

# NSW DEPARTMENT OF PRIMARY INDUSTRIES

## JOHN HOLLIDAY STUDENT CONSERVATION AWARD

– 2007 –

**2007 WINNER**

Amy Smoothey



**Winner of the 2007 John Holliday Student Conservation Award**

*Picture from left to right: NSW DPI's Chief Scientist, Prof. Steve Kennell, Dr Amy Smoothey (winner);  
Mr Alexander Holliday (John Holliday's son) and Mrs Sue Holliday (John Holliday's wife) .*

### OTHER ENTRIES RECEIVED FOR 2007

*(in alphabetical order of surname)*

Katherine Dafforn  
Marcus Miller  
David Roberts

\*\*\*\* 2007 WINNING ENTRY \*\*\*\*

## Understanding the habitat-requirements of two species of harvested gastropods

By Amy Smoothey

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### **Summary**

Harvesting of invertebrates for food and bait is widespread in coastal areas world-wide. Along the coast of New South Wales, many intertidal and subtidal invertebrates are harvested for recreational and/or commercial use, often with little knowledge of their ecology. *Turbo undulates* is an intertidal turban snail collected recreationally for food; the larger *Turbo torquatus* is predominately found subtidally, where it is the target of a small-scale commercial fishery. Before these species could be effectively managed in an ecologically sustainable way, a comprehensive understanding of the processes that influence their distributions, abundances and sizes is necessary.

One process widely recognized to influence abundances of organisms is structural complexity of habitat, usually with more organisms in structurally complex habitats. Extensive sampling of intertidal rock-platforms along the coast of NSW, showed the *T. undulates* were more abundant in complex habitats (such as mats of Neptune's necklace; *Hormosira banksii*, beds of cunjevoi; *Pyura stolonifera* and coralline turf) than in an adjacent simple habitat ('bare rock'). Similarly, more *T. torquatus* were found where habitat is complex (e.g. kelp, *Ecklonia radiata*) than where it is simple (barrens). Therefore, for these two species in intertidal versus subtidal habitats, similar associations occur between complexity of habitat and numbers of animals. To understand some of the mechanisms generating these patterns (intertidally and subtidally), models about the importance of each snails' local environment and/or type of habitat were evaluated by testing relevant hypotheses using experiments. Results suggest that for each species, greater numbers were maintained amongst seaweeds (e.g. *H. Banksii* and kelp) by the movement of the snails in response to physical or biological features of the seaweeds as opposed to the 'local environment' i.e. where the seaweeds are sound. Importantly, this knowledge of habitat-requirements and the influences of habitat on the numbers and sizes of these gastropods are necessary for the conservation of these species and their habitats and will provide some of the information necessary for management of the turban shell fishery. This study also provides a comparative example of how similar types of habitats influence patterns of distribution, abundance and size-structure of two closely-related species that live in habitats but in quite different systems (intertidal and subtidal environments).

# Differential effects of tributyltin and copper anti-foulants on recruitment of non-indigenous species

By Katherine Dafforn

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## **Summary**

Maritime vessels play an important role in the transport of many marine invasive species. Vessels can be classified as either commercial or recreational and the two categories differ in vessel size, speed, distance traveled and anti-fouling (AF) methods. For the past two decades in Australia, the active biocidal agent in AF paints used by most commercial vessels has been tributyltin (TBT), whereas recreational vessels have been restricted to alternatives, most commonly containing copper. I deployed settlement plates painted with a collar of copper or TBT AF paint, and unpainted control plates, in commercial and recreational embayments in Port Jackson, Australia. The plates were used to collect sessile invertebrates and these fouling communities were sampled photographically after five and ten months. Copper enhanced early recruitment of several invasive species, whereas recruitment of native species was typically reduced by copper. TBT limited the recruitment of invasive species for just five months and native species for the entire study.

My research has highlighted the potential role of copper in both the transport of some tolerant species to new regions and in providing an advantage to those species once they reach the new region. These results also suggest that the use of toxic AF paints, and the accumulation of AF biocides in embayments has the potential to negatively affect native species. Managers should consider highly polluted estuaries at greater risk of marine invasion and take steps to restore water quality to enhance native species resistance.

# Key biological parameters and commercial fishery for ocean leatherjackets *Nelusetta ayraudi* (Monacanthidae) off New South Wales, Australia

By Marcus Miller

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## Summary

Ocean leatherjackets (*Nelusetta ayraudi*) are distributed along the entire coast of New South Wales (NSW) contributing significantly to the total catch of fish taken from the NSW Ocean Trap and Line Fishery (~ 340 tonnes in 2005/2006), in addition to other NSW fisheries, such as the Ocean Fish, Ocean Prawn and Haul-net fisheries.

In spite of their significance in commercial fisheries world-wide, only a few studies have aged monacanthids. Of those, researchers have mainly used bony structures, such as vertebrae and anterior dorsal spines. In this study, commercially captured ocean leatherjackets were aged by counting growth increments in thin-sectioned otoliths. The periodicity of increment formation was validated using a vital stain oxy-tetracycline (OTC) injected into young of the year fish (0+). The von Bertalanffy growth function parameters provided good estimates of growth,  $k = 0.163 \text{ yr}^{-1}$ ,  $t_0 = -0.565 \text{ yrs}$ , and  $L_\infty = 886 \text{ mm}$ .

The fishery was found to be dominated by two and three year old fish, making up 83% of the ocean leatherjackets captured. The oldest fish (5+) and largest fish from both sexes (male – 605 mm, female – 656 mm) were found in northern NSW. All fish displayed a rapid rate of growth especially as juveniles, with no significant differences in growth between sexes and locations (southern and northern NSW).

Ocean leatherjackets showed a geographical and temporal 'preference' for spawning. Gonado-somatic indices (GSI) revealed a peak in spawning during August in northern NSW. During this period adult fish were observed, via depth soundings, in large aggregations in depths ranging from 45 to 80 fathoms. Ocean leatherjackets are pelagic egg broadcasters with no parental egg care. Oocytes from ovulated ocean leatherjackets had a mean diameter of 0.66 mm ( $\pm$  S.E 0.002). The estimated size and age at maturity ( $L_{50}$ ) for each sex was 352 mm and 2.5+ years old. Mature fish of each sex displayed clear differences in dimorphic and dichromatic features.

This research is the first internationally recognised program to successfully age a commercially harvested monacanthid species by thin-sectioned otolith with an accompanying validation program using a vital stain. This work has contributed greatly to the ongoing Resource Assessment Program (RAS) at NSW Department of Primary Industries providing a comprehensive understanding of the biological information necessary for future stock assessment of ocean leatherjackets. In addition, it has provided management with appropriate strategies to enhance the sustainability and longevity of ocean leatherjackets captured in NSW.

# Where are all the Black Bream?

By David G Roberts

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## **Summary**

Conventional wisdom has always suggested that the estuaries of southern New South Wales contain largely *Acanthopagrus butcheri* (Black Bream) with lesser numbers of *A. australis* (Yellow Fin Bream) and some extremely rare hybrids. However, I have now used a broad scale genetic survey to show that hybrids are more common than previously thought, with the area of greatest overlap of the species a 'hot spot' of hybridization. Here I use a fine-scale genetic survey of Bream within five estuaries of southern NSW to determine the frequency and consequences of hybridization for the commercially important and highly valuable *A. butcheri*. An enormously high proportion (95%) of 688 juvenile Bream within all waterways were in fact either pure *A. australis* (347) or hybrids (309); only 32 (5%) were apparently pure *A. butcheri*. Most hybrids were later generation hybrids backcrossed with *A. butcheri*— suggesting that these are long term residents (multi-generational) within estuaries. Interestingly, the higher percentages of hybrid juveniles were found within two estuaries that are generally permanently closed to the ocean— Coila and Brou Lakes (85% hybrids). My data imply that introgression and demographic swamping by hybrids threatens the persistence of *A. butcheri* populations in this area.