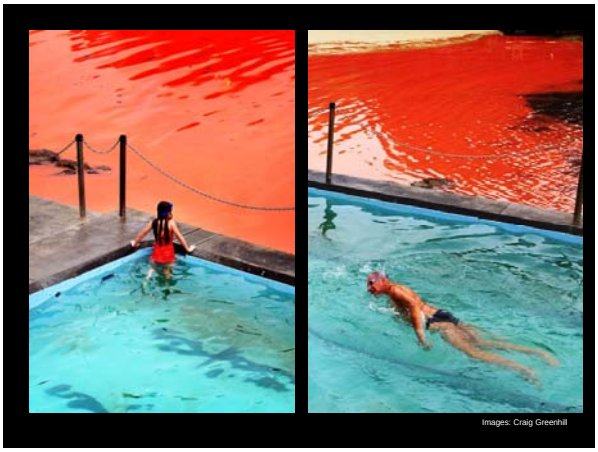
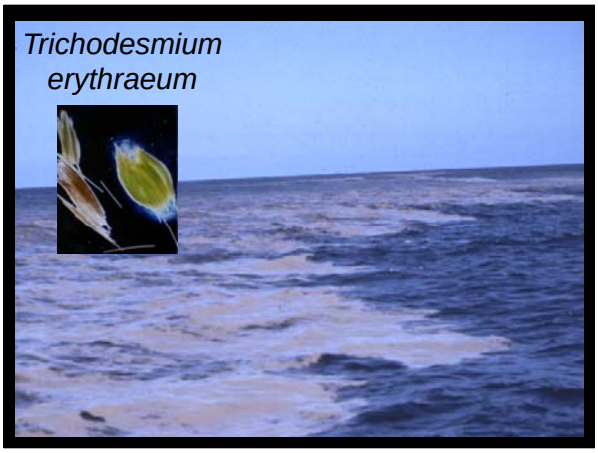
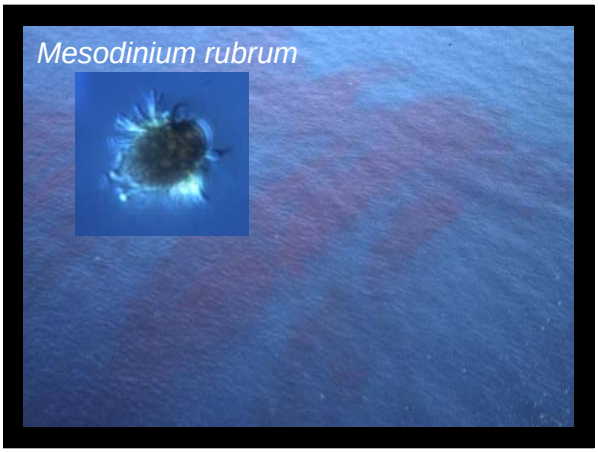
Talk Outline

- what are algae?
- why are they important?
- algal blooms – the good, bad and toxic
- bloom management
- my research





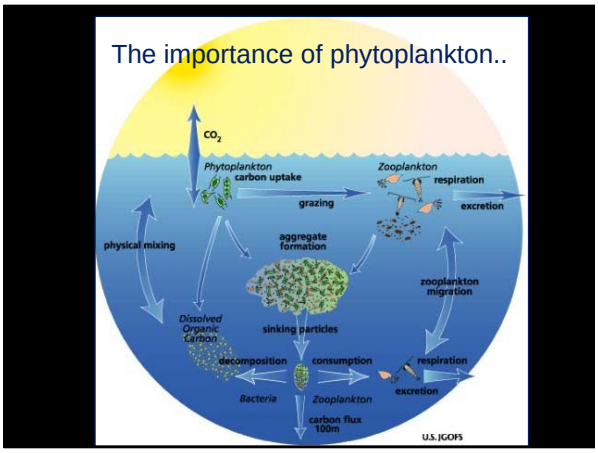


What are algae?

- algae = phytoplankton = microalgae = microscopic plants (*phyto* = plant, *planktos* = to wander)
- oceans, lakes and rivers
- ~10,000 species in coastal/oceanic waters
- complex morphology

Why are they important?

- 40% of global photosynthesis, ~1/2 world's oxygen
- carbon generated feeds the marine food web
- few long-term studies in southern hemisphere



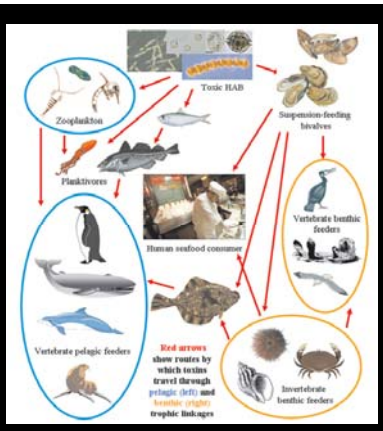
Phytoplankton community

Algal Blooms = “Red tides”

“….all the waters that were in the river turned to blood. And the fish that was in the river died; and the river stank and the Egyptians could not drink of the water of the river”. (Exodus 7: 20-21)

Algal Blooms –the good, bad and toxic

- Humans: toxicity (ASP, PSP, DSP); skin irritation; aerosols
- Food production (wild and farmed): fish kills; taste
- Ecosystem effects: spring blooms; anoxia; destabilisation
- ~80 toxic species



“Crazed Birds” California 1961

Santa Cruz Sentinel

Seabird Invasion Hits Coastal Homes

He Got The Bird–Or Was It Vice Versa

Thousands Of Birds Floundering In Streets

Did Lights Bring Birds Ashore

Agency Okays SL Park Pact With Shaffer

University May Use Cabrillo Facilities To Open Its Doors

correspondence

Mystery behind Hitchcock's birds

Bargu et al. 2012 *Nature Geo.*

What causes algae to bloom?

Physical
- temperature, light, water movements

Chemical
- nutrients, inorganic substances, light-absorptive capacity of algal pigments

Biological
- life histories, reproductive strategies, resting stages, resource competition, grazing pressure from zooplankton

Current Bloom Management in NSW

RACC Regional Algal Coordinating Committee (NSW Office of Water) – Metropolitan and South Coast, Hunter, North Coast

RACC Contingency Plans = list of responsibilities; phytoplankton experts and laboratories; draft media releases etc.

SACC Statewide Algal Advisory Group (Policy and Management)

TAG Statewide Algal Technical Advisory Group (Technical expertise)

Current Bloom Management in NSW

Toxic/Non-toxic bloom?

Toxic – NSW Food or NSW Fisheries with assistance from RACC

Non-toxic – localised: local Council and RACC;

widespread: RACC to co-ordinate

NSW Office of Water
Department of Environment, Climate Change and Water

Metropolitan South Coast
Regional Algal Co-ordinating Committee
Algal Information Line 1800 999 457
Web page www.water.nsw.gov.au

ALGAL INFORMATION REPORT UPDATE ISSUED WEDNESDAY 28th NOVEMBER 2012

This report highlights high or red algal alerts in the Sydney Metropolitan and South Coast region, where blue-green algae levels or marine algal levels exceed the recreational guidelines and trigger levels specified within the Metropolitan and South Coast Marine and Freshwater Contingency Plans and Appendices.

Water area affected and alert	Media release	Signage body	Monitoring org	Main taxa and BV or Cell count
GREEN Alert	[illegible]			
Hawkesbury River at Lower Portland (25/11/2012)			NSW Office of Water	[illegible]
Sydney International Regatta Centre, Penrith (19/11/2012)			Penrith Lakes Development Corporation	[illegible]
Waterside Estate, Penrith (10/10/2012)			Stocklands	[illegible]
Fitzroy Falls Reservoir (Moss Vale) (19/11/2012)			Sydney Catchment Authority	[illegible]
Lake Yarrunga at the Bendeela Picnic Area (19/11/2012)			Sydney Catchment Authority	[illegible]
Brogo Reservoir (Bega) (11/07/2012)			State Water Corporation	[illegible]
AMBER Alert	[illegible]			
Hawkesbury River at Cattai (25/11/2012)			NSW Office of Water	[illegible]
Hawkesbury River at Sackville (25/11/2012)			NSW Office of Water	[illegible]
Sir Joseph Banks Park, Botany (13/11/2012)			Botany Bay City Council (Office of Water currently collecting samples for a research project)	[illegible]

File Location on G drive — Page 1 of 1

DISCLAIMER Information within this report and the emails associated within the dissemination of the Metropolitan South Coast RACC Algal Report relate to the information available to describe conditions in the Metropolitan and South Coast Regions of NSW and do not generally represent the conditions prevalent in the rest of the NSW.

Centennial Park (13/11/2012)			Centennial Park and Moore Park Authority (Office of Water currently collecting samples for a research project)	[illegible]
RED Alert	[illegible]			

Marine algae area affected	Media release	Signage body	Monitoring org	Algae type and/or species
Botany Bay / Georges River (23/11/2012)	Department of Primary Industries (Fisheries)	Department of Primary Industries (Fisheries)	Oyster growers, NSW Food Authority	[illegible]
On the beach at Bondi Beach, Clovelly Beach, Cronulla Beach (27/11/2012) Offshore at North Curl Curl Beach, Clovelly Beach (28/11/2012)	MSCRACC	Councils	Office of Environment and Heritage (Beachwatch)	Noctiluca scintillans

Red alert information is available from the algal information line maintained by the NSW Office of Water, at 1800 999 457. Stakeholders and water users should be encouraged to check this line for updates or the NSW Office of Water web page at www.water.nsw.gov.au – For more information about this report contact MSC RACC Co-ordinator: Lee Bowling Lee.Bowling@water.nsw.gov.au Parramatta (02) 8838 7506.

File Location on G drive — Page 2 of 1

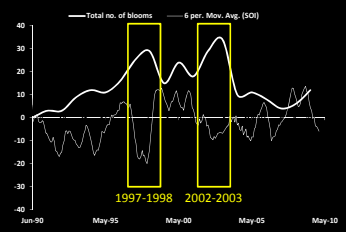
DISCLAIMER Information within this report and the emails associated within the dissemination of the Metropolitan South Coast RACC Algal Report relate to the information available to describe conditions in the Metropolitan and South Coast Regions of NSW and do not generally represent the conditions prevalent in the rest of the NSW.

My research

- reported (visual) algal blooms ~20 year database
- harmful algal blooms (HABs) in oyster-growing estuaries of NSW
- potentially toxic genus *Pseudo-nitzschia*
- Port Hacking 100m coastal station – decadal time-series

Reported (Visual) Algal Blooms in NSW

Noctiluca scintillans and *Trichodesmium erythraeum*



Significant El Nino Episodes

Ajani *et al*. 2001; 2011

HABs in the oyster-growing estuaries

The risk of harmful algal blooms (HABs) in the oyster-growing estuaries of New South Wales, Australia

- meta-analysis 2005-2009, 31 estuaries
- Phytoplankton Action Limits (PALs) exceeded at 86% sites
- 45 species identified; 20 exceeded the limits
- Wallis, Hawkesbury, Wagonga Inlet

NSW Industry & Investment

Media Release

30 April 2010

Toxic Marine Algal Bloom: Wagonga Inlet

The South Coast Regional Algal Coordinating Committee today advised all residents in the Narooma area that marine algal blooms have been detected in Wagonga Inlet. Marine algal biotoxins exceeding food safety guidelines have also been detected in shellfish from Wagonga Inlet.

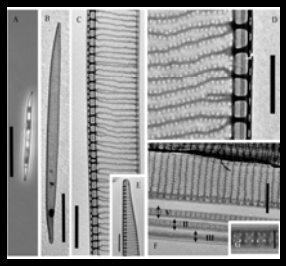
Image: Ana Rubio

Ajani *et al*. 2012 *Env. Mon. Ass.*

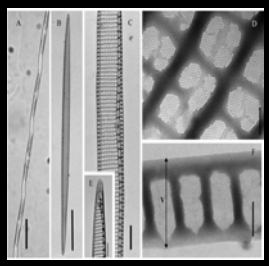
Harmful diatom - *Pseudo-nitzschia*

ten species; two toxic; three species reported for the first time in the Southern Hemisphere

P. multistriata

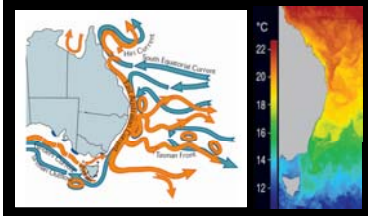


P. cuspidata



Ajani et al. 2013 in prep.

Port Hacking 100m coastal station (1953)



In summary

- algal are generally good (and extremely beautiful)!
- majority of 'visual' blooms are harmless water discolourations
- bloom management via RACCs
- harmful algal blooms require surveillance for aquaculture and human health
- (decadal) changes in phytoplankton are being observed offshore

Thank you

Image: Craig Greenhill