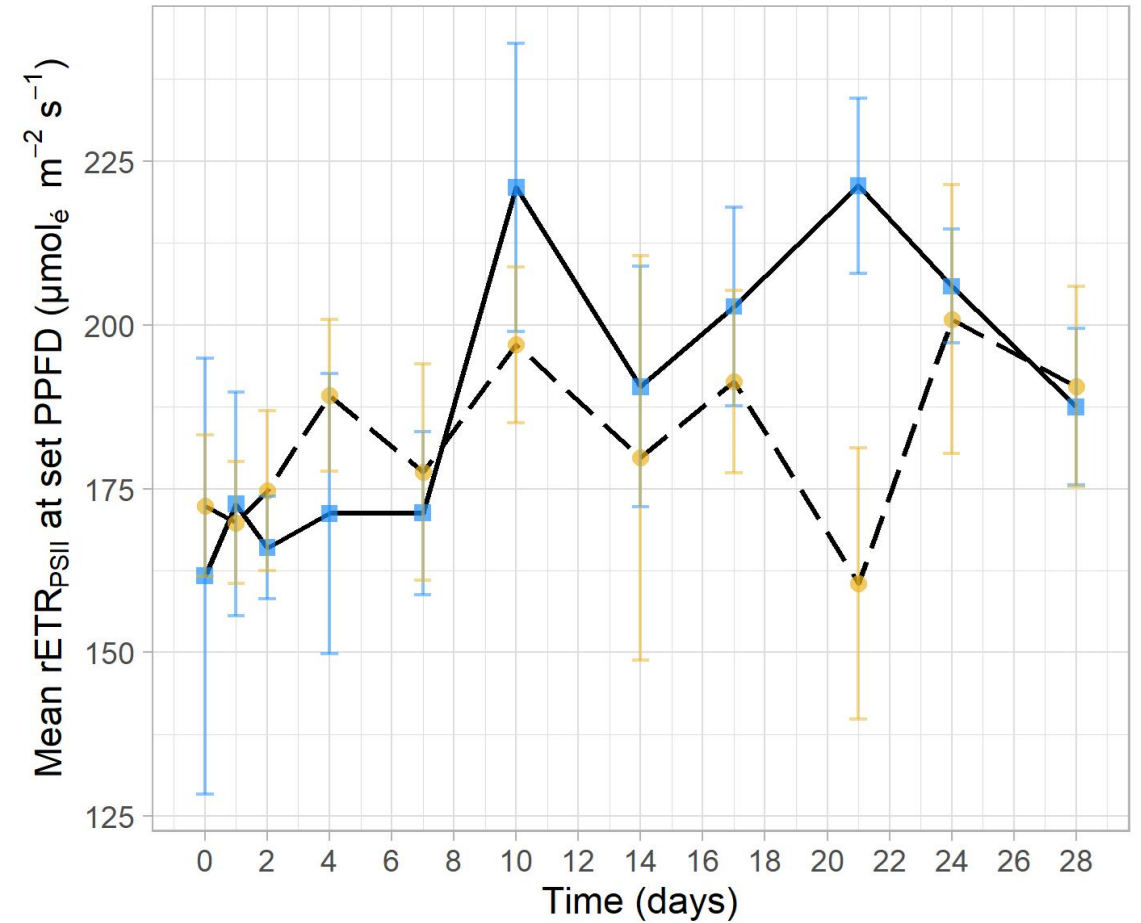
Mean rETR-PSI at PPFD 860 aafo time (days)



Temperature (°C) — ctrl — HS

n=3-4
 signif ↗
 no signif ≠

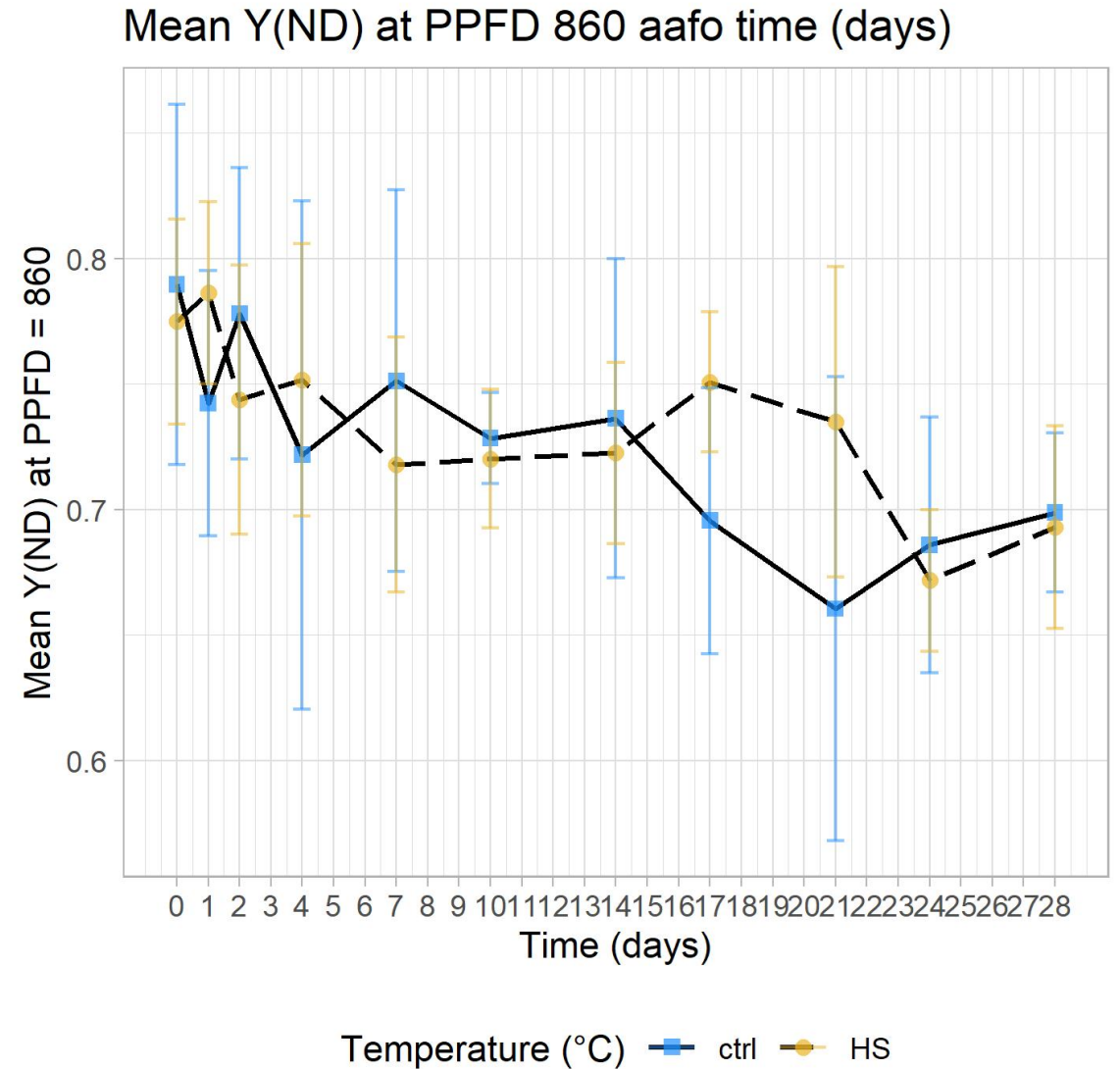
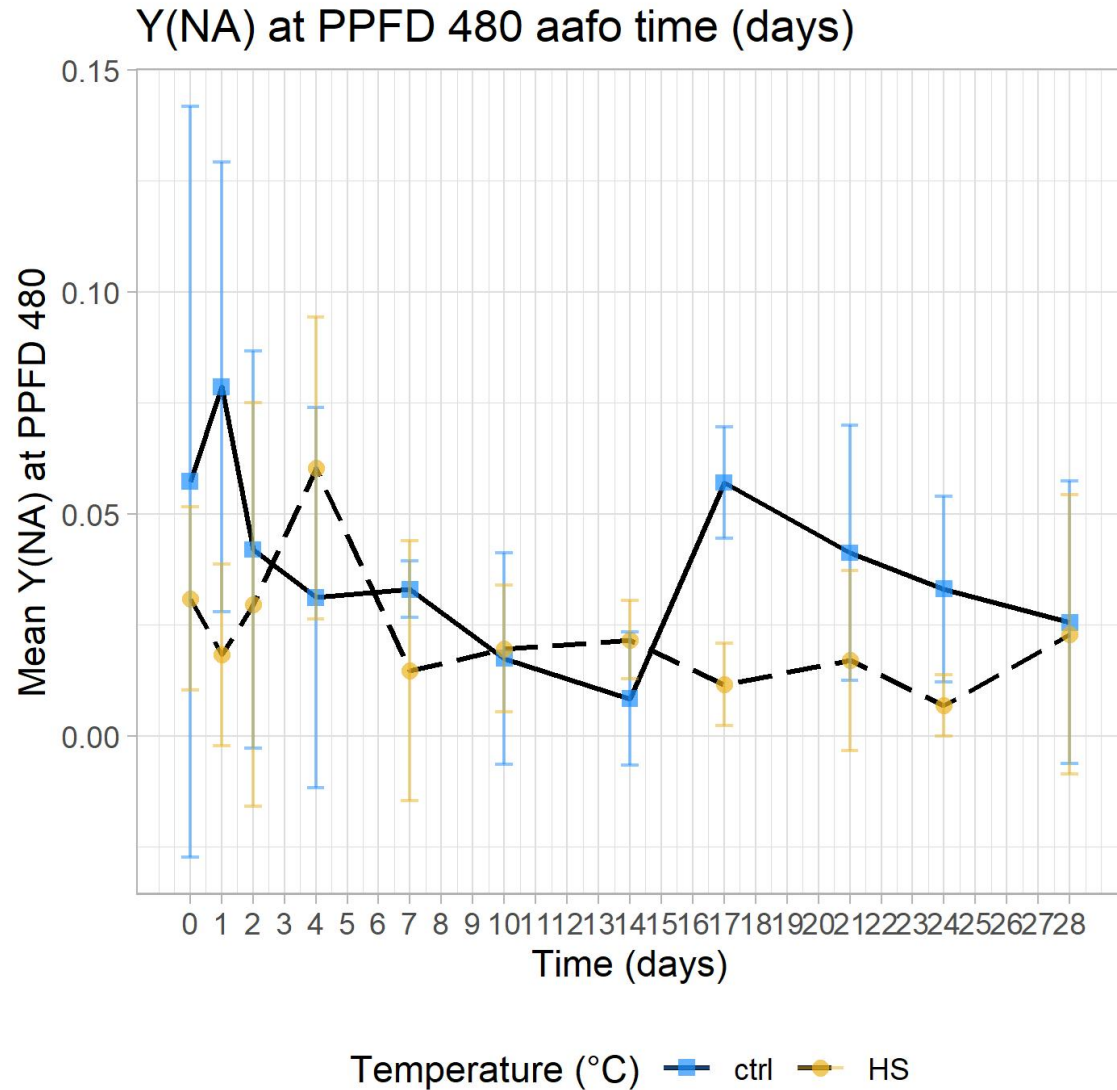
rETR-PSII at PPFD 860 aafo time (days)



Temperature (°C) — ctrl — HS

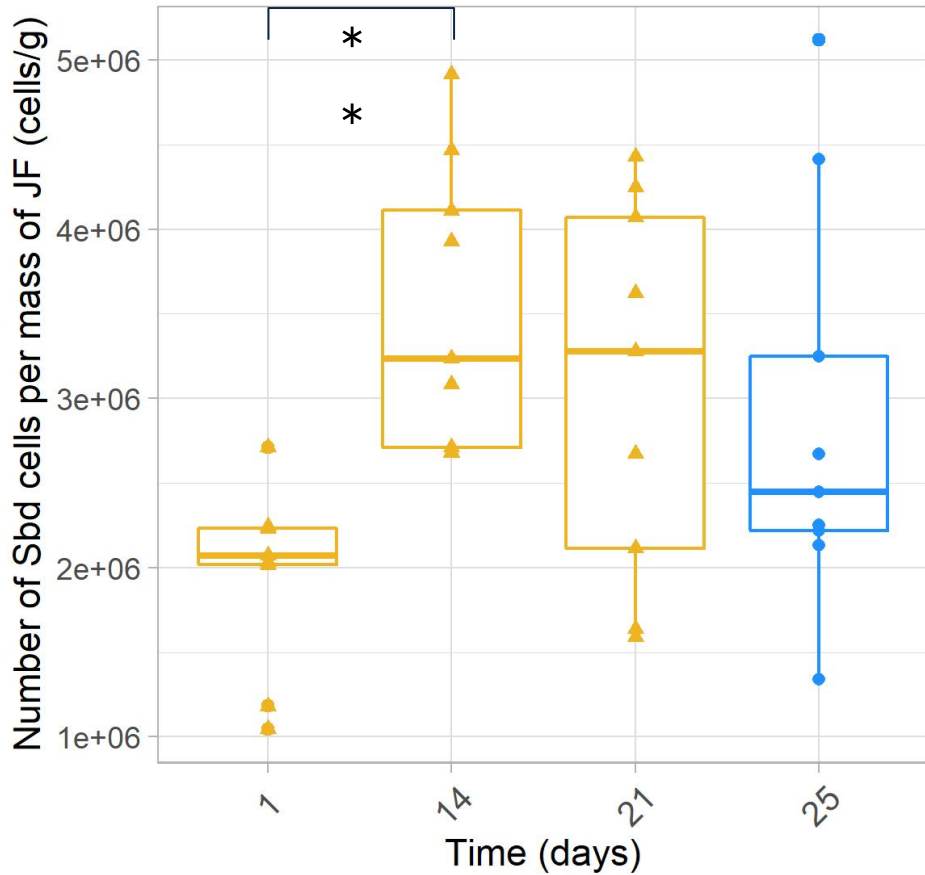
n=4
 no
 signif ≠

2. Heat stress in Cassiopea - Y(NA) and Y(ND)

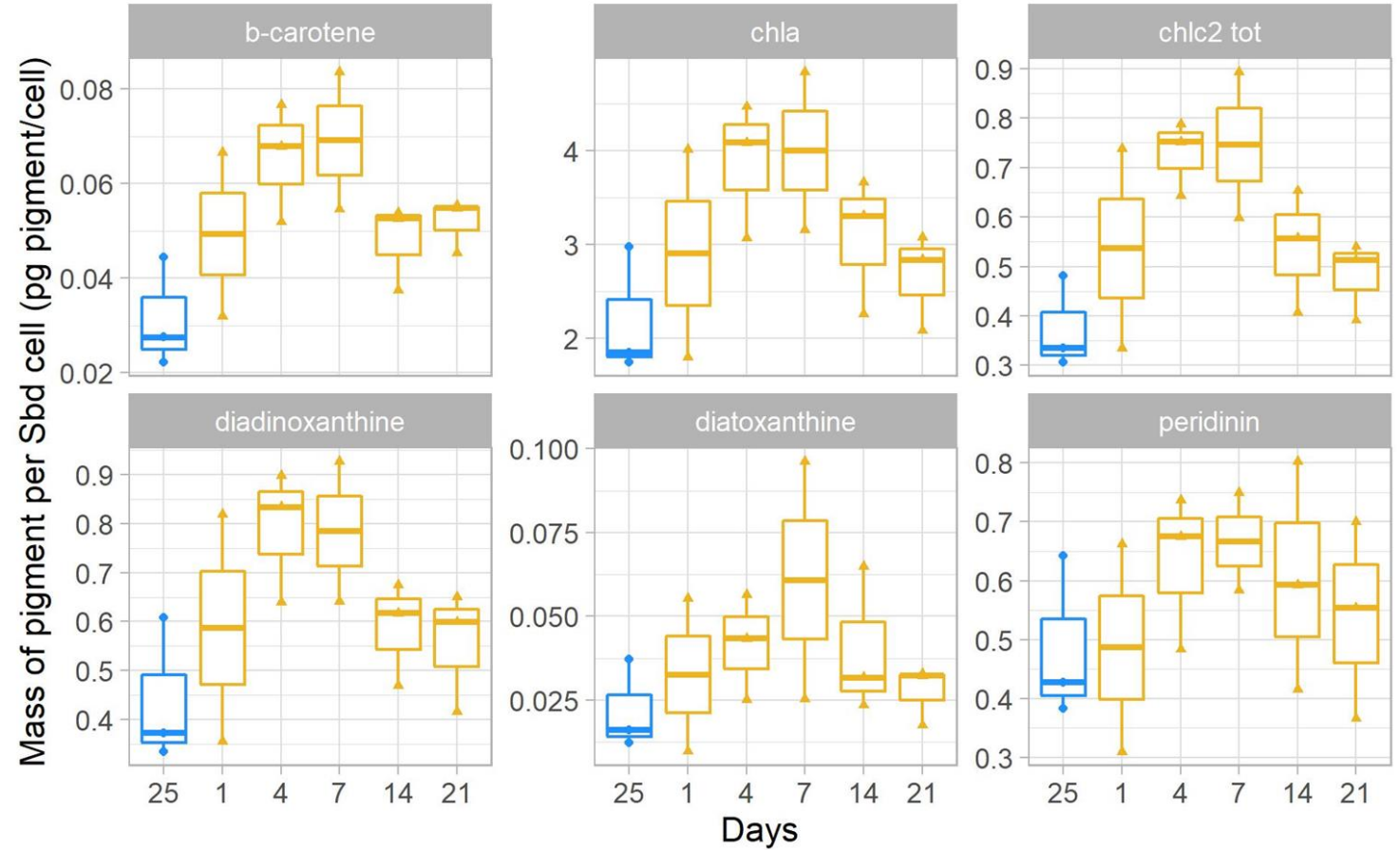


2. Heat stress in *Cassiopea* - Sbd density and pigments

Number of Sbd cells per mass of JF on each day



Pg of pigment per Sbd cell (HPLC)



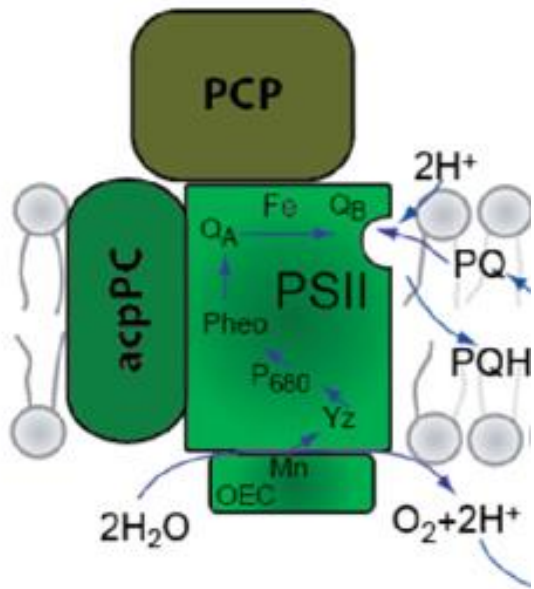
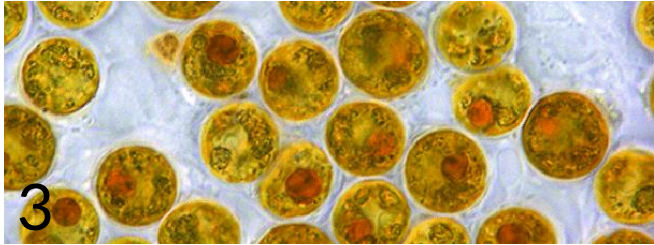
Temperature (°C) ■ ctrl ■ HS

n=9, **pval= 0.003

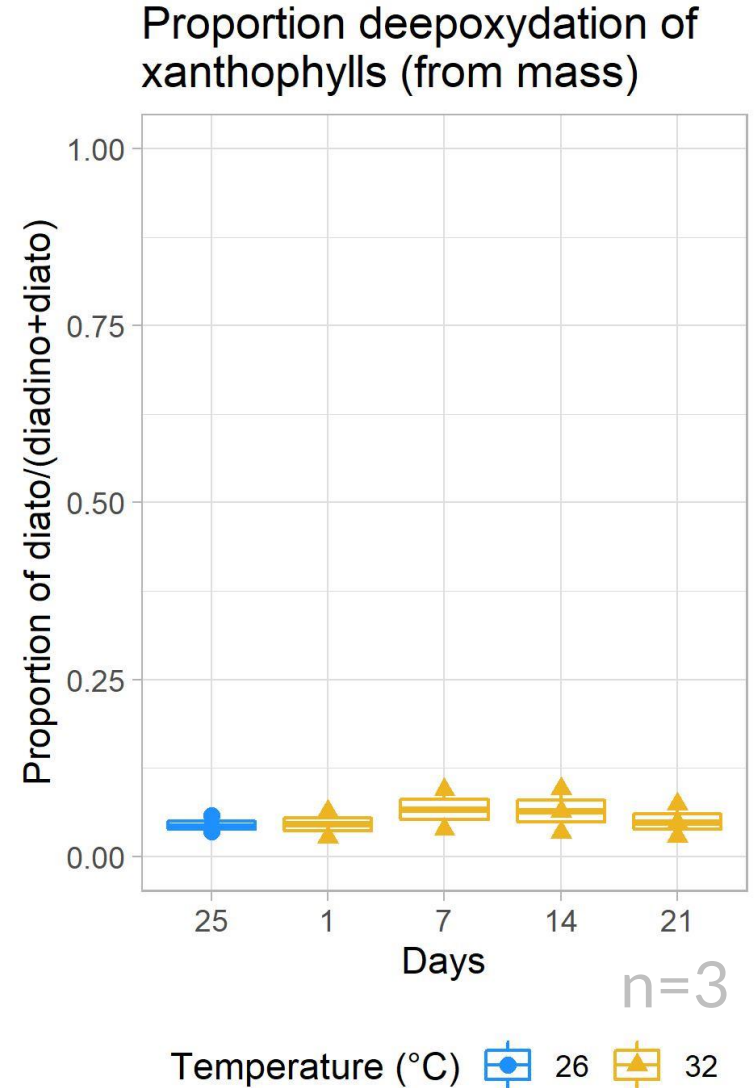
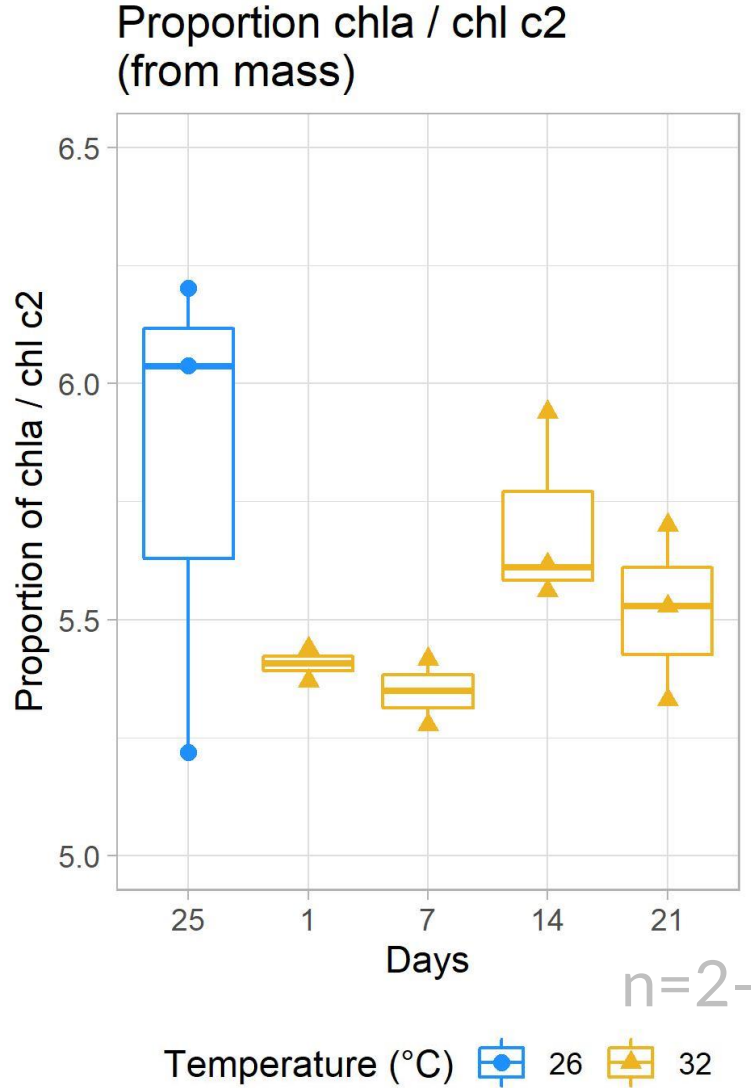
Temperature ■ 26 ■ 32

n=3

2. Heat stress in *Cassiopea* - context

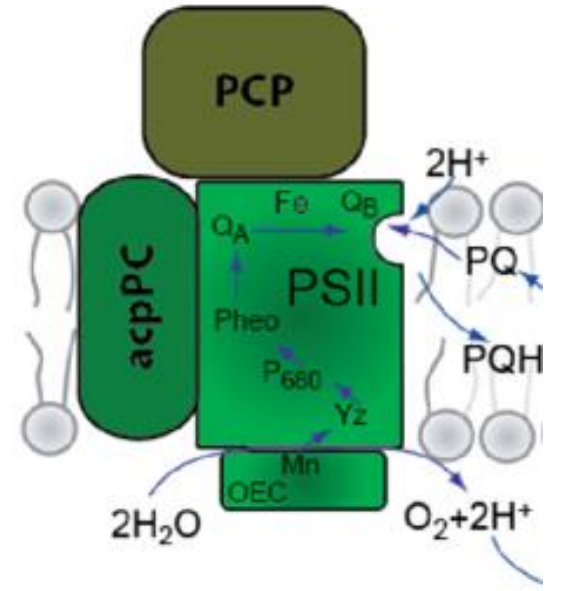
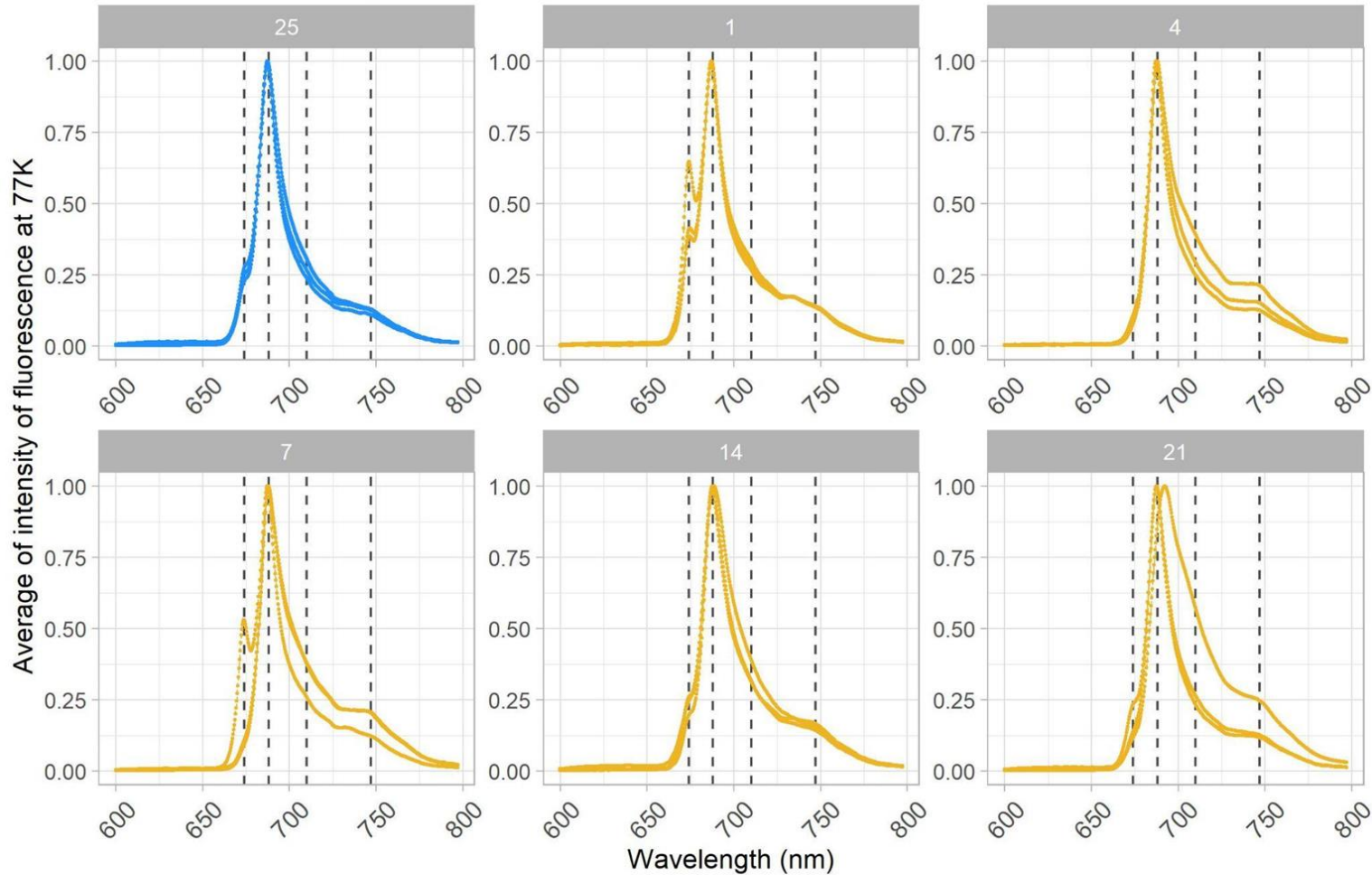


adapted from 5.



2. Heat stress in Cassiopea - 77K fluorescence emission

Average of intensity of fluorescence at 77K for different days (and T°)



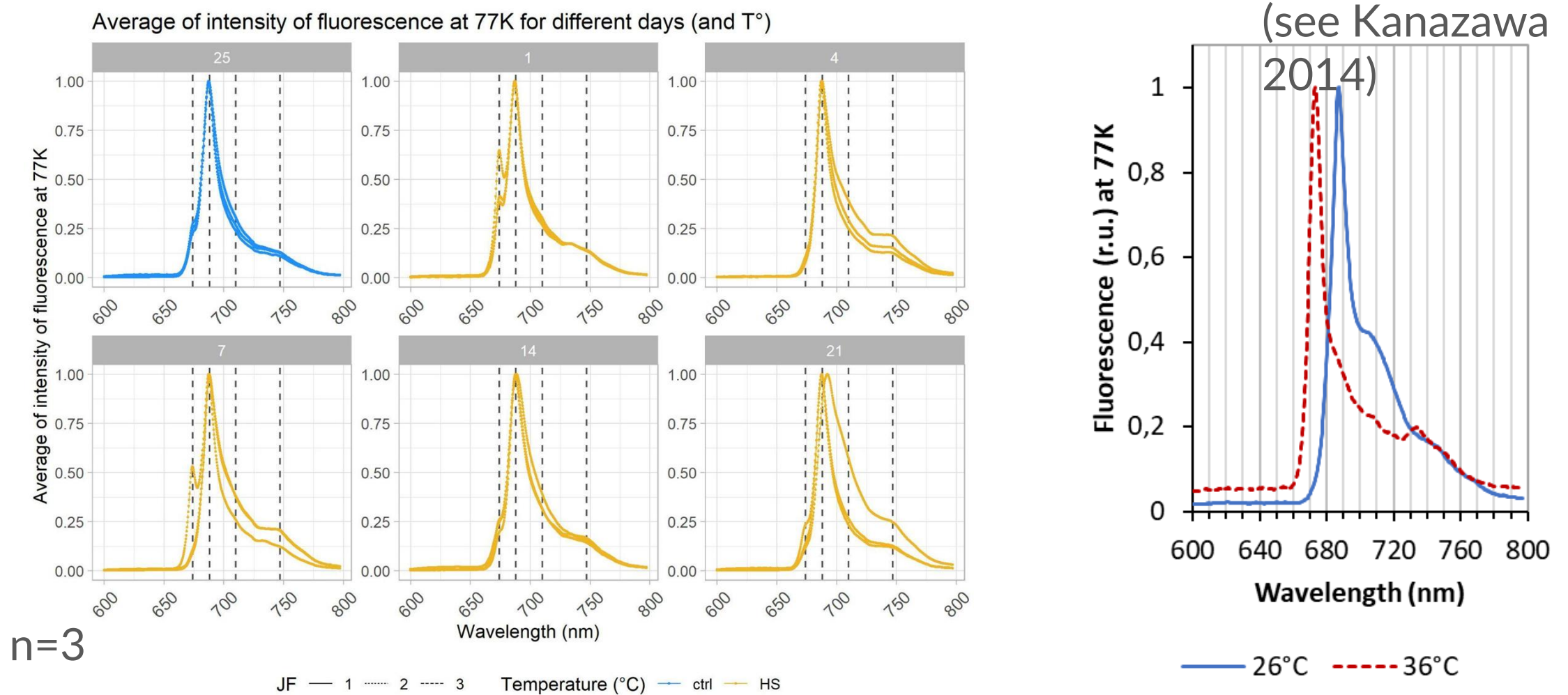
adapted from 5.

n=3

JF — 1 2 ---- 3 Temperature (°C) — ctrl — HS

(see Kanazawa

2. Heat stress in Cassiopea - 77K fluorescence emission



A re-organization of the light-harvesting complexes of the dinoflagellate is also suggested by the variation of the relative importance of peaks corresponding to the