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TO: Department of Planning and Infrastructure

Submission re: SSI 5657
Commercial Shellfish Aquaculture Leases, Jervis Bay, NSW

'Approximately 86 per cent of Australians live in the coastal zone and value coastal recreation and tourism, resources and conservation'
Dr John Parslow, CSIRO Marine and Atmospheric Research.[1]

As a regular visitor to Callala Beach, I submit my strong objection to placing Aquaculture Leases 1.5k from the shore for the following reasons.

1. INJURY FROM STEPPING ON SHELLS

The left picture is a cut from an oyster shell and the right one is a cut from a mussel shell.

Many children and families, including my six granddaughters, play on the beach beside the proposed aquaculture shellfish leases. I do not believe that the Department can guarantee that, in all of their holiday playing, they will not step on a fresh sharp piece of septic mussel shell. The shells naturally washed up on the beach are well worn and pose nowhere near the risk.

Families would be unnecessarily distressed if a child were so injured. A parent would need to find a doctor, or travel to Nowra to hospital for treatment which may take some hours. The child would be distressed, perhaps need anaesthetic injection to remove fragments and cleaning, plus antibiotics to prevent infection because these

[1] http://www.csiro.au/Outcomes/Oceans/Marine-Life/Managing-Coastal-Waters.aspx

shells are septic. Were the injury serious, he or she may miss some school. Were the parent single, of course the rest of the family would need to traipse to the hospital. A female Quay Road resident recently nearly lost her left forearm from a fragment of a prawn shell embedded in her finger which became seriously infected. Marine shells can be dangerous sources of infection. Who would be liable for public injury caused by broken shells?

The Department cannot guarantee that NO fragments of fresh sharp-edged shells would EVER wash up on Callala Beach 1.5k from the proposed aquaculture lease, therefore, for the health and safety of my grandchildren and other peoples' children, I strongly reject this proposal.

This argument is sustained by Gulf of Maine Aquarium (2005) in their study on *The Effect on Humans and How to Control*, "The mussels not only affect humans by washing up on the shore and cutting feet but also fouls … culverts, waterways …"[2] and, "When the zebra mussels coat bathing beaches, the sharp-edged mussels cut the tender feet of swimmers".[3]

> **If the Department cannot guarantee that no child or adult will be injured and/or become ill from the impact of inadvertent contact with fresh sharp shell from the lease, the leases should not be installed.**

2. INGESTION OF TOXIC MATERIALS

> "A variety of chemicals are used in coastal aquaculture. These include: therapeutants, disinfectants, anaesthetics, biocides, hormones and growth promoters to control predators, prevent and control diseases and parasites and to alter sex, productive viability and growth of cultured organisms".[4]

When disinfectants or treatments are administered around the leases, Ludyanskiy and McDonald (1993)[5] suggest that fish recruitment and growth may also be affected. For example, "When the zebra mussel feeds and cleans the water, it deposits these contaminants by way of waste, or pseudo feces, which is mucous combined with the contaminants". These faeces fall to the benthos and interfere with normal microbial balance. This interference with the natural and existing balance would perhaps be an overlooked and under-researched negative impact upon the quality of the water in which my grandchildren swim and, at times, in the natural course of their swimming activities, swallow.

> **The consequences of subsequent possible illnesses of people who ingest such contaminated water is not worth the risk.**

Whereas sewage is not pumped into Jervis Bay, there could be lessons to be learned from a study by Zhai (2002)[6]. This Abstract (below) represents a study of

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[2] Effects of Zebra Mussels as an Invasive Species http://bioclass102.tripod.com/
[3] Human Impact: Zebra mussels http://octopus.gma.org/surfing/human/zebra.html#sthash.NuaVpWB3.dpuf
[4] 3. Coastal aquaculture and the environment: The context http://www.fao.org/docrep/t0697e/t0697e04.htm
[5] Ludyanskiy, Michael L., McDonald, Derek. What are the Impacts of Introduced Species? "Impact of the Zebra Mussel, A Bivalve Invader." Bioscience 43.8 (1993): 1-19. http://tiee.ecoed.net/vol/v1/figure_sets/species/species_back1.html
6 Interactions of Aquaculture and Waste Disposal in the coastal zone http://www2.ouc.edu.cn/xbywb/web/filedata/02010102.pdf

aquaculture in coastal zones. The study shows that aquaculture and sewage creates health problems for the environment and for humans where they overlap. It creates the potential for toxic blooms and eutrophication[7] which may destroy the health of whole ecosystems. Shellfish growing in sewage polluted waters accumulate micro-organisms including human pathogenic bacteria and viruses. Despite the fact that Callala Beach does not have a sewer outlet, I am not convinced that the potential for toxic blooms does not exist, especially in light of the increasing tendency for unpredictable major storms and flash floods to wash excessive drainage materials into the bay. Bivalves growing in areas affected by toxic algae blooms may accumulate toxins which can be harmful to humans. It is not known how clean the 30% of water from the local REM scheme is uncontaminated waste.

> "A Review of the Effects of Algal Blooms on Shellfish and Aquaculture ... In addition, blooms can appear and render shellfish toxic virtually overnight. The presence of toxic algae and the potential for blooms have clear, negative effects on the development of aquaculture … [8]
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> **The possibility of my grandchildren and others ingesting toxic blooms and human pathogenic bacteria and viruses, is unacceptable.**

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Interactions of Aquaculture and Waste Disposal in the Coastal Zone

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Abstract Throughout the world, the coastal zones of many countries are used increasingly for aquaculture in addition to other activities such as waste disposal. These activities can cause environmental problems and health problems where they overlap. The interaction between aquaculture and waste disposal, and their relationship with eutrophication are the subjects of this paper.

Sewage discharge without adequate dispersion can lead to nutrient elevation and hence eutrophication which has clearly negative effects on aquaculture with the potential for toxic blooms. Blooms may be either toxic or anoxia-causing through the decay process or simply clog the gills of filter-feeding animals in some cases. With the development of aquaculture, especially intensive aquaculture, many environmental problems appeared, and have resulted in eutrophication in some areas. Eutrophication may destroy the health of whole ecosystem which is important for sustainable aquaculture.

Sewage discharge may also cause serious public health problems. Filter-feeding shellfish growing in sewage-polluted waters accumulate micro-organisms, including human pathogenic bacteria and viruses, and heavy metal ion, presenting a significant health risk. Some farmed animals may also accumulate heavy metals from sewage. Bivalves growing in areas affected by toxic algae blooms may accumulate toxins (such as PSP, DSP) which can be harmful to human beings.

Key words waste disposal; aquaculture; environmental problems

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[7] … excessive richness of nutrients in a lake or other body of water, frequently due to runoff from the land, which causes a dense growth of plant life and death of animal life from lack of oxygen.
[8] A Review of the Effects of Algal Blooms on Shellfish and Aquaculture, Sandra E. Shumway http://onlinelibrary.wiley.com/doi/10.1111/j.1749-7345.1990.tb00529.x/abstract

This argument is backed up by a study[9] on coastal ecosystems where, over four decades, 269,000 hectares (660,000 acres) of Indonesian mangroves were converted to shrimp farms. Most of these farms were abandoned within a decade because of the toxin build-up and nutrient loss. Continuing on in this study, salmon farms are typically sited in pristine coastal ecosystems which they then pollute. It was stated that:

> "… a farm with 200,000 salmon discharges more fecal waste than a city of 60,000 people. This waste is discharged directly into the surrounding aquatic environment, untreated, often containing antibiotics and pesticides. There is also an accumulation of heavy metals on the benthos (seafloor) near the salmon farms, particularly copper and zinc".

Whereas a salmon farm and the proposed aquaculture leases may not be comparable in terms of impact, that there will be an increase in faecal waste in the water is undeniable, the impact of which is frighteningly unknown.

The possibility of anyone ingesting such faecal waste as they swim and play is unacceptable.

3. NAVIGATION DANGER

The two most popular recreational fishing locations in Jervis bay are Longnose Point and Middle Ground reef. Following an evening of fishing, residents of Callala Beach travel from Middle Ground reef and/or Longnose Point back to Callala Beach after sundown. The proposed lease sites are directly in the path of the route taken by recreational anglers. Navigating the leases at night would present a danger to the anglers' crafts from Callala Beach. An alternate location that is not in the direct path of the route the recreational angler uses when they go fishing should be found.

The leases would present a dangerous hazard for anglers returning home at night, risking physical personal injury and damage to craft.

4. IMPACT ON PHYSICAL AND MENTAL HEALTH

Callala Beach and other local beaches are promoted in the tourism industry as having the 'whitest sand on earth'. This claim, and the beauty and calm of Jervis Bay, entices people to the area for recreation to support physical and mental health.

The EIS finds that there **is** a moderate risk that biofouling, or that diseases, parasites and pests could be introduced (EIS, Table 1, p.vi). That these materials and other waste from the aquaculture leases could wash up onto these pristine beaches is unacceptable especially as currently the beach provides a safe swimming environment for local and holidaying children and families. Very frequent and regular washing up of natural marine materials such as seaweed dumps and debris on the beaches, so we consider that onshore biofouling represents **a very high risk.** The risk of anyone becoming ill or injured from biofouling materials whilst enjoying the beauty of the bay is unacceptable.

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[9] Wikipedia, Aquaculture, Common welfare concerns
http://en.wikipedia.org/wiki/Aquaculture#Common_welfare_concerns
Hinrichsen D (1998) Coastal Waters of the World: Trends, Threats, and Strategies Island Press. ISBN 978-1-55963-383-3
Meat and Fish AAAS Atlas of Population and Environment. Retrieved 4 January 2010.

If the Department cannot give a 100% guarantee that no illness or injury would result from the physical or bacterial impact of the proposed leases, then they should not be installed anywhere near where people swim or watercraft. Even if this risk was slight, and the EIS states it is a moderate risk; this is not acceptable.

Yours sincerely

Bronte Somerset, MEd., EdD. 2 November 2013