SMALL BIVALVE FISHERY - 2015

Vongole (Katelysia scalarina), Ansons Bay

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Ansons Bay Vongole Fishery Assessment, 2015

Summary
The commercial fishery for Vongole (*Katelysia scalarina*) clams takes place on an inter-tidal sandbar in Ansons Bay, North East Tasmania. The fishery is managed in part by a total allowable catch (TAC) that is derived from 10% of the estimated population biomass. Biomass estimates are produced following surveys at regular two-three year intervals. The survey conducted by IMAS in April 2015 resulted in a biomass estimate of 27.15 tonnes of Vongole in the fished area (95% confidence limits of 22.85 - 31.45 tonnes). A TAC of 10% of biomass would therefore be 2.7 tonnes. The biomass estimate is greatly reduced compared with the previous (2012) estimate of 133.32 (106.62 – 161.03) tonnes, and appears to have been caused by an environmentally driven decline in recruitment. The harvest strategy for this fishery does not include a limit reference point for biomass at which fishing should cease. In the absence of a limit reference point, consideration should be given to closing the fishery to harvests until the stock recovers above an agreed reference point. An example of a limit reference point for biomass is 40 tonnes, which is 70% depletion in the biomass from the fished stock surveyed in 2009.

STOCK STATUS	Environmentally limited
This species occurs state-wide, but the fishery is restricted to Ansons Bay	
IMPORTANCE	Minor fishery
STOCKS	Ansons Bay only
INDICATORS	Biomass, size-composition

Survey results
The survey was conducted by sampling from quadrats placed at regular (approx. 40 m) intervals over the fished area (estimated area 149,049 m^2). The tide was low, and the entire area of the fishery was surveyed. The position of each quadrat was recorded using a GPS receiver. 132 quadrats of area 0.0625 m^2 (i.e. a square sided 250 mm) were sampled, from which a total of 77 clams were recovered. The clams were measured, and using the length-weight relationship from previous surveys (weight = a_*length^b, where a = 0.0002, b = 3.1389), it was estimated the biomass of clams in the area was 27.15 tonnes (95% C.I. 22.85-31.45).

The results from the current and past surveys are presented below for comparison (Table 1). The 2015 estimate represents an 80% fall in biomass compared with the previous (2012) survey, and is an abrupt departure from the relatively stable range of biomass estimates between 75.68 t and 202.25 t since 1997.

During the survey, no pre-recruits or juveniles were found, and the small numbers of mature Vongole that were collected were generally larger than found in most of the previous surveys (Figure 1). In comparison, in 2002 there were two distinct groups of pre-recruits modal at 10 mm and 26 mm. The 2009 distribution also shows one group of pre-recruits, modal at 27 mm. In contrast, pre-recruits were poorly represented in the 2006 and 2012 distributions, and entirely absent in the 2015 sample distribution. Above the 32-mm LML, Vongole from the 2012 and 2015 surveys appear to be larger than

previous years, although the small number of Vongole in the most recent survey makes comparisons less reliable.

Table 1. Comparison of results obtained from surveys of Vongole beds at Ansons Bay: 1997 to 2012. The fished area was remeasured in 2008, causing a reduction in estimated area.

	1997	1998	2000	2001	2002	2006	2009	2012	2015
Total area of fishery (m^2)	185,800	185,800	185,800	185,800	185,800	185,500	149,049	149,049	149,049
Total area surveyed (m^2)	125,650	90,000	85,000	90,000	80,000	80,000	149,049	149,049	149,049
Avg. no. per quadrat (S.D.)	2.24 (1.20)	4.00 (1.57)	3.79 (1.94)	4.98 (1.35)	3.56 (2.57)	3.195 (2.60)	3.26 (2.47)	3.02 (3.43)	0.58 (0.76)
Population size ('000s)	6,671	11,890	11,261	14,811	10,598	9,483	7,783	7,196	1,391
Avg. wt. per quadrat (g) (S.E.)	25.5 (3.9)	33.2 (3.8)	50.0 (2.3)	52.61	53.78 (1.99)	53.03	53.28 (2.82)	55.91 (0.66)	11.39 (0.90)
Biomass (tonnes)	75.8	98.7	148.6	202.25	159.87	157.64	127.07	133.32 (105.62 - 161.03)	27.15 (22.85 - 31.45)

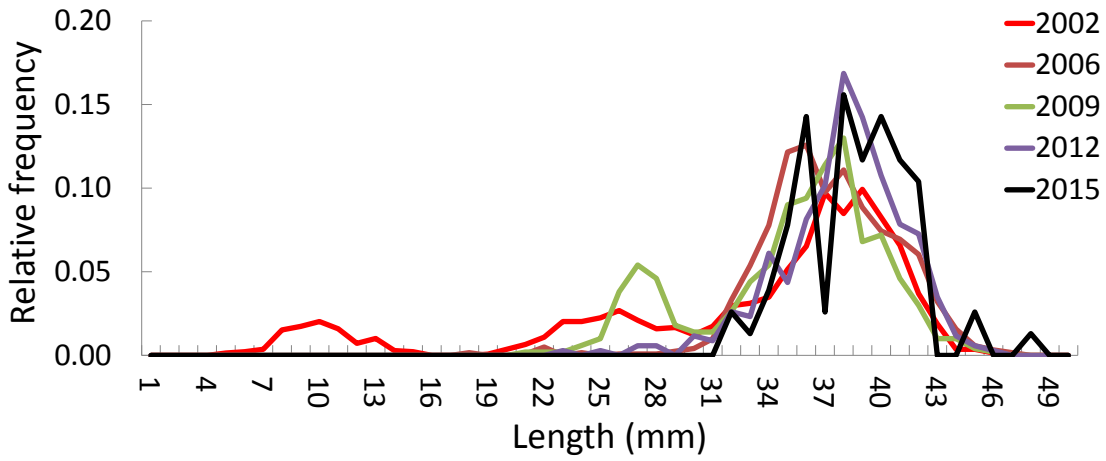

Figure 1. Size distributions of Vongole collected from Ansons Bay in surveys between 2002 and 2015.

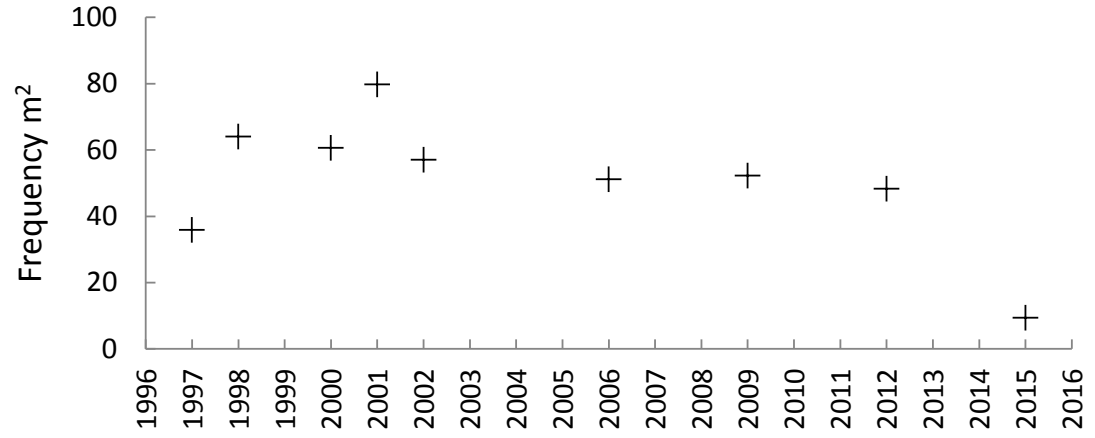

Figure 2. Estimated density (number per square metre) of Vongole collected from Ansons Bay in surveys between 1997 and 2015, derived from the average number per quadrat and fishery area (Table 1).

It was readily apparent during survey collection that there were much fewer Vongole than encountered during previous surveys (Figure 2), and that individual clams were large while juveniles were absent. The density of non-commercial bivalve species (e.g. *Katelysia rhytiphora*, *Paphies sp.*, *Callista sp.*) was remarkably low compared with previous years, although Vongole are the only species where density has been quantified . This indicated that an environmental factor had increased mortality of Vongole and other bivalves, rather than fishing mortality.

The area contained several large circular patches of accumulated dead shells of Vongole, approximately two to three metres across. This also indicated that the cause of decline of biomass was an environmental event rather than fishing mortality.

Discussion

The decline in abundance of Vongole at Ansons Bay has been rapid and extreme. The current management strategy includes limited entry (three participants), a LML of 32 mm shell length, a TAC set at 10% of the most recent biomass estimate and a review of biomass every two to three years. This harvest strategy was designed to ensure that the fishery is robust, and is at the core of its management plan (DPIPWE, 2007). Since 2007, fishing has been restricted to a defined zone within Ansons Bay as a further measure to protect the clam stocks, and birdlife from indirect effects of fishing (Taylor, 2005). Formerly, fishing occurred to the north of this zone along the bayhead spit to Shark Bay, and eastwards in the channel towards the sea. Apart from daily bag limits, there is no limit to the annual recreational catch, but it is understood that the recreational catch is insignificant in the context of the total catch.

Table 2. Summary of Vongole biomass, TAC and catch weights, 1997-2015. All weights are in kilograms. "Year" includes the period 1 September-31 August. Between 1997 and 2006, the TAC was derived by summing the weights specified on each fisher's permit. In 2007 and 2008, the TAC is unknown, but assumed to be 10% of biomass, as it was thereafter. Estimated catches between 2001 and 2005 were reported in the fishery's policy document (DPIPWE, 2007), and between 2008 and 2014 were supplied by DPIPWE. Prior to 2001, catch weights are unknown.

Year	Biomass estimate	TAC	Estimated catch
1997	75,800	9,360	?
1998	98,700	9,360	?
1999		9,360	?
2000	148,600	9,360	?
2001	202,250	9,360	9,720
2002	159,870	9,360	8,765
2003		9,360	8,310
2004		9,360	5,708
2005		9,360	4,182
2006	157,640	9,360	3,012
2007		15,764	2,299
2008		15,764	8,272
2009	127,066	12,707	8,468
2010		12,707	12,580
2011		12,707	11,940
2012	133,320	13,332	12,895
2013		13,332	9,174
2014		13,332	458

Annual catches in the fishery have been limited by the ability of fishers to sell clams for an economically viable price so that the TAC has only been reached once (Table 2).

Consequently, annual catches have been less than 10% of the available biomass and overfishing risk appears low under normal conditions. The size structure of the population indicates that exploitation rate has been very low with no truncation of the size distribution towards the LML in 2012 and 2015 (Figure 1).

The most probable cause for the population collapse appears related to both the low levels of pre-recruits observed in the 2006, 2012 and 2015 surveys (Figure 1), exacerbated by sporadic events of high natural mortality and ongoing fishing mortality of recruited Vongole.

There have been similar natural mortality events in the past with Venus Clams (*Venerupis largillierti*) in Georges Bay on the sandbars near Akaroa, 25 km to the south of Ansons Bay. These are an introduced sub-tidal species (Grove, 2011) that opportunistically colonised the sandbanks at Akaroa. A collapse in this fishery was caused by several extreme rainfall events in the Georges Bay catchment between 2004 and 2011, and consequent prolonged periods of low salinity, which killed much of the marine life in shallow water, including all Venus Clams (A. Flintoff, pers. comm.).

In contrast to Venus Clams, Vongole are an estuarine inter-tidal species (Maguire, 2005) adapted to large-scale salinity fluxes typical of Tasmania's east coast estuaries (Bellchambers et al., 2005), to which they respond like many other shallow-water bivalves by closing their valves (Dame, 1996). At Ansons Bay, the Vongole fishery survived the floods that devastated the Georges Bay southern zone Venus Clam fishery, but with apparently high levels of mortality among juveniles. Juveniles were found to be less likely to have their valves closed during periods of low salinity (Bellchambers et al., 2005) and perhaps this explains the between-survey variability in levels of pre-recruits (Figure 1).

Assessments of the Vongole fishery occur every two to three years. In recent years clam prices have been at low levels and participation rates by fishers have been reduced to the extent that their ability to monitor the fishery is also reduced. Consequently between successive assessments, fishery managers have been unaware of the apparent large-scale changes to the Ansons Bay stock of Vongole. This level of uncertainty is one reason why the normal harvest rates are set at the conservative level of 10% of the estimated biomass.

Although the Vongole TAC decision rule is conservative under normal situations, it doesn't respond to collapse in stock as seen recently. Harvest strategies normally include a limit reference point to prevent harvests of the stock when density is at very low levels. The intent of these limits is to ensure that fishing harvests don't impact future recruitment and delay recovery. A suggested limit reference point for this fishery is 40 tonnes of biomass. This is approximately 30% of the biomass estimated in the 2009 survey, the first estimate after the spatial area of the fishery was redefined. A 30% limit is consistent with limits used in fisheries elsewhere, such as Commonwealth scalefish. If this limit were applied to this Vongole fishery then it would imply that the fishery would need to be closed until future surveys show that recruitment and biomass have recovered.

Reference points

Performance indicators	Proposed reference points	Breached?
Biomass	< 40 tonnes (30% of 2009 biomass estimate)	yes
Stock stress	Significant change in size composition, particularly with regard to pre-recruits.	yes

Species biology

Parameters	Estimates	Source
Habitat	• Intertidal • Soft sediments in sheltered habitats • 2-4 cm depth	(Bellchambers et al., 2005)
Distribution	Southern NSW to southern WA, inc Vic, Tas, and SA	(Grove, 2011)
Natural mortality	0.24-0.35 pa	(Riley et al., 2005)
Maximum age	> 20 years	R. Green, DPIPWE (pers. comm.)
Length-weight relationship	Maximum length 48 mm $W=a*L^b$, where a= 0.0002, b= 3.1389	IMAS field surveys
Spawning	Predominantly in spring and summer	(Maguire and Kent, 2005)

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