



Harmful algal bloom forecasting – can we do it?

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For forecasts of **relative risk**:

Yes - where harmful algae have a large direct response to environmental conditions.

More difficult – where there are complex feedbacks, lags and sensitivity to previous conditions (e.g. dependency on cyst beds).

(HAB-OFS)



Chesapeake Bay Ecological Prediction System (CBEPS)

*Karenia
brevis*

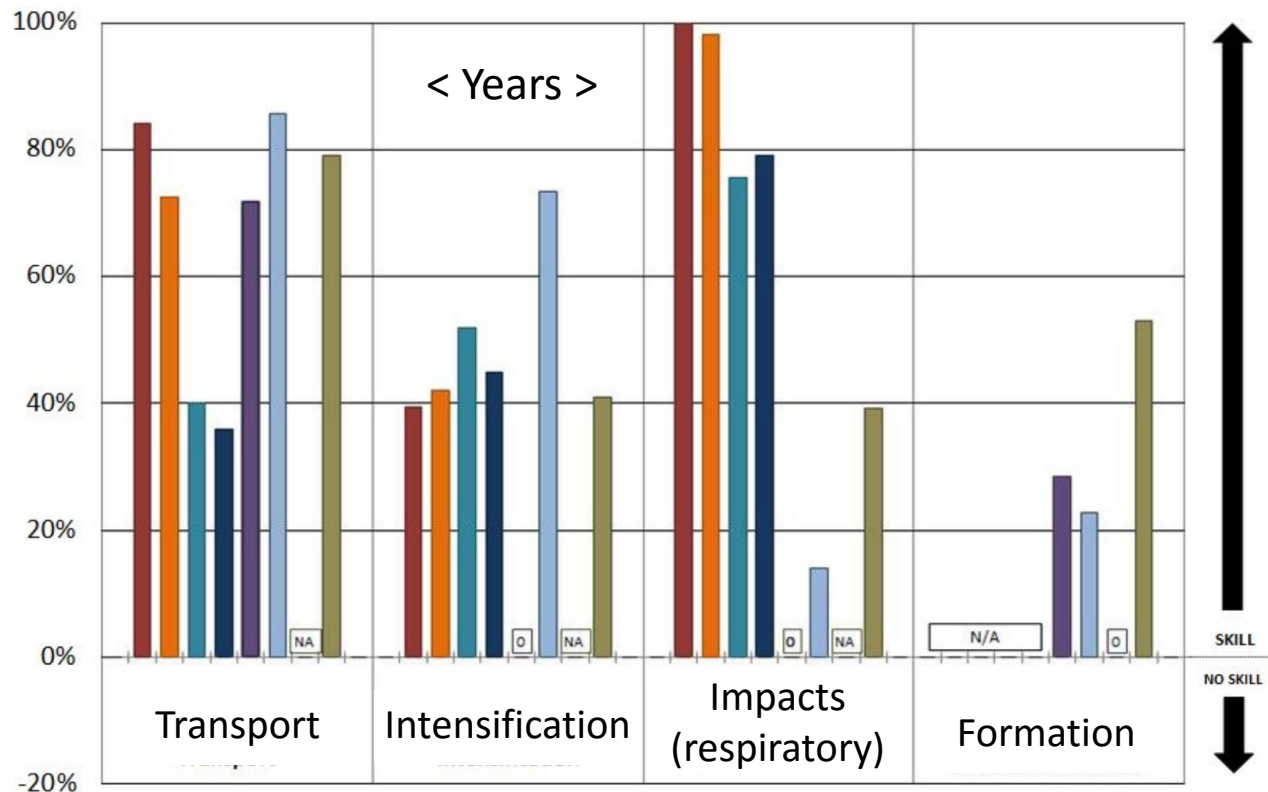
Eastern Gulf of Mexico HAB-OFS

- Forecast winds
- In situ samples (dinoflagellate: *Karenia brevis*)
- MODIS satellite images

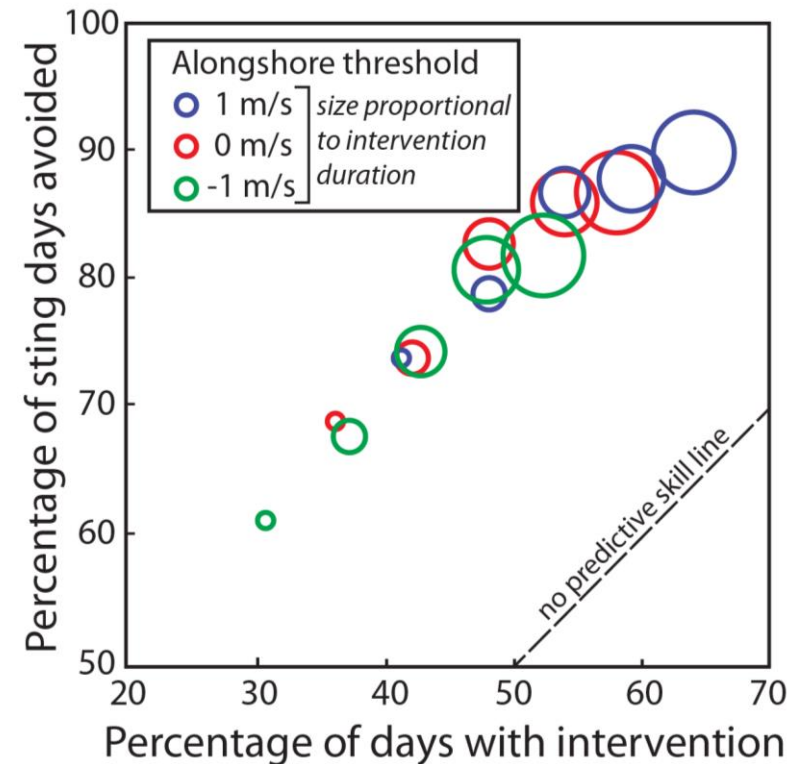
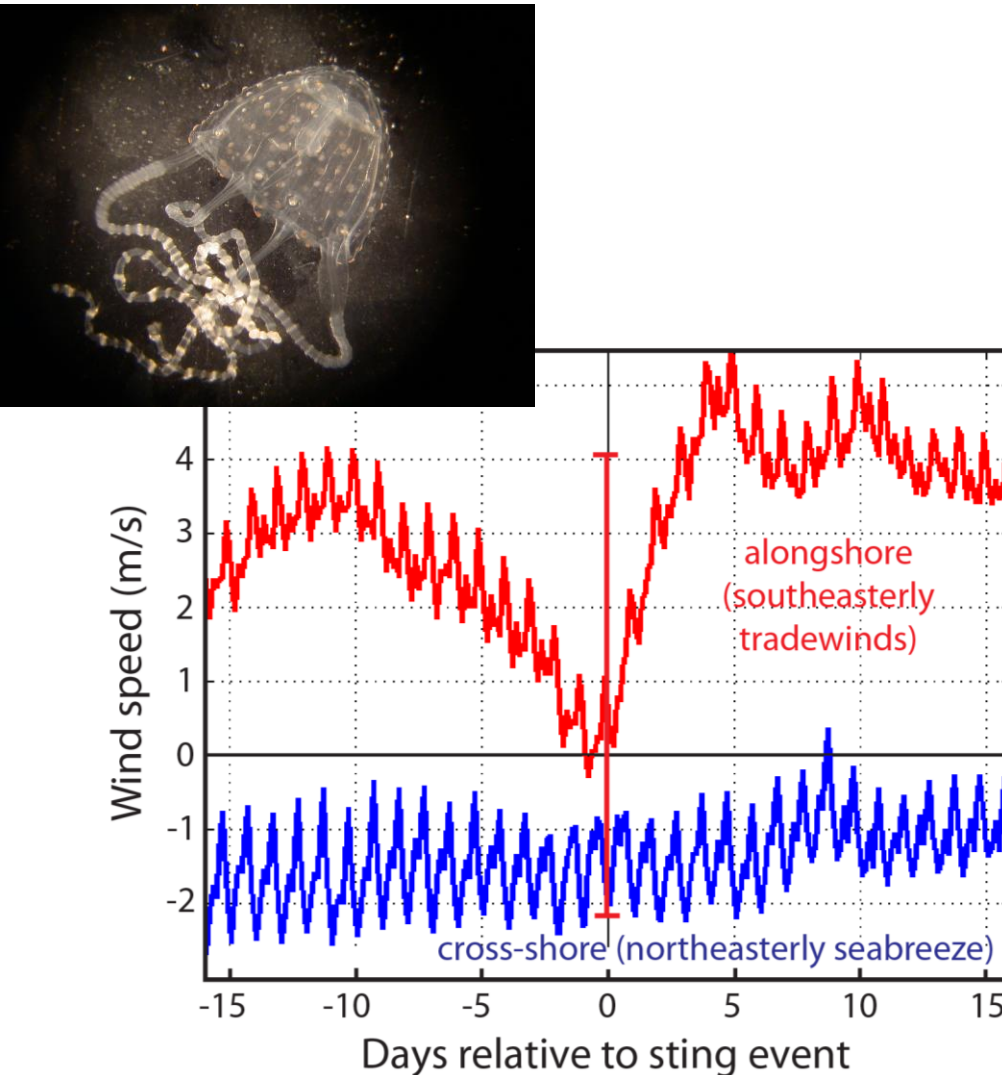
} Formation / Transport
 } Intensification / Impacts

Forecast skill
 (correct forecasts
 relative to chance)

Stumpf et al.(2009)
Journal of Marine Systems



Irukandji jellyfish on the GBR



Alexandrium Tamarense blooms off eastern Tasmania

2012 2013 2015 2016



DANGER 

TOXIC SHELLFISH
DO NOT EAT clams, oysters,
mussels, or scallops.

Shellfish in this area are unsafe to eat
due to biotoxins.

위험! 지명역면 독성 조개류. 먹지 마십시오!

Nguy Hiem! Nghêu sò bị nhiễm độc. Đừng ăn!

خطر! صرخة المحار والصدف ملوثة. لا تأكل!

¡Peligro! Mariscos tóxicos. ¡No comer!

Опасно! Ядовитые моллюски. Не употреблять в пищу!

ອັນຕະລາຍ! ສິດນ້ຳ/ເພດນີ້ມີອາການເຢັນ. ຫ້າມກິນ!

危險! 有毒的貝類。切勿食用!

Always check the shellfish safety hotline:

1-800-562-5632 or

www.doh.wa.gov/shellfishsafety.htm

For more information, contact:



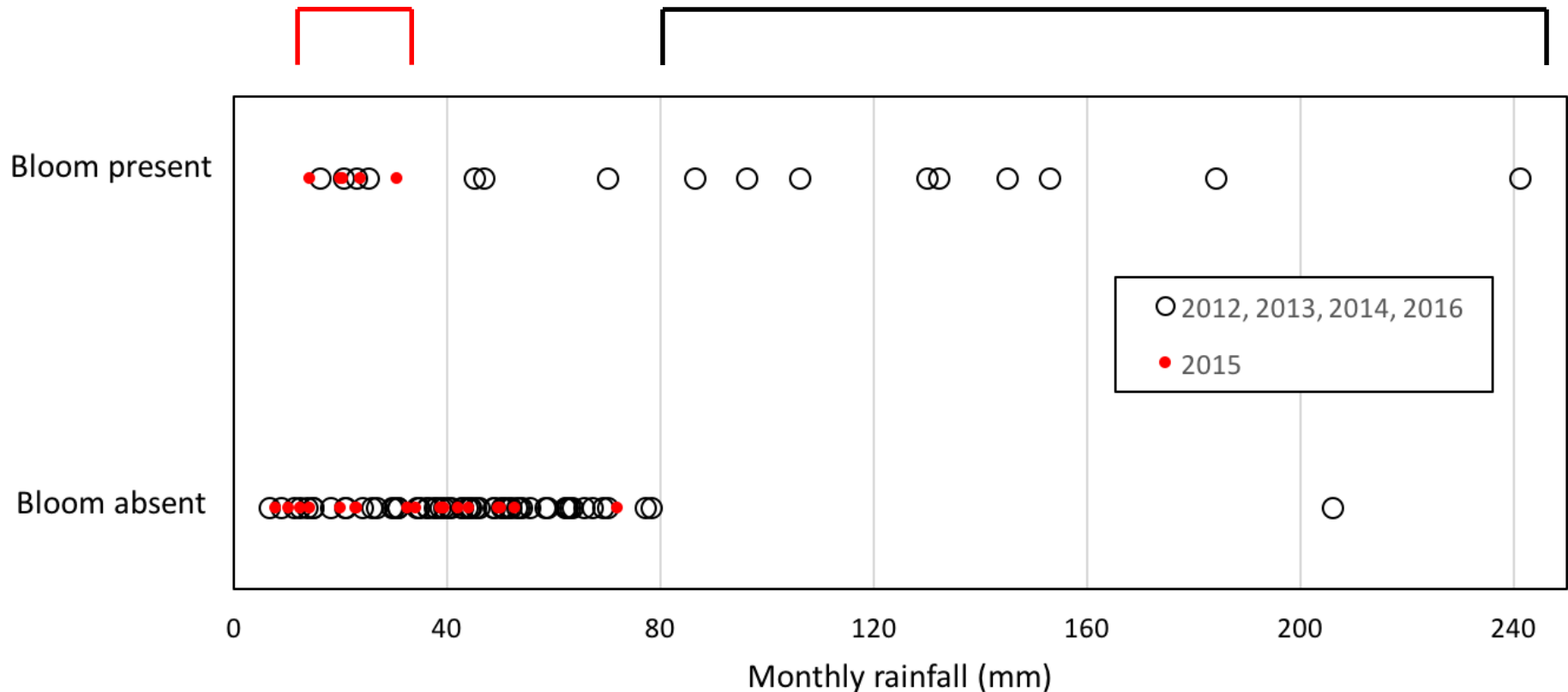
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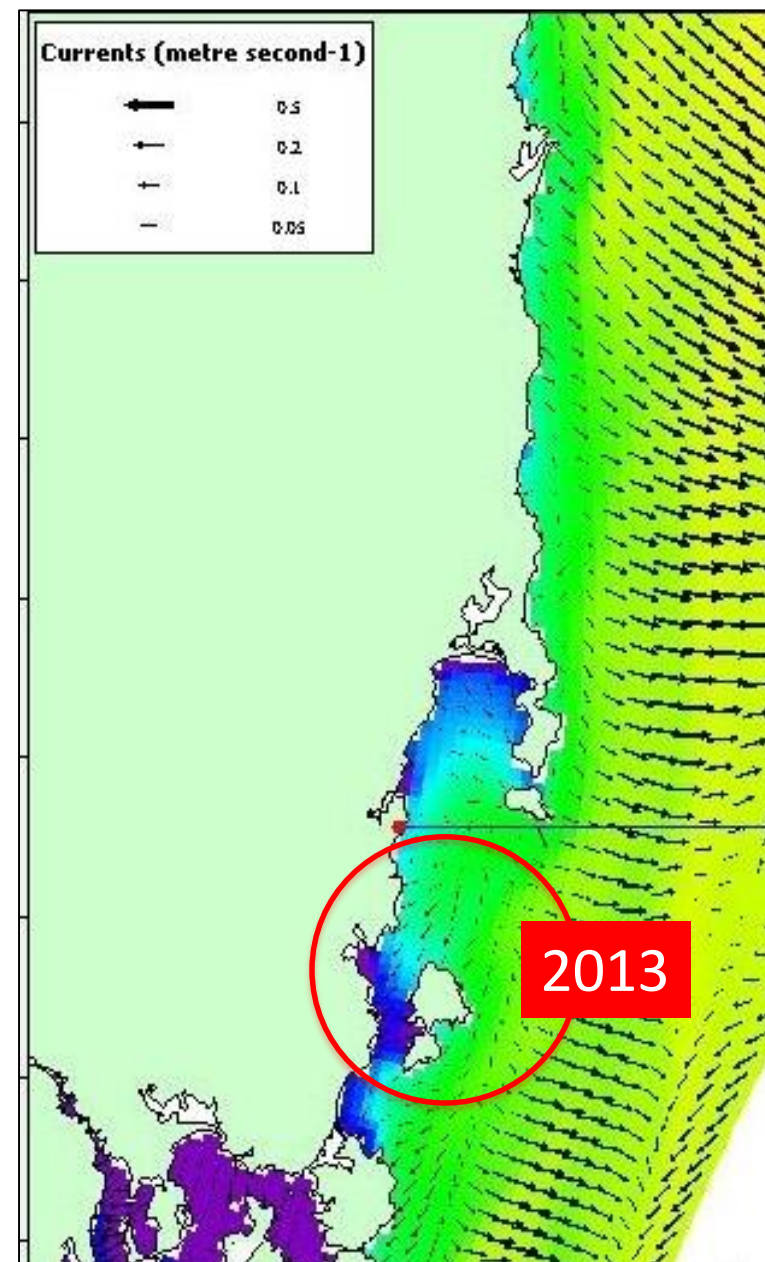
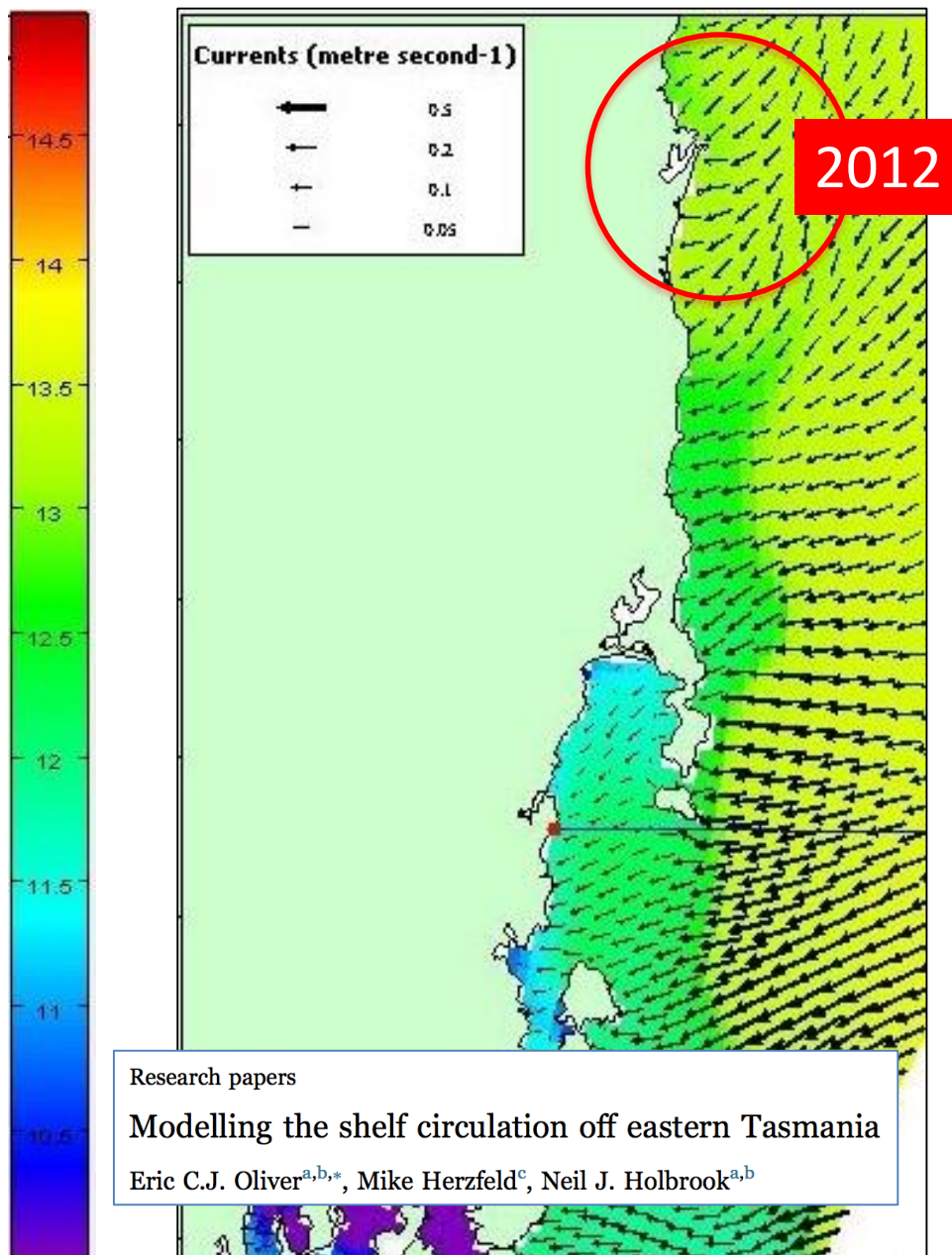
Rainfall during months with water temperature 10-14°C

2015 blooms south of
Great Oyster Bay
under low rainfall

Blooms nearly always preceded
by high monthly rainfall



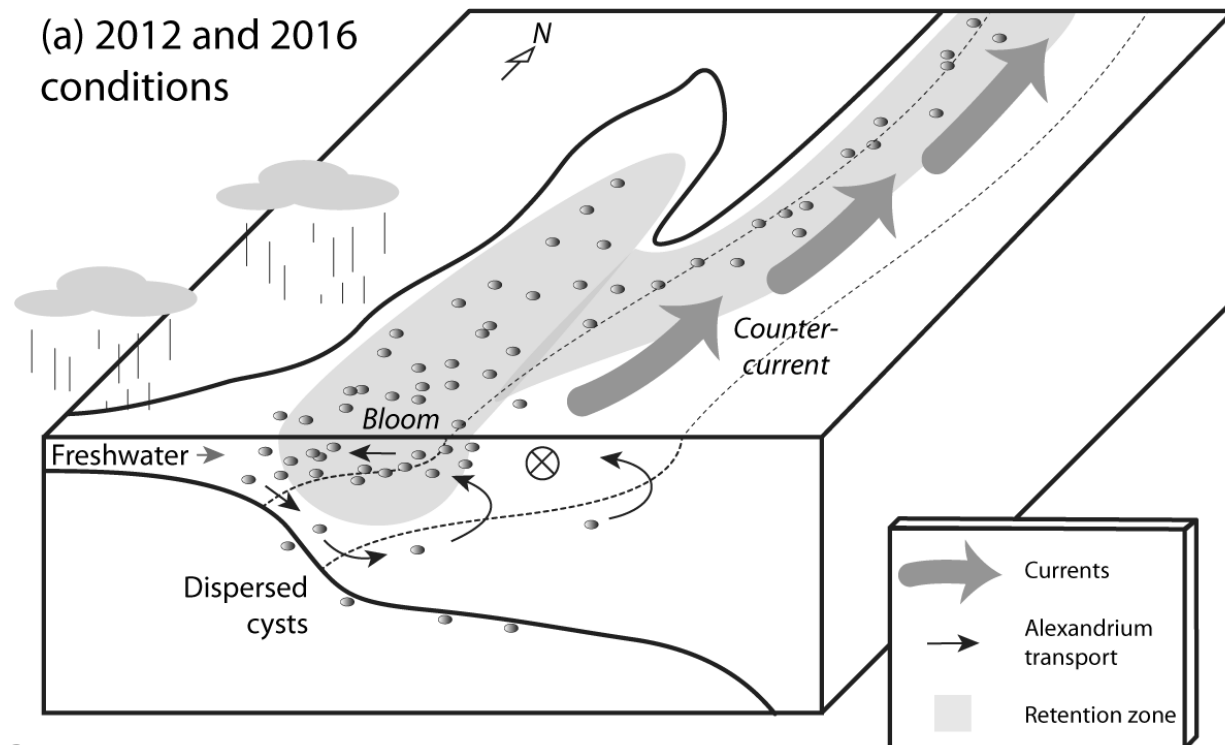
Bloom-rainfall relationship is statistically significant when 2015 data is excluded



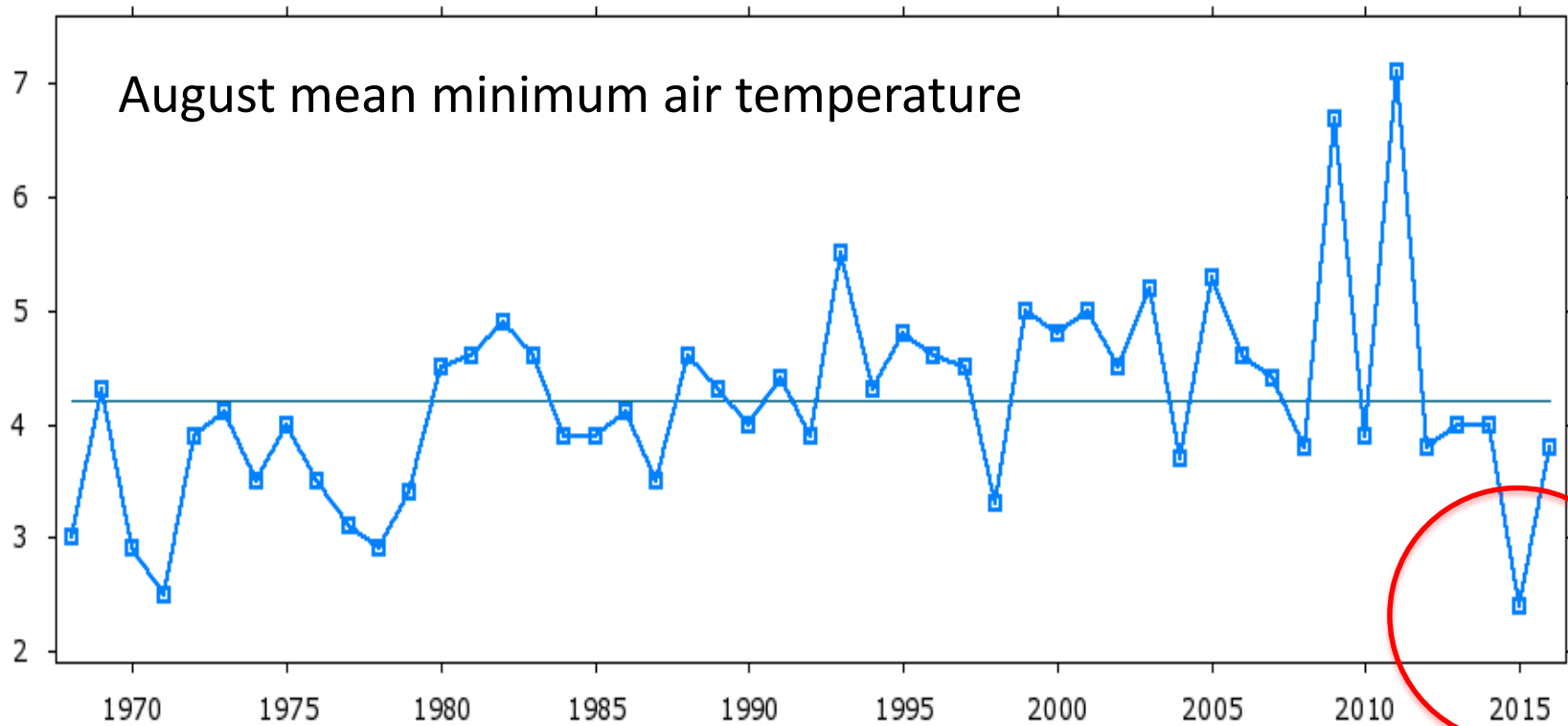
Wind driven (downwelling) circulation promotes coastal retention of bloom

Hypothesis for 2012, 2013, 2016

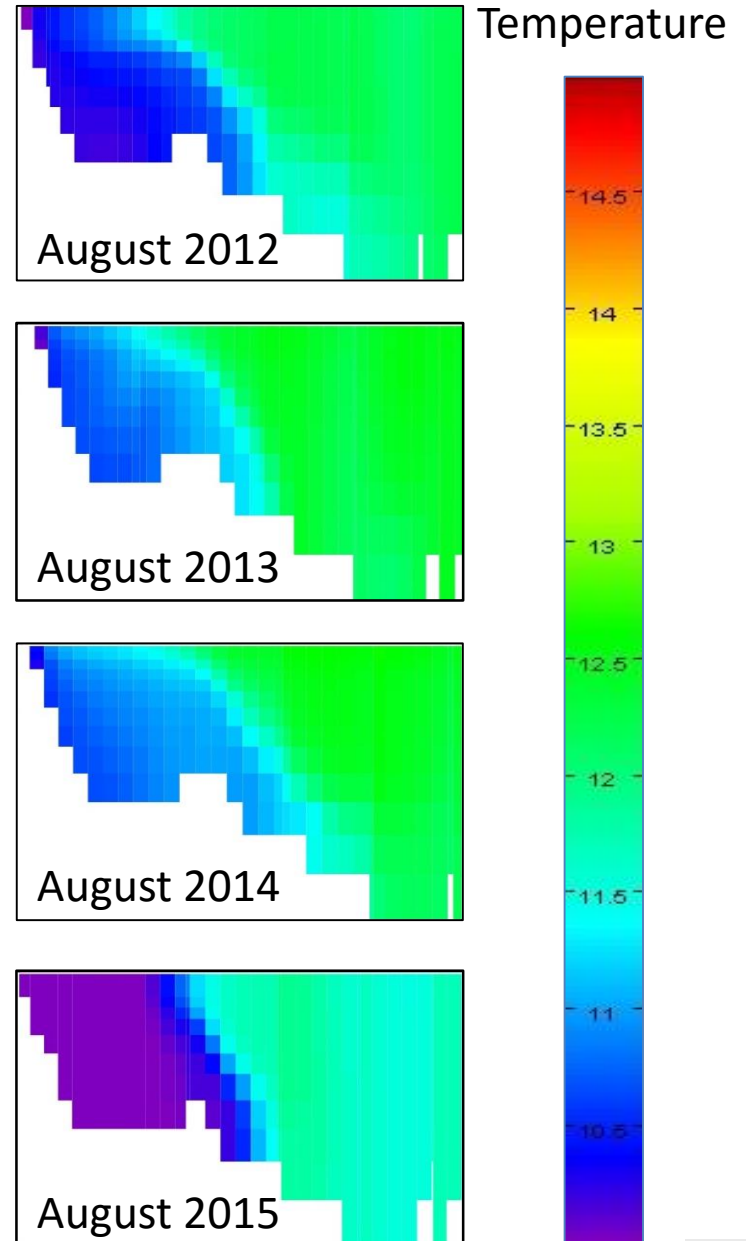
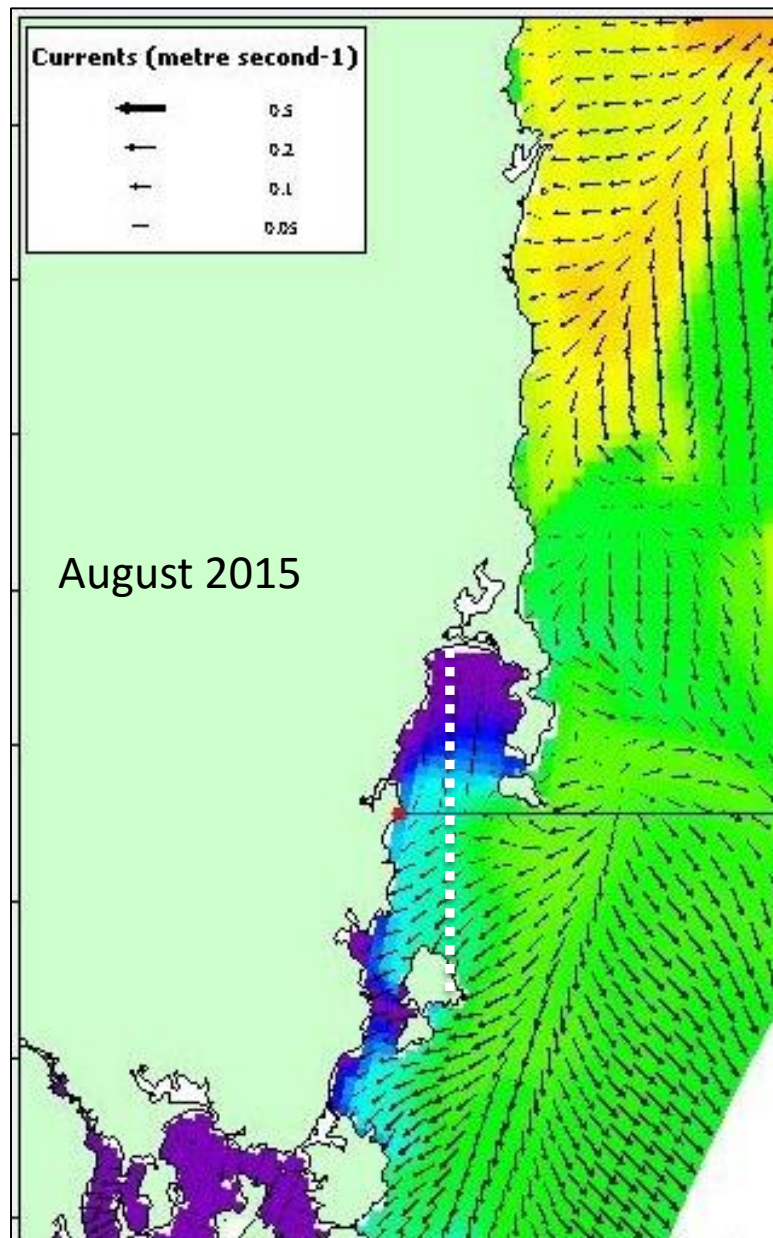
- River discharge + downwelling winds
- Enhanced stratification trapped against the coast
- Dinoflagellates (floating/motile) accumulate along the coast, with light/nutrient advantage over diatoms (sinking)



So what happened in 2015?

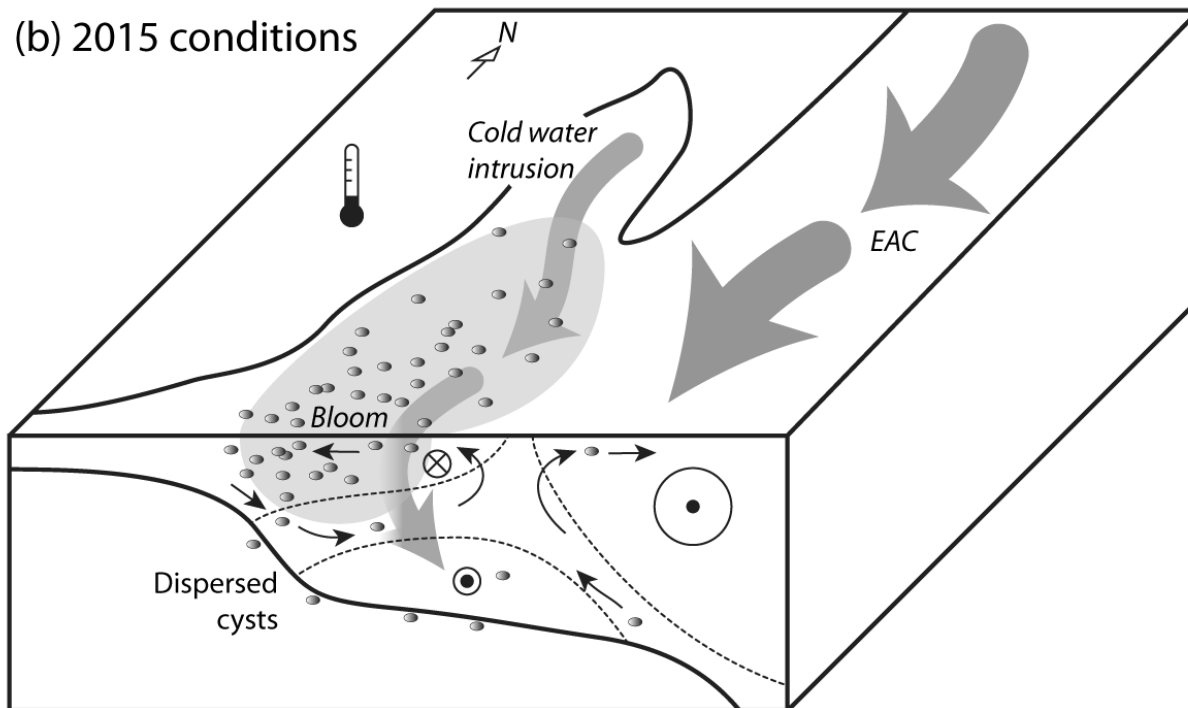


2015



Hypothesis for 2015

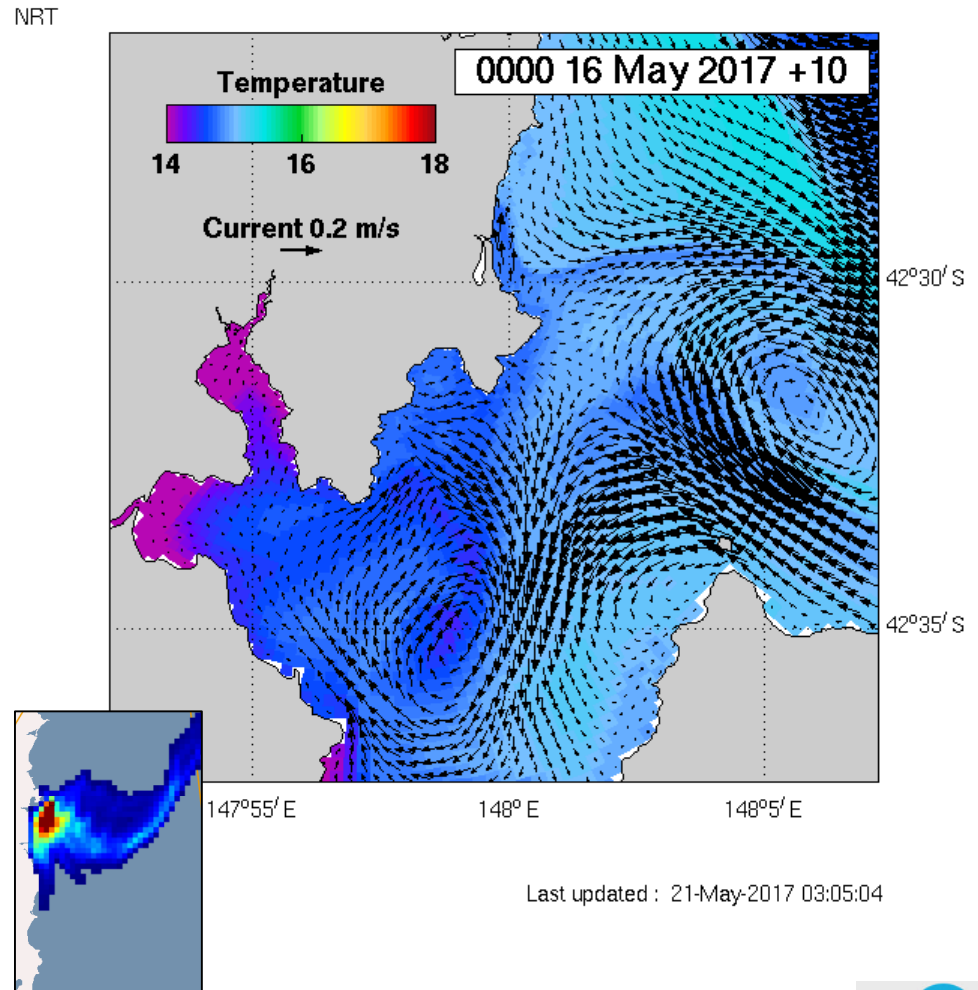
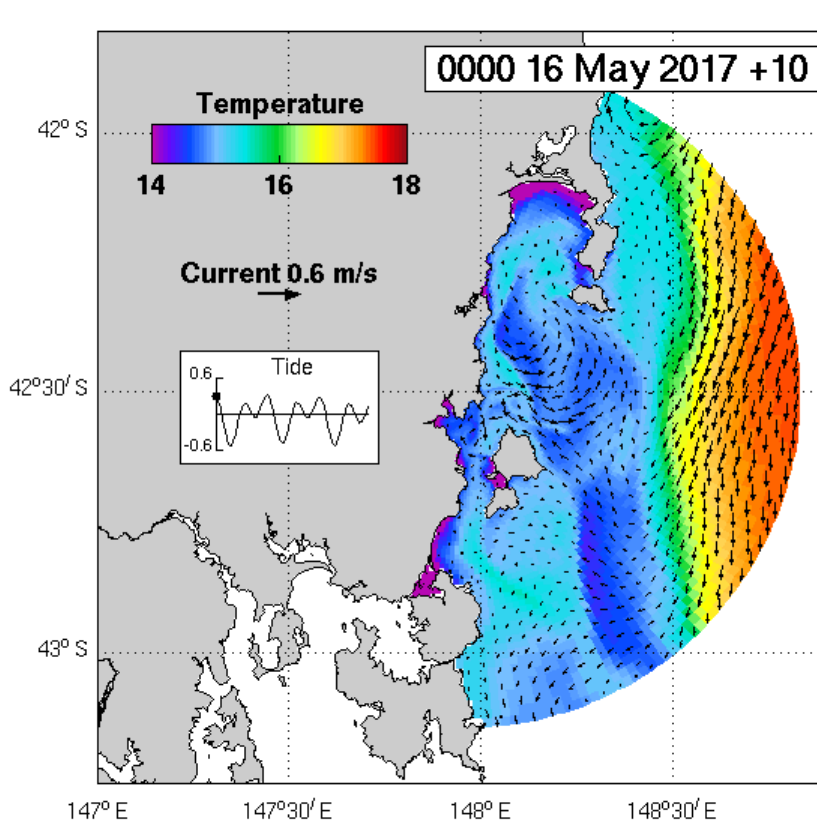
- Low air temperatures generate cold water in shallow coastal areas such as Great Oyster Bay and Mercury Passage
- Enhanced stratification again supports dinoflagellates



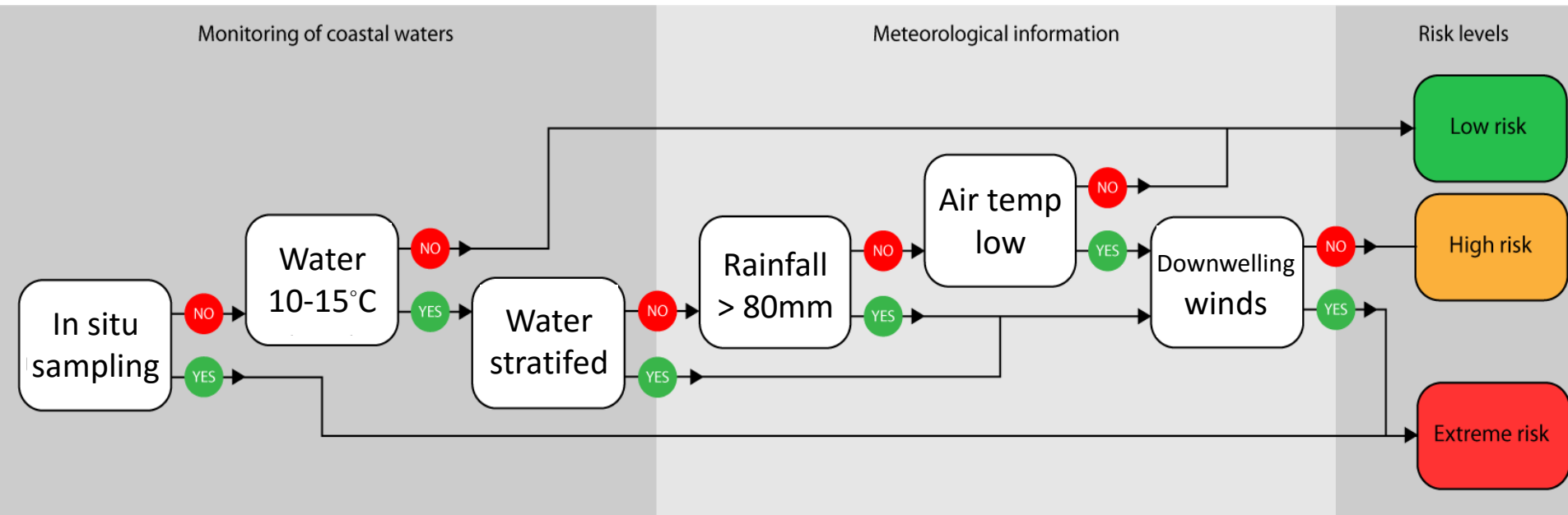
Forecasting potential

- ☹ Small number of bloom events for testing.
- 😊 Plausible environmental forcing hypothesis consistent with theoretical expectations.
- 😊 Requisite modelling and monitoring infrastructure starting to be developed (CSIRO hydrodynamics plus aquaculture mooring).

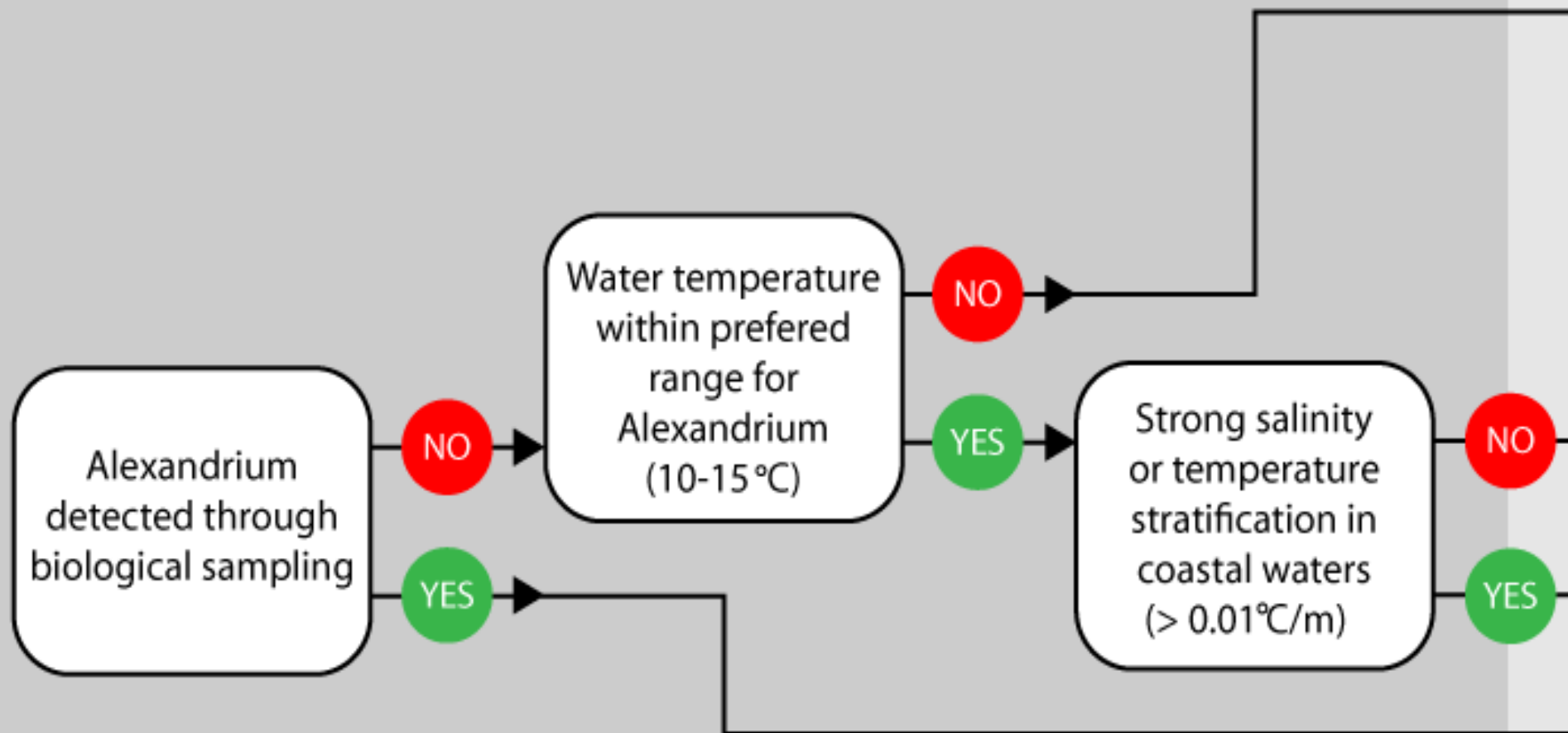
Near-real time hydrodynamics and dispersal (requires further calibration)



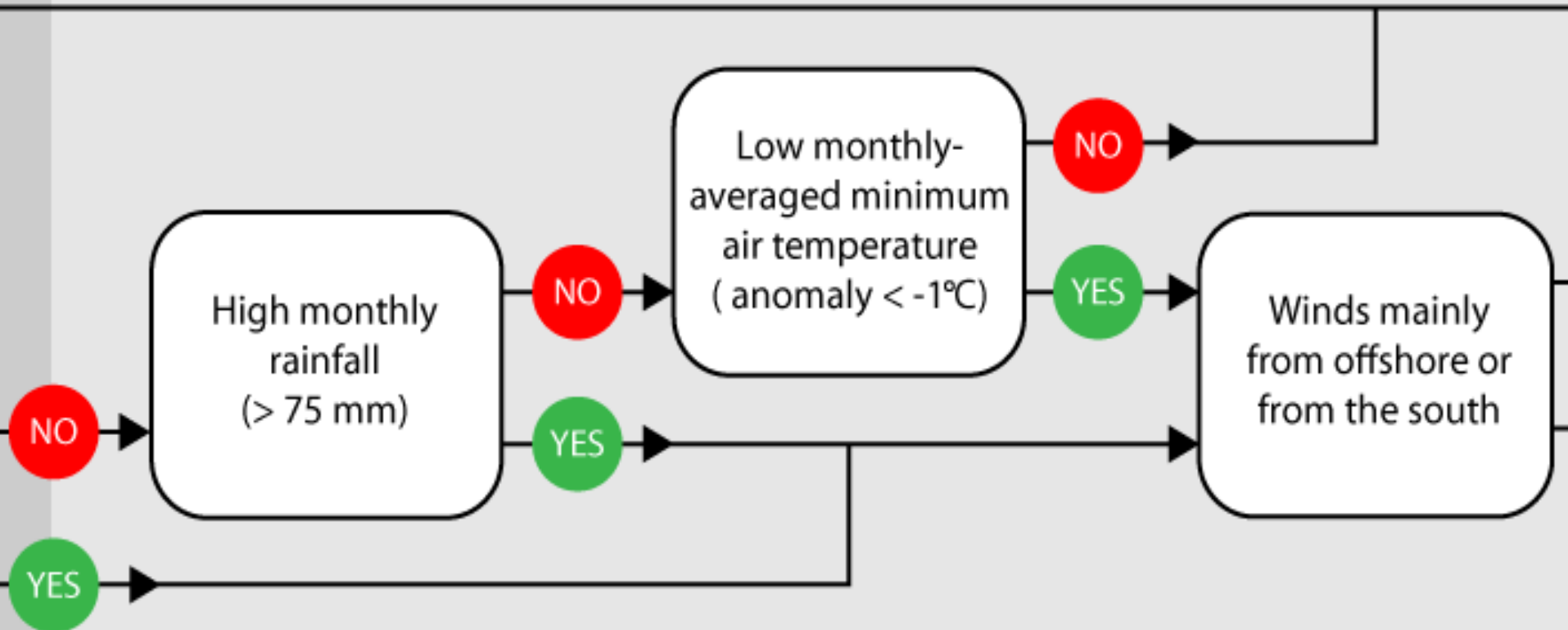
Risk assessment framework (decision tree)



Monitoring of coastal waters



Meteorological information



eteorological information

Risk levels

