ASSESSMENT OF THE 2008 RECREATIONAL GAMEFISH FISHERY OF SOUTHEAST TASMANIA, WITH PARTICULAR REFERENCE TO SOUTHERN BLUEFIN TUNA

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Executive Summary

A recreational gamefish fishery has existed in Tasmania for many years, but limited information is available in relation to levels of catch and participation. In the context of the overall recreational fishery, gamefishing is a relatively small but specialised component that has a high profile in terms of the species targeted, capital investment in boats and fishing gear, and tourism impacts.

The primary aim of this study was to quantify the catch of southern bluefin tuna (SBT) by recreational fishers in Tasmania. It also provides catch information on other gamefish species. The survey utilised boat ramp surveys (including coverage of gamefishing competitions) and charter boat logbooks. The boat ramp survey was the primary survey technique as it provided an effective means of sampling private-boat anglers. The survey was conducted at both the Pirates Bay (Tasman Peninsula) and Southport boat ramps between April and June 2008.

The boat ramp surveys indicated that during the survey period 215 SBT (177 retained) were caught from the Tasman Peninsula with a harvested weight of 5.0 tonnes. A further 112 SBT were caught and retained out of Southport weighing 3.6 tonnes. Fishing activity for a sub-set of gamefishers undertaken prior to the start of the boat ramp surveys indicated that at least 68 SBT were caught by private boat fishers earlier than April, with 58 of which were retained representing an estimated weight of 1.5 tonnes. Therefore the total harvest estimate from the recreational sector (excluding charter boat catch) fishing off south eastern Tasmania is 395 SBT with a retained catch of 347 weighing 10.1 tonnes.

A further 162 SBT were taken from charter boats with 133 being retained, giving a retained catch weight for the Tasman Peninsula of just over 3.9 tonnes. However, since catch information was unavailable for several key operators, these values are known to underestimate the magnitude of the charter catch.

By combining available catch estimates for recreational and charter sectors a catch of 557 SBT (95% CI = 422-708) was derived, 480 (95% CI = 365-609) of which were retained representing a harvested weight of 14.0 tonnes (95% CI = 10.6-17.7) for south eastern Tasmania in 2008. For several reasons these represents minimum estimates. Firstly the temporal and spatial scale of sampling did not cover the entire fishery, for instance any private vessels (including motor cruisers) operating out of access points other than Pirates Bay and Southport were not covered and any fishing and catches taken prior to April were under-represented. Charter boat catches of SBT were reported earlier in the season, suggesting that this latter issue may have been significant. Furthermore, coverage of the charter fleet was incomplete, the magnitude

of catches taken by those operators not represented have the potential to be significant.

As the wider issues relating to the management of the tuna fishery and rights of recreational fishers have yet to be fully defined, it is unclear what level of future monitoring may be required. The current study provides insight into the recreational and charter fisheries and highlights some of the logistical issues that will need to be addressed in the development of any future monitoring programs that support the management of the fishery.

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1. Introduction

Recreational fishing is a popular pastime for Tasmanians with an estimated one in four people over the age of five engaging in some form of recreational fishing activity (Lyle *et al.* 2009). In terms of participation, gamefishing represents a relatively minor and specialised component of the overall fishery but in terms of social and economic impacts the fishery is considered to be particularly significant. Many gamefish participants are particularly avid, generally investing significant resources in vessels and equipment to effectively target this fishery. Through direct expenditure, gamefishing is generally considered to provide disproportionately high financial inputs into regional economies, particularly the north east (St Helens) and south east (Tasman Peninsula) coastal regions. In addition to the private-boat fishery, a charter industry has developed around gamefishing opportunities in Tasmania and several well structured organisations and events are focused around the fishery with tourism opportunities also generated by the high quality of gamefishing in Tasmanian waters.

Despite the significance of the fishery in Tasmania there has been limited research conducted into any aspects of the fishery. Preliminary surveys of the charter fishery were conducted in the early 1990s (Smith 1994, Evans 1995) and a targeted gamefishing survey was conducted in 2003 (Morton & Lyle 2003). More recently a post-graduate research project has focussed on socio-economic aspects of the private- and charter-boat fisheries for gamefish, the results of this study while confirming the socio-economic significance of the fishery are not currently available (S. Frijlink, unpubl. data). More general state-wide surveys of recreational fishing conducted in 2000/01 (Lyle 2005) and 2007/08 (Lyle *et al*. 2009), while revealing the gamefishery in the context of the overall recreational fishery, provide only general detail about this fishery.

The gamefishing season in Tasmania is typically limited to between January and June and is concentrated in waters extending out to the shelf break along the north-east, east and south coasts. St Helens in the north-east, Eaglehawk Neck (Pirates Bay) in the south-east and Southport in the south are recognised as regional epicentres of gamefishing activity. Gamefishing activity also occurs off Flinders Island.

The fishery targets several large pelagic species including; yellowfin tuna (*Thunnus albacares*), southern bluefin tuna (*Thunnus maccoyii*), albacore (*Thunnus alalunga*) and skipjack tuna (*Katsuwonus pelamis*) and mako shark (*Isurus oxyrinchus*). Catches of black marlin (*Makaira indica*) and striped marlin (*Tetrapturus audax*) are also occasionally taken. The premier and arguably most sort after species being the southern bluefin tuna (SBT). However, species composition and abundance are highly variable throughout the season and between years.

SBT is a valuable species that forms the basis of a significant commercial fishery in Australia and other countries in the Asia-Pacific region. The species is regarded as overfished globally, with the spawning stock considered to be severely depleted (BRS 2007). SBT was listed as critically endangered in 1996 by the International Union for

the Conservation of Nature (IUCN 2000) and in October 2006 SBT was listed under the Threatened Species Protection Act 1995.

The Convention for the Conservation of Southern Bluefin Tuna (CCSBT) determines global total allowable catches (TAC) and quota allocation among member countries. Australia has committed to maintain its TAC within Australian waters at the last agreed commission limit of 5,265 tonnes. As the statutory authority commission for Commonwealth Fisheries, the Australian Fisheries Management Authority (AFMA) allocates the entire TAC for SBT to the commercial sector within the Australian Fishing Zone (AFZ). The 2002 Southern Bluefin Tuna Assessment Report recognises that the Southern Bluefin Tuna Fishery Management Plan (1995) does not cover the recreational sector and that recreational catch data is important to the management of the fishery. The crossover between the recreational and the commercial sector with respect to the resource share of Tasmania's SBT fishery was predicted to be a contentious issue in the management review of this valuable resource (Galeano *et al*. 2004). In the context of international management obligations, Australia is vulnerable to criticism since recreational catches are taken outside of the Australian TAC and, furthermore, the non-commercial harvest is not factored into the stock assessments.

The management of SBT in Australia is complex, while AFMA manages the commercial sector, the States have jurisdiction over the recreational and charter boat sectors. In Tasmania, the Department of Primary Industries, Parks, Water and Environment (DPIPWE) manages the recreational gamefish and charter boat fisheries. Under existing regulations the SBT catch is regulated by a combined possession limit of two fish for any of SBT, Yellowfin tuna, and Bigeye tuna (*Thunnus obesus*), and a possession limit of 10 fish applies for Albacore tuna.

Traditionally, the recreational SBT fishery in Tasmania was focused around the Tasman Peninsula (particularly from Pirates Bay), with most catches taken between April and May and occasional catches as early as January and as late as July. Sporadic catches of SBT have also been reported in the past from as far north as Flinders Island. In recent years there has been increased activity (and catches) off southern Tasmania, particularly south of Bruny Island and around Pedra Branca (approximately 20 nautical miles south of the Tasmanian mainland). SBT are also targeted in recreational fisheries off Victoria and South Australia. Very little information is available about these fisheries apart from mainly anecdotal reports in recreational fishing magazines and fishing websites.

This primary objective of this study is to estimate the size of the recreational SBT catch for the 2008 season and provide basic operational information about the fishery and characteristics of the catch.

2. Methods

2.1 Survey design

2.1.1 Overview

The gamefishery is undertaken from privately operated trailer boats and motor cruisers as well as from charter boats, with some fishers utilising both charter and private boats within a given fishing season. Recognising these different fishing modes, a methodological approach utilising two primary sources of information was adopted, namely boat ramp surveys for the private boats and voluntary fishing logbooks for the charter sector.

The focus of this study was gamefish fishing activity off the Tasman Peninsula and the south coast, mainly around Bruny Island and Pedra Branca. In practice, logistic and financial restrictions meant that active sampling (boat ramp survey) was constrained to the April to June period, and was limited to two major access points, Pirates Bay and Southport. Charter boats fishing for SBT also operate primarily out of Pirates Bay and Southport due to their proximity to the fishing grounds.

2.1.2 Boat ramp surveys

The on-site survey component was implemented to cover the period when most fishing for SBT was anticipated, i.e. April to June 2008, and was conducted at the Pirates Bay and Southport boat ramps (Fig. 1). These ramps have traditionally represented key access points for fishers targeting SBT. However, trailer boat fishers also use alternative boat ramps to access the fishery, which along with a relatively small number of motor cruisers that use marinas, means that coverage of the private-boat fishery was incomplete and catch and effort estimates need to be regarded as minimum values.

The survey involved a stratified random sampling design, with the two sampling sites considered independently in the allocation of sampling effort. For each site the survey period was divided into 3 strata; viz (i) weekdays, (ii) weekends and public holidays, and (iii) fishing competitions. For the weekday stratum the target sampling rate was 20%. As most fishing effort typically occurs on weekends and public holidays (Morton and Lyle, 2003), a higher sampling rate of around 50% was applied for this strata. All three days of the annual Tom Jenkins Memorial Bluefin Championship (Pirates Bay) were included in the survey, club rally days were not treated as a separate stratum. Actual sampling rates for each location are presented in Table 1. Each sampling session was intended to account for all of the gamefishing activity on that day by trailer boats operating from the boat ramp. Sessions started at midday and finished when all boats were off the water, or when all known gamefish boats had been taken into account[1].

[1] Information provided by TGFA members and charter boat operators confirmed that very few game boats would be expected to return from fishing trips before midday.

Table 1. Sampling rate per stratum at each site

	Pirates Bay			Southport		
	No. Days	Sample Days	% Sampled	No. Days	Sample Days	% Sampled
Weekdays	64	13	20	64	14	22
Weekends and Public Holidays	24	12	50	27	9	33
Competitions	3	3	100			

At the start of each session the number of trailers in the car park was recorded, and throughout the session any boats being launched or retrieved (or recreational boats docking at the jetty or on moorings) were noted. At the end of each session the number of boats that had been retrieved, number of trailers remaining, and number of interviews were recorded along with weather and any additional observations.

Anglers were interviewed at the boat ramp or jetty upon completion of their fishing trip. Structured interviews were conducted with one member of each fishing party, with the type of fishing activity undertaken established at the outset. If the party had not been engaged in gamefishing, the type of activity was classified and the interview terminated. For gamefishing trips, regardless of whether any fish were caught or not, the number of fishers, their gender, and whether or not they belonged to a gamefishing club was established. For the purposes of this study fishers were categorised as gamefish club members (i.e. members of clubs affiliated to the Tasmanian Gamefishing Association or TGFA) or non-affiliated anglers (but potentially including members of non-TGFA affiliated fishing clubs or associations).

Furthermore, whether the trip was undertaken as part of a fishing competition (including club rally days) or was a chartered fishing trip was established. The time spent gamefishing, general fishing location, method (bait, lures or both) and catch numbers (kept, released and tagged) by species were also ascertained. Where feasible, fish were weighed or at least fisher's estimated weights were recorded. Filleting of the catch prior to landing was observed in a number of instances.

When possible, all persons within the fishing party were then interviewed individually and asked whether they had already participated in the present survey and if not, they were asked about any SBT catches (kept and released) already taken during the 2008 season. First-time respondents were also asked to recall the number of days fished for tuna (in Tasmania) during 2007 and to estimate the numbers of SBT personally kept and released during the 2007 season. By identifying first-time respondents, it was hoped that multiple counting of fishing history would be avoided.

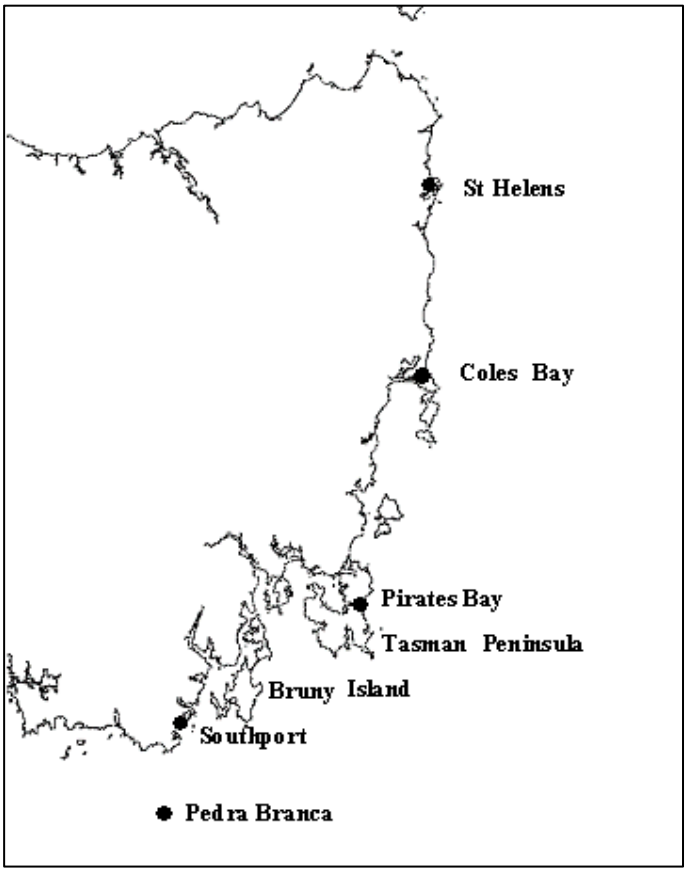

Fig. 1. Map of Tasmania showing important gamefishing locations

2.1.3 Charter Boat Logbook

Prior to the start of the 2008 gamefishing season, all charter operators fishing in south-eastern Tasmania were contacted and invited to participate in the survey by completing a voluntary logbook. Six operators agreed to take part, at least a further three fishing charter operators are known to have been active during 2008 but chose not to take part in the survey, therefore the results reported for the charter boat operators are a minimum estimate.

The logbook used was originally developed by the Sea Charter Boat Operators of Tasmania (SCBOOT) and provides a daily summary of charter operations. Information reported includes date, port of operation, departure and return times, main fishing area (using commercial fishing blocks), number of clients, types of fishing activity, effort (hours and number of lines fished), and catch by species (numbers retained and released, and retained weights). For the purpose of this study gamefishing operations between March and June 2008 have been included in the analyses.

2.2 Data analysis

2.2.1 Boat ramp data

For each site, the survey day represented the primary sampling unit (PSU) with the private-boat fishing parties engaged in gamefishing representing secondary sampling units (SSU). By definition, charter boat and non-gamefishing parties were considered to be out of scope. The catch of gamefish (by species) and effort (trips) for each PSU was calculated as the sum of the catch or number of trips undertaken by all of the private-boat gamefishing parties fishing from the site on that day. Although it was usually possible to interview all of fishing parties at a site, there were rare occasions where this was not feasible. In such instances daily catch and effort estimates were adjusted in accordance with proportion of gamefishing parties actually interviewed. While some subjectivity was necessary in determining whether non-interviewed parties had been gamefishing we are confident that, based on the type of vessel and fishing gear, we were able to accurately classify the vast majority of non-interviewed fishing parties. Catch and effort data by stratum were bootstrapped (5000 replicates) and expanded in accordance with the sampling fraction relevant to the stratum, confidence limits were determined using the percentile method (Haddon, 2001).

2.2.2 Charter boat data

Non-response was an important issue in this component of the study, with at least one third of the active charter operators not participating in the survey. Data adjustment to account for these operators was considered problematic, primarily because the level of fishing activity of those operators who did not cooperate was likely to be quite different to those that did provide fishing data. Gamefish catches for the charter sector were therefore simply summed for those operators who participated, thereby producing *minimum* estimates of catch and effort.

2.3 Weather conditions

Weather observations from the Bureau of Meteorology (BOM) were obtained from 1st April to 30th June 2008 in order to investigate correlations between fishing effort and weather conditions. Environmental variables including wind speed (knots) and direction (compass points) and were available from Tasman Island and Maatsuyker Island, the former indicating conditions off the Tasman Peninsula while the latter was used as a proxy for conditions that would be experienced by fishers leaving from Southport.

3. Results and Discussion

3.1 Private-boat fishers

3.1.1 Overview

Out of the 28 sampling sessions (fishing days) allocated at Pirates Bay, 21 (75%) were actually surveyed, the remaining seven sessions were abandoned due to bad weather (wind speeds > 20kts) and not replaced. Seventeen (73%) of the 23 sampling sessions allocated at Southport occurred, the remaining six days were not sampled due bad weather.

A total of 411 fishing parties were interviewed during the survey, 388 (94 %) provided full responses, 22 (5%) provided incomplete responses, mainly due to time constraints at the boat ramp, and there was only one full refusal. Of the parties interviewed, 351 (85%) were engaged in gamefishing activities from private boats with a further three being gamefishing parties on charter trips and thus considered out of scope for this phase of the study. All partial responses were gamefishers and in all but one at least catch data were collected.

3.1.2 Weather and fishing activity

Wind speed, in combination with direction (the two variables thought most likely to influence fisher behaviour) were investigated to determine possible relationships between weather and recreational fishing effort (number of boats). Wind speed tended to be variable over a given 24 hour period, and for this analysis the average wind speed on a given day for the period 0300 - 1200 hrs was estimated, this being the time frame that fishers are most likely to use when making judgements about whether or not to fish. The average wind speed on each survey day was plotted against the total number of boats (both gamefish and non-gamefish) that fished that day (Fig. 2). Virtually no fishing occurred on days with average wind speeds of greater than 20 knots, with greatest activity observed on days when wind speeds averaged less than 15 knots.

In terms of subsequent data analysis, it was decided to infer zero gamefishing effort for non-sampled days when wind speeds averaged greater than 20 knots. For Southport 26 days fitted this criterion and for Pirates Bay 8 days. These, along with sample days abandoned due to poor weather conditions (typically days with winds well in excess of 20 knots and rough seas, 2-3m) were removed from the day type-site strata, effectively reducing the size (number of potentially fishable days) of some of the strata.

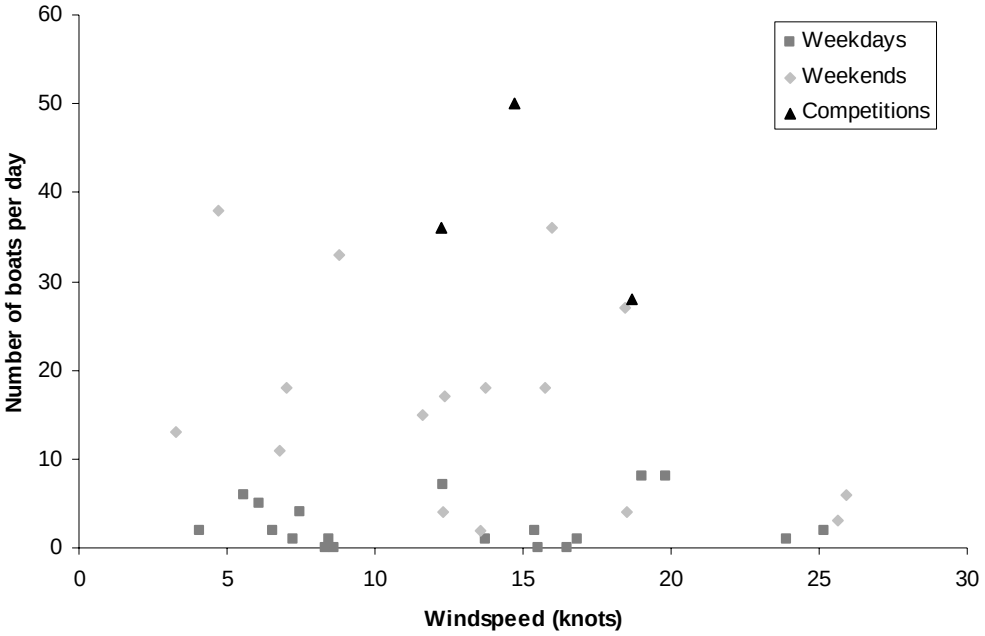

Fig. 2. Average daily wind speed and numbers of boats (by stratum) fishing April–June 2008.

3.1.3 Trip Characteristics

Private boat gamefishing parties accounted for 348 of all interviews conducted, with each fishing party comprised of an average of 3.2 fishers (±1.0 sd) (representing 1123 fishers) and having fished for an average of 6 hours (±1.92 sd). Based on fishers who identified an interview as being their first involvement with the current survey, we estimated that a total of 663 individual fishers participated in the study.

TGFA affiliates accounted for 405 (36%) of the gamefishers interviewed, and not unexpectedly comprised the majority (90%) of fishers encountered at Pirates Bay during the tuna competition (Table 2). However, on weekdays, weekends and public holidays that tuna competitions or rallies were not held, club members accounted for just 12% of the total number of fishers surveyed. Although these numbers represent a cumulative measure of fishers interviewed, noting that many fishers were encountered more than once, it was clear that non-affiliated fishers represent an important component of the fishery and that surveys focussed on gamefishing club members would not include the majority of gamefishing participants. There was a strong gender bias in both TGFA and non-affliliated fisher towards males, with females representing just 3-6% of fishers (Table 2).

Table 2. Number of interviews based on club membership and gender.
Note: some fishers were interviewed on multiple occasions

Location	Strata	No. Interviews	Gamefishing Parties (no.)	TGFA affiliated		Non affiliated	
				Male	Female	Male	Female
Pirates Bay	W'days	38	37	18	0	82	2
	W'ends	197	175	68	1	543	34
	Comp's	125	120	297	10	19	2
Southport	W'days	6	2	3	0	5	0
	W'ends	45	17	8	0	39	3
Total		411	351	394	11	688	41

3.1.4 Pirates Bay

At Pirates Bay, 332 gamefishing parties were interviewed, a third of which occurred during the Tom Jenkins Memorial Bluefin Championship (Table 3). The majority (73%) of fishing parties surveyed reported catching no gamefish; this rate increased over time from 68% in April to 94% in May and 100% in June.

Table 3. Sampling rates and numbers of vessels surveyed (excluding charter boats) at Pirates Bay between April–June 2008

	Stratum			
	Weekday	Weekend	Comp's	Total
Total no. of days	64	24	3	91
Days deemed too windy to fish	12	3	0	15
Fishable days	52	21	3	76
No. days surveyed	9	9	3	21
Proportion of fishable days surveyed	0.17	0.43	1.00	0.28
Total no. of boats	45	234	138	417
Total no. interviews	38	197	125	360
No. gamefishing parties interviewed	37	175	120	332
Proportion of gamefish boats	0.97	0.89	0.96	0.92

The total catch of gamefish species taken by the private-boat fishing parties interviewed was 221 fish, 81% of which were retained (Table 4). SBT accounted for 39% of retained catch while albacore and skipjack tuna accounted for 31% and 30% respectively. Two mako sharks were also caught. Of the 17 SBT that were released, 4 were tagged and of the 15 albacore released 8 were tagged.

Biological Characteristics

The combined retained weight of tuna and mako shark taken by private-boat was almost 2.7 tonnes, with SBT accounting for about 73%, albacore 14%, skipjack tuna 9% and mako shark 4% of the weight landed. SBT ranged in weight from 10kg to 110

kg with a median weight over the entire survey period of 20 kg (Inter-quartile range (IQR) = 5). The weight distribution was bi-modal. Fish weighing between 10 and 40kg (schoolies) were caught earlier in the season, while the larger fish (60 – 110kg) were caught later in the season (Fig. 3). The median weight of SBT increased from 20 kg (n = 65; IQR = 5) in April to 48kg (n = 4; IQR = 63) in May. Albacore ranged in weight from 4 - 30 kg with a median of 5.5 kg (IQR = 2), although the majority of fish weighed between 2 and 10kg with only a small number of larger fish landed. Skipjack tuna ranged between 2 - 7.5 kg with a median of 5 kg (IQR = 2). Albacore and skipjack tuna were only present in catches taken during April and displayed a uni-modal (Fig. 4).

Table 4. Observed catch of gamefish taken at Pirates Bay between April–June 2008.

	Numbers			Weight (kg)		
	Total	**Kept**	**Released/ (tagged)**	**Retained**	**Median/ (IQR)**	**Range**
Albacore	70	55	15 (8)	385	5.5 (2)	4-30
Skipjack tuna	63	55	8 (1)	250	5 (2)	2-7.5
SBT	86	69	17 (4)	1940	20 (5)	10-110
Mako shark	2	2	0	98	49	45-53
Total	**221**	**181**	**40 (13)**	**2673**		

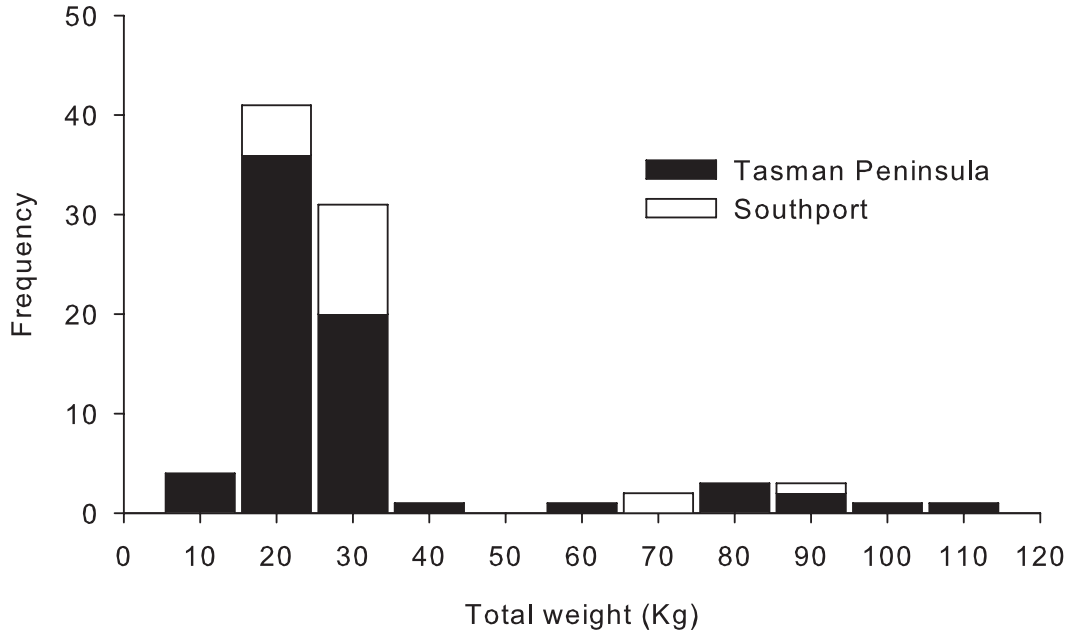

Fig. 3. Composition of the retained weights of SBT harvested over the sampling period April – June 2008 inclusive.

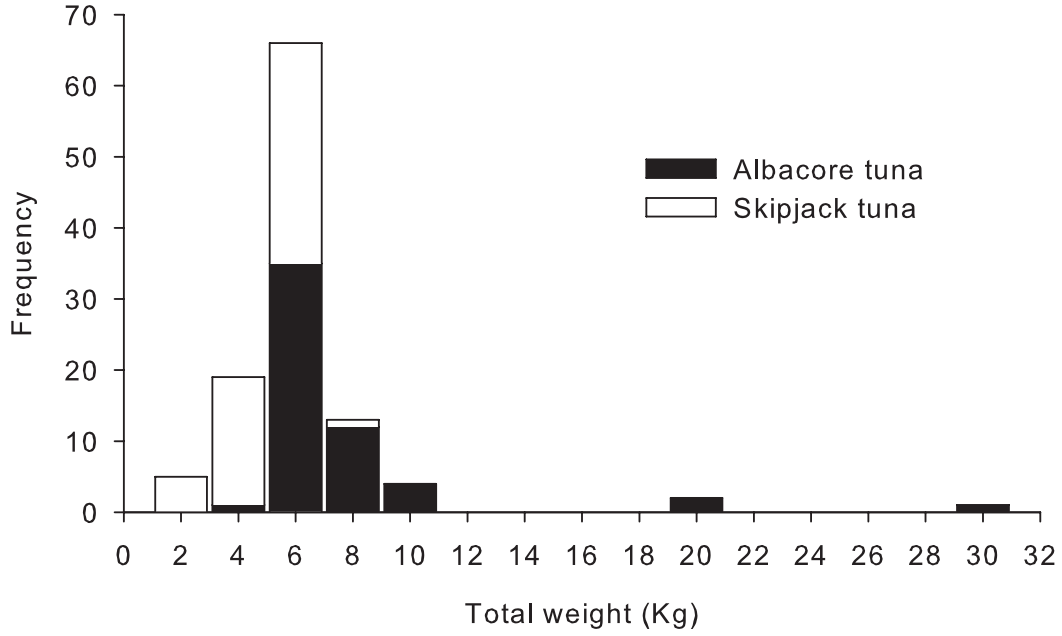

Fig. 4. Composition of the retained weights of Skipjack and Albacore tuna harvested over the sampling period April – June 2008 inclusive from around the Tasman Peninsula.

3.1.5 Southport

Out of 51 fishing parties interviewed at Southport only 19 were involved in gamefishing. Nil catches were reported by 63% of the parties, and SBT was the only gamefish species reported by those that did catch fish. All of the 19 SBT caught were retained, representing a total retained weight of 631 kg.

Biological Characteristics

Fish ranged in weight from 19 to 90 kg, with a median of 26 kg (IQR = 8.5). The median size of fish varied throughout the season, 30 kg in April (IQR = 2.5, n = 7) 20 kg in May (IQR 3, n =7) and 70 kg in June (IQR 44, n = 5). SBT landed at Southport also showed a bi-modal weight distribution similar to fish landed at Pirates Bay (Fig. 3). The larger fish were all landed in June.

3.1.6 Catch estimates

By expanding the survey data to account for sub-sampling, a total of 848 private vessel gamefishing trips were estimated to have been undertaken out of Pirates Bay between April and June 2008 inclusive, yielding a total catch of 438 tuna (95% CI = 247-654) of which 364 (CI = 212-537) were retained (Table 5). SBT dominated the catch, with an estimated 215 fish (CI = 138-299) or 49% of the tuna catch during this period, of which 177 (CI = 120-239) were retained.

Recreational fishers (private vessels) fishing out of Pirates Bay retained approximately 6.3 tonnes of tuna over the survey period. It is not, however, possible to estimate the

total weight of tuna caught as we have no information on the size of fish that were released. SBT accounted for 82% (5.0 t) of the retained catch by weight, with 0.5 t of albacore, 0.6 t of skipjack tuna and 0.2 t of mako shark retained (Table 5). In addition an estimated 112 SBT (95% CI = 54-179) were caught at Southport, with a retained catch weight of 3.7 t.

By combining the SBT catch estimates for privately owned vessels from Pirates Bay and Southport, the expanded catch estimate for South East Tasmania between April and June was 327 SBT captured, 289 of which were retained representing a retained weight of 8.7 t (95% CI = 5.2-12.3).

Table 5. Expanded catch estimates for gamefish taken by privately-owned vessels between April-June 2008.
95% Confidence Intervals (CI) are shown in parentheses.

		Catch (number)		Retained Weight
		Total	**Retained**	**(t)**
Pirates Bay	Albacore	76 (14-186)	61 (14-142)	0.49 (0.15-0.94)
	Skipjack Tuna	148 (40-269)	122 (33-231)	0.59 (0.14-1.07)
	SBT	215 (138-299)	177 (120-239)	4.99 (3.50-6.56)
	All tuna	438 (247-654)	364 (212 - 537)	6.27 (4.31-8.28)
	Mako Shark	4	4	0.22
Southport	SBT	112 (54-179)	112 (54-179)	3.67 (1.68-5.78)
SE Tasmania	**Total SBT (t)**	**327 (192-478)**	**289 (174-418)**	**8.66 (5.18-12.34)**

3.1.7 Previous fishing activity

3.1.7.1 Fishing prior to April

During the boat ramp survey, first-time respondents were asked to estimate their catch of SBT taken during the 2008 season and prior to the day of interview. Based on the assumption that catches taken by first-time respondents who were interviewed during the first two weeks of April were likely to have been taken prior to the start of the survey period, these catches could provide at least a minimum estimate of catches taken prior to April 2008. A total of 68 SBT was reported caught, 58 of which were retained. By using the average weight of SBT for April, this represented a pre-survey minimum catch estimate of 1508 kg.

3.1.7.2 2007 Fishing season

Respondents who also reported gamefishing activity during the 2007 season fished for an average of 5.8 days, catching a total of 1796 SBT, just over half of which (921 fish) were retained.

3.2 Recreational Charter Boat logbook

3.2.1 Overview

Six charter operators provided information related to gamefishing between March and June 2008, information for the remainder of the fleet was not available. Since the main run of albacore and skipjack tuna occurred in February 2008, catch estimates for these species are incomplete.

3.2.2 Trip Characteristics

Information was available for 78 gamefishing trips, all conducted around the Tasman Peninsula, around 40% occurred in March, 44% in April and 16% in May. No trips were reported during June. Each trip comprised an average of 6 clients (± 2.0 sd) and lasted an average of 7.8 hours with a fishing time of 6.8 hrs. A range of 2-7 game rods (average of 4.8) were used on each charter vessel.

3.2.3 Catch estimates

Over 710 fish were caught on gamefishing charters, 513 (73%) were gamefish species (Table 10). Skipjack tuna dominated catch numbers, accounting for 65% of the total catch, followed by SBT (23%), and albacore (5%). Two yellowfin tuna were reported, but there were no reports of mako shark captures. The vast majority (> 80%) of the SBT and albacore, and all of the yellowfin tuna were retained, whereas about half of the skipjack tuna were released. Of the 162 SBT taken by the participating charter boats between March and May 2008, 133 (82%) were retained, representing a harvested weight of just over 3.9 tonnes. The weight distribution of harvested SBT was again bi-modal reflecting the pattern observed in the harvested weights of SBT from caught from private boat, with schoolies caught earlier in the season and the larger fish later in the season (Fig. 5).

The majority of the gamefish catch (over 80% by number) was taken in March, with catches dropping markedly in April (17%) and May (3%). This pattern was mainly driven by skipjack tuna catches, with 314 (96%) of the skipjack tuna taken in March. Significantly, about 44% of the SBT were taken during March, prior to the commencement of the private-boat survey.

Table 10. Total and retained catches (no. and weight) by month based on 2008 charter boat logbook data.

Species		March	April	May	Total
Albacore tuna	Catch (no.)	24	0	0	24
	Kept (no.)	21	-	-	21
	Retained weight (kg)	221	-	-	221
	Av wt (kg)	10.5	-	-	10.5
Skipjack tuna	Catch (no.)	314	11	0	325
	Kept (no.)	157	11	-	168
	Retained weight (kg)	694	29	-	724
	Av wt (kg)	4.4	2.7	-	4.3
Southern bluefin tuna	Catch (no.)	72	76	14	162
	Kept (no.)	47	73	13	133
	Retained weight (kg)	994	2024	929	3947
	Av wt (kg)	21.1	27.7	71.5	29.7
Yellowfin tuna	Catch (no.)	2	0	0	2
	Kept (no.)	2	-	-	2
	Retained weight (kg)	110	-	-	110
	Av wt (kg)	55.0	-	-	55.0
Total	**Catch (no.)**	412	87	14	513
	Kept (no.)	227	84	13	324
	Weight (kg)	2019	2053	929	5002

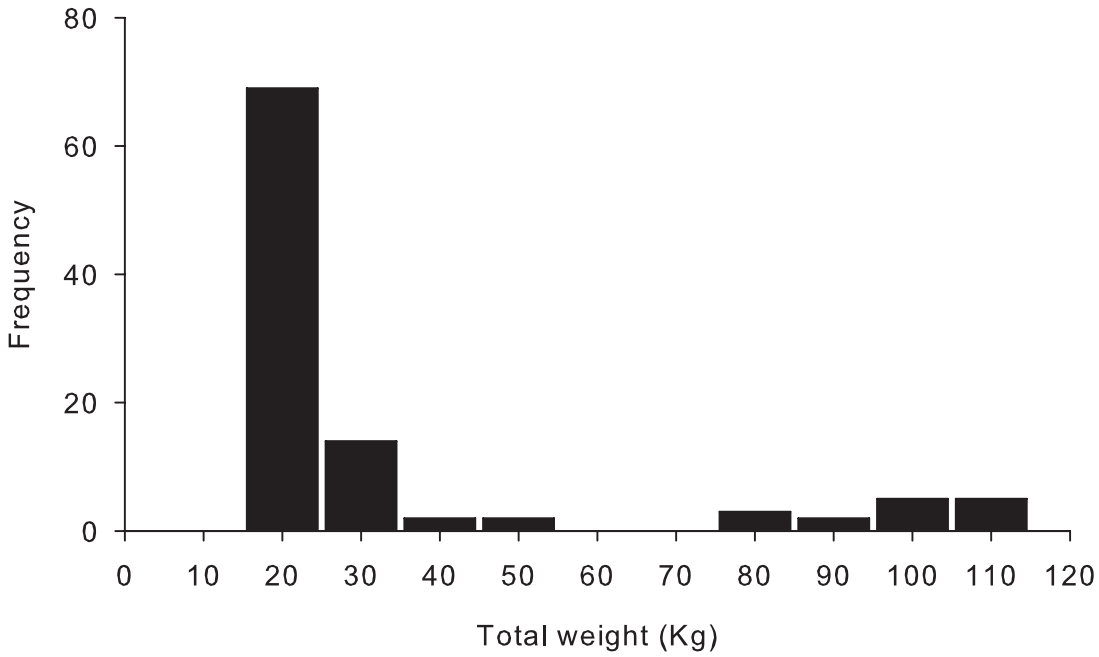

Fig. 5. Composition of the retained weights of Southern bluefin tuna harvested by fishers on charter boats from March to May 2008 inclusive from the Tasman Peninsula.

3.3 2008 SBT catch estimate

The primary objective of this study was to provide an estimate of the recreational catch of SBT in Tasmania for the 2008 season. In order to derive the catch estimate we have available two sources of information; the boat ramp survey of private-boat fishers and charter boat logbooks.

During the boat ramp survey period (April-June 2008) an estimated 327 (95% CI = 192-478) SBT were caught from South East Tasmania by private boats operating out of the Pirates Bay and Southport boat ramps, with 289 (95% CI = 174-418) fish retained, representing a harvested weight of 8.66 t (95% CI = 5.18-12.34). Catches taken by private boat fishers prior to April 2008 accounted for at least a further 68 SBT, 58 of which were harvested representing an estimated weight of 1.5 t. For the recreational sector this gives a minimum harvest estimate for SBT of 347 (95% CI = 232-476) fish, weighing 10.1 t (95% CI = 6.7-13.8).

In addition, a further 162 SBT were taken from by the charter sector, 133 of which were retained, representing just over 3.9 tonnes landed weight. By combining recreational and the charter boat catches, a harvest estimate of 480 (95% CI = 365-609) SBT with retained weight of 14.0 t (95% CI = 10.6-17.7) was obtained.

4. Conclusions

During 2008 private-boat and charter sectors harvested at least an estimated 480 SBT (95%CI = 365-609), representing a weight of about 14.0 t (95% CI = 10.6-17.7). The charter sector accounted for 36% of the numbers while of the remaining 64%, private vessels fishing out of Pirates Bay and Southport accounted for 61% and 39% respectively. There are, however, several important uncertainties in these estimates, namely incomplete spatial and temporal coverage of the private-boat fishery (not all access points were surveyed and early season catches were only partially taken into account), and incomplete coverage of the charter sector (not all operators participated). As such these values are considered *minimum* estimates for the 2008 Tasmanian recreational SBT fishery.

A state-wide survey of recreational fishing in Tasmania was also conducted during 2007/08 and encompassed the 2008 gamefish season (Lyle *et al*. 2009). While gamefishing was a rare activity in the context of the general recreational fishery, this 'big-picture' survey did provide a harvest estimate for SBT that, while imprecise, was not significantly different (based on overlapping confidence intervals) to that obtained in the present survey. The harvest estimate obtained was 1075 fish (95% CI = 275-1875) and the estimated release rate of 28% was slightly greater than 20% estimated for this study.

Notwithstanding coverage limitations of the present study, the 2008 estimate was significantly greater than that for 2003 when it was estimated that just 112 SBT were harvested, representing a retained catch of about 2.5 t (Morton and Lyle 2003). The majority of catch in that year was caught from the south coast, in particular south of Bruny Island and around Pedra Branca. By comparison, the recall based estimate for 2007 of about 1800 fish (over 900 retained) would suggest that 2008 was not as productive a season as the previous one, an observation confirmed by many gamefishers. The accuracy of the 2007 estimate is, however, highly questionable since it was derived only from individuals interviewed in 2008 and is likely to be strongly influenced by recall biases which tend to result in an overestimate of catch (and effort).

Previous charter boat surveys have provided catch estimates for SBT of 12.5 tonnes (678 fish) (Smith 1994) in 1993, and 6.9 tonnes (295 fish) in 1994 (Evans 1995). These values would appear roughly comparable to 2008, noting that catch data was unavailable for several major operators in the current survey.

Success rates, based on the proportion of trips that resulted in the capture of at least one gamefish species, were about 25% for private boats fishing out of Pirates Bay; this decreased from 30% in April to 5% in May and zero in June. The success rate for boats fishing out of Southport was around 35%. In 2003 success rates were about 60% for private boats fishing out of Pirates Bay between April and May and compared with success rates of about 70% for responding TGFA diarists and over 80% for gamefishing charters. Success rates are a function of many variables, including the skill and experience of the fishers, availability of the target species and prevailing environmental conditions.

Southern bluefin tuna are distributed throughout the southern oceans predominantly between 30°S - 50°S. Their seasonal occurrence in Tasmanian waters is highly variable, and related to a complex interaction of factors including oceanographic currents and conditions, water temperature and prey availability (Young *et al*. 1997). This variability is reflected in the timing, location and availability of SBT to the recreational fishery, with catch levels varying between years as indicated by the previous surveys. Recognising that the availability of SBT to the recreational and charter fisheries around Tasmania varies from year-to-year is important in the development of management strategies, with a need to consider catches across years/seasons rather than on the basis of an individual season.

While boat ramp surveys have obvious advantages in being able to observe catches directly and collect detailed fishing information with minimal non-response and recall bias problems, fisheries that are spatially and temporally dispersed with low levels of activity require high sampling intensities to produce reasonable precision in parameter estimation. The SBT fishery is a case in point where, as demonstrated in this study, fishing effort tends to be spread over a wide number of sites (from the Tasman Peninsula to southern Tasmania) and levels of effort at given sites tends to be very low. Furthermore, the timing and distribution of catches can vary markedly between years, further exacerbating the difficulty in providing robust estimates based on on-site survey methodologies.

Ultimately the design of any monitoring program will depend upon a number of factors, including survey or management objectives, intended use of the data and required precision. Costs and feasibility (logistics) are also important considerations. As the wider issues relating to the management of the tuna fishery and rights of recreational fishers have yet to be fully defined, it is unclear what level of future monitoring might be required. For instance, different assessment options would be necessary if real-time monitoring and/or absolute catch estimates were required, as opposed to indicative or even relative estimates of catch. The current study provides insight into the recreational and charter fisheries and highlights some of the logistical issues that will need to be addressed in the development of any future monitoring programs that support the management of the fishery.

4.1 Future surveys

Through this study we have been able to provide a minimum estimate of SBT catch from southeastern Tasmania during 2008. However, due to limitations in the survey design we were unable to achieve complete coverage of the fishery. Within season variability in the timing, location and size composition of SBT catches make it inherently difficult to comprehensively cover this fishery; a situation exacerbated by the limited resources available to undertake the survey. Reliance on the voluntary participation of charter operators in providing information for their sector also represented a weakness, with only partial coverage achieved.

The most efficient way to survey the SBT fishery in Tasmania would be via a sample frame that identified all participants. This technique has been used successfully to survey specific recreational fisheries, including the Tasmanian rock lobster and abalone fisheries (Lyle 2008). For these studies a licence database is used to recruit a representative sub-sample of participants, thereby allowing estimates for the entire licensed population to be calculated. In the absence of licensing, the Tasmanian boat licence registry has potential to provide an efficient sampling frame for gamefishing since it is a boat-based activity. Through the application of the telephone-diary approach, fishing activity could then be monitored in detail (Lyle 2008, Lyle et al. 2009). Some form of on-site survey would be required to validate the results from the phone/diary survey and in particular provide information on the size composition of the catch. This is especially important due to the significant variation in weight of individual SBT which if misreported could significantly confound the estimate of total weight harvested. Given the significance of the charter boat sector it would also be desirable to implement a more formal catch reporting system for this sector, an outcome that could be developed as part of the overall management of the charter industry.

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