Application of health guideline levels for cyanobacterial toxins in seafood from the Gippsland Lakes

Rachael Poon
Water Program – Department of Health Victoria
3rd Cyanobacterial Workshop Canberra August 2012
Gippsland Lakes - Background

- Department of Sustainability and Environment (DSE) - Regional Coordinator
- Department of Health – Provide advice potential health effects of cyanobacteria
- At the time the Department of Health was responsible for seafood safety under the *Food Act 1984*
Nodularia spumigena blooms 1999 & 2001

- Elevated levels of nodularin in fish, mussels and prawns.
- Orders issued under the Food Act 1984 by Chief Health Officer forbidding the sale or supply of seafood from the Gippsland Lakes
- Health risk assessment completed 2001, health guideline levels derived for fish, mussels, prawns.
Nodularia spumigena bloom 2002

- Chief Health Officer issued advisory for fish, mussels and prawns - health guideline values 2001
- Restriction - harvest and sale of whole fish and prawns landed within 10 km radius of Lakes Entrance

<table>
<thead>
<tr>
<th>Seafood Sample</th>
<th>1999 Nodularin concentration (µg/kg)</th>
<th>2002 Nodularin concentration (µg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Mussels (whole)</td>
<td>900</td>
<td>2725</td>
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<tr>
<td>Prawn flesh</td>
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</table>
New research

- 2007 Australian National Children’s Nutritional and Physical Activity survey (seafood consumption of consumers aged 2-16 years and > 17 years)
- Research on uptake and depurination of nodularin in seafood from the Gippsland Lakes (Myers et al, 2011)
- Studies on fish movement within the Gippsland Lakes (Hindell 2008)
- Biology and life cycles of prawns in Gippsland Lakes (Montgomery 2010)
Scientific Advisory Group

Professor Brian Priestly (Chair)
Director, Australian Centre for Human Health Risk Assessment

Dr Andrew Humpage
Senior Biochemist, Australian Water Quality Centre
Affiliate Professor, University of Adelaide, Department of Health Sciences and Flinders University Medical School

Dr Utz Muller
Principal Toxicologist, Food Standards Australia New Zealand

Dr Graeme Allinson
Principal Research Scientist, Food & Health Sciences, Department of Primary Industries

Associate Professor Glen Shaw
School of Public Health, Griffith University

Em Professor Ian Falconer
Water Quality Consultant
### Health guideline values 2011

<table>
<thead>
<tr>
<th>Toxin</th>
<th>Health guideline value μg/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fish</td>
</tr>
<tr>
<td>Cylindrospermopsin</td>
<td>18</td>
</tr>
<tr>
<td>Microcystin/Nodularin</td>
<td>24</td>
</tr>
<tr>
<td>Saxitoxin*</td>
<td>800</td>
</tr>
</tbody>
</table>

* International health guideline level adopted by FSANZ food standard 1.4.1
Health Risk Assessment for Cyanobacterial Toxins in Seafood

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4 Food Standards Australia New Zealand, 55 Blackall Street, Barton, ACT 2600, Australia
5 Australian Water Quality Centre, SA Water, GPO Box 1751, Adelaide, SA 5001, Australia
6 School of Public Health, Griffith University, Gold Coast Campus, Queensland 4222, Australia
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8 Pharmacology, Medical Sciences, University of Adelaide, Adelaide, SA 5005, Australia

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Health Guideline Value Consultation - 2011

- Commercial fishing industry
- Presented the health risk assessment
- Discussed options to sell whole fish/fillets/gutted fish if fish were affected by toxins (advised only viable to sell whole fish and whole prawns)
- Early testing - more lead time for fishers prior to advisories
- DH coordinated *Protocol for managing risks to seafood safety from BGA toxins in the Gippsland Lakes*
- Greater transparency - science informing advisories
- Industry to provide input on seafood sampling protocol
Gippsland Lakes Nodularia bloom 2011-2012

- DSE notified high levels of *N. spumigena* November 2012
- Priority to determine whether nodularin toxins were produced
- Toxin accumulation in seafood from the Gippsland Lakes?
- Seafood sampling protocol
Seafood sampling protocol working group

Representative seafood sampling protocol

- Key agencies: DPI, EPA, DSE (PrimeSafe declined)
- Biostatisticians – Arthur Ryler Institute/DSE
- Biometrician - Arthur Ryler Institute/DSE
- Commercial fishing representative
- Monash University – School of Chemistry
Seafood sampling sites

Map showing locations of seafood sampling sites.
Whole Fish Results

Nodularin (ug/kg) in whole fish by sample location and sample date

- Eagle Bay
- Tambo Bay
- Metung
- Point Turner
- Wattle Point
- Health Guideline Value = 24
- Jones Bay

Date of sampling

Plot Area
Blue Mussel results

Nodularin (ug/kg) in mussels

Date
19/12/2011, 20/12/2011, 21/12/2011, 22/12/2011, 23/12/2011, 26/12/2011, 28/12/2011, 31/12/2011, 1/01/2012, 2/01/2012, 5/01/2012, 6/01/2012, 7/01/2012, 9/01/2012, 10/01/2012, 13/01/2012, 14/01/2012, 16/01/2012, 17/01/2012, 18/01/2012, 20/01/2012, 21/01/2012, 22/01/2012, 23/01/2012, 24/01/2012, 25/01/2012, 26/01/2012, 27/01/2012, 28/01/2012, 29/01/2012, 30/01/2012, 2/02/2012, 3/02/2012, 4/02/2012, 5/02/2012, 6/02/2012, 7/02/2012, 8/02/2012, 9/02/2012, 10/02/2012, 13/02/2012, 14/02/2012, 15/02/2012, 16/02/2012, 20/02/2012, 21/02/2012, 22/02/2012, 23/02/2012, 24/02/2012, 26/02/2012, 27/02/2012, 28/02/2012, 29/02/2012, 2/03/2012, 3/03/2012, 6/03/2012, 7/03/2012, 8/03/2012, 9/03/2012, 12/03/2012, 13/03/2012, 14/03/2012, 15/03/2012, 16/03/2012, 19/03/2012, 20/03/2012, 21/03/2012, 22/03/2012, 23/03/2012, 26/03/2012, 27/03/2012, 28/03/2012, 29/03/2012, 30/03/2012, 2/04/2012, 3/04/2012, 4/04/2012, 5/04/2012, 6/04/2012, 9/04/2012, 10/04/2012, 11/04/2012, 12/04/2012, 13/04/2012, 16/04/2012, 17/04/2012, 18/04/2012, 19/04/2012, 20/04/2012, 23/04/2012, 24/04/2012, 25/04/2012, 26/04/2012, 27/04/2012, 30/04/2012, 1/05/2012

Nodularin (ug/kg)
0, 100, 200, 300, 400, 500, 600, 700, 800

Value Axis Major Gridlines

Legend:
- Kalimna
- Nungurner
- Metung
- HGV
• Updated health guideline values were implemented in the 2011-2012 N. spumigena bloom

• CHO issued seafood safety advisories based on seafood sampling results

• Representative seafood sampling protocol was developed with input from all agencies and commercial fishing industry

• Seafood sampling data communicated directly to fishermen and also made available online

• Multiple factors affect toxin production, toxin uptake in seafood can’t be predicted. Variation from bloom to bloom. Testing is required in each instance to determine level of toxin uptake in seafood.
Acknowledgements

Department of Health

Water Program
Environmental Health
Jennifer Muscat

Gippsland Region
Sam Kelly, Tim Owen

Communicable Diseases Prevention & Control:
Joy Gregory, Robert McKenzie

Dr Simon Slota-Kan
Dr Rosemary Lester

Emergency Management
Julian Meagher

Incident Management Team

DSE, DPI, EPA underway monitoring, Monash University (School of Chemistry), Jonathan Smith (water quality analyst), East Gippsland Shire Council, Wellington Shire Council, Tourism Victoria, Destination Gippsland, Lakes Entrance Fishermans Co-Operative Limited, Victoria Police, East Gippsland Catchment Management Authority, Gippsland Coastal Board

Department of Sustainability & Environment/Arthur Ryler Institute

Dr Jeremy Hindell

NSW Department of Primary Industries

Dr Stephen Montgomery

Gippsland Lakes Commercial Fishers
How the health guideline values were derived

1. Determine the Tolerable Daily Intake (TDI) for each toxin

2. Determine the acceptable limit of toxin consumption per person per day

3. Define a high level intake of seafood per customer per day

4. Derive a health guideline level for toxin in seafood
### Summary of results

<table>
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<tr>
<th>Seafood Sample (whole)</th>
<th>Health guideline value µg/kg</th>
<th>Maximum detection µg/kg</th>
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<tbody>
<tr>
<td>Blue Mussels</td>
<td>51</td>
<td>740</td>
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<tr>
<td>Black Bream fish</td>
<td>24</td>
<td>203</td>
</tr>
<tr>
<td>Black Bream (gilled and gutted)</td>
<td>24</td>
<td>&lt; 16</td>
</tr>
<tr>
<td>School Prawns</td>
<td>32</td>
<td>270</td>
</tr>
<tr>
<td>Eastern King Prawns</td>
<td>32</td>
<td>299</td>
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Nodularin uptake in seafood

Maximal nodularin concentrations in seafood samples from the 1999 and 2001 *N. spumigena* blooms

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