Estimates of the landed catch of mid-slope shark species 1992–2006

Russell Hudson and Ian Knuckey

Introduction

Deepwater dogfish have been caught on the slopes of the Continental shelf as either a targeted catch or bycatch of other fisheries. In Southern Australia, the species captured can be divided into two groups: the upper slope species are made up of the gulper sharks (*Centrophorus species*) and green eye species (*Squalus spp*) which are now seldom targeted, and the mid-slope species generally marketed as either black shark, pearl shark (Melbourne) or roughskin shark (Sydney), and are sourced from at least 4-5 species or species groups, Golden dogfish, (*Centroscymnus crepidater*), Owston's dogfish (*Centroscymnus owstoni*) black shark (*Dalatias licha*) Brier shark (*Deania spp*) and lantern sharks (*Etmopterus spp*).

Background

The landing of carcasses and livers from deepwater of southern Australia has been occurring for at least the last 20 years. In the mid 1980's small quantities of gulper sharks were captured by shark fishers in eastern Victoria using monofilament gill nets. By 1990 this had increased to 100 t carcass weight (Walker et al. 2003). In 1992 the catch peaked at over 380 t as fishers from South Australia targeted these gulper species for liver oil.

The historical catches of the gulper sharks have been recorded in authoritarian reports (Walker et al 2002). However little is known of the catch history of the mid-slope shark species (referred to as black shark in this report). Species identification is difficult and fishers and buyers/processors documented them as 'mixed shark'. This report attempts to determine the historical catches landed of black shark from assessing available published data and industry records.

Methods

Malcolm McLaughlin of Consolfish provided Richard Saul of Ocean oils with handwritten sales of liver oil weights for the period 1995–1999 and electronic data for the period 2000–2006. The hand written sales from Consolfish was transcribed and converted to liver weight and carcass weight by Richard Saul; additional estimates of proportion of endeavour dogfish were also made by Mr. Saul.

In addition Ross Daley et al. (2002) supplied catch figures of mid-slope dogfish compiled from both Melbourne and Sydney Fish markets. For the Melbourne fish Market, the catch figures only extend from 1997 to 2000, while the Sydney fish markets extend from 1992 to 2000.

A summary of these 3 sources of data and what state landings they have included is given in Table 1.

Results

Paper records indicate there was black shark livers sold in Victoria from at least 1994, though anecdotal evidence indicates sales began earlier than this (Malcolm McLaughlin pers. com). In Sydney, black shark was sold from at least 1992; prior to this it would have been sold as mixed shark (Daley *et al*. 2002). During 1995 the ban on the landing of deepwater shark carcasses in Victoria was revoked, resulting in increased landings of black shark from trawling on the mid-slopes of the continental shelf. In addition to retaining the liver, the carcasses were now also retained and marketed. In Victoria for ease of handling and marketing, Consolfish became the sole purchaser of all deepwater shark livers at the Melbourne Fish Market, claiming nearly 80–90% of all livers sold in Victoria going through Consolfish (Malcolm McLaughlin Pers. Com.). Consolfish extracted and sold the oil with Ocean Oil a major purchaser of the oil. While the bulk of these livers were black shark species, a proportion of it was livers sourced from gulper sharks.

Consolfish lost all electronic records of its sales prior to 2000 (Y2K) but retained a small handwritten book on the sales of its liver oils. This sales book was made available to Richard Saul of Ocean Oils who made estimates of the catches of black shark from 1993 to 2006 (Table 2). To determine these figures a conversion factor of 85% was used to convert the liver oil weight to liver weight (Conversion factors for liver oil to liver weight are in the range 80–90%, Malcolm McLaughlin pers. com.). The catches for years 1993 and 1994 were estimated from trips Richard Saul did to Tasmania as no catch/sales figures were available. For the years 1995–2000, Richard Saul estimated the quantity of gulper sharks through a combination of tests of the percentage of squalene in the oil, (For gulper sharks the proportion of squalene is approximately 80–85% while for mid-slope dogfish it is considerably lower, approximately 55% (Richard Saul pers. com.)) and an estimated sliding proportion as the catch of gulper sharks declined.

To determine a conversion factor of liver weight to carcass weight, Richard Saul asked a fisher to keep the liver and carcasses of a number of sharks. The livers were then weighed and carcasses weighed, giving a ratio of 1:1.666 livers to carcass. This figure is comparable to research conducted by CSIRO which gave a conversion of 1:1.5 livers to carcass weight (Ross Daley pers. com).

To verify Richard Saul's figures, access to Consolfish handwritten sales book was obtained. The results differed slightly from Richard Saul's figures as– nearly all sales of livers from 1995 to 1999 were recorded as mixed livers; some sales only recorded amount paid not actual weight. In the latter case an estimate was made using the previous month's price per kilogram (Table 3).

For liver weights from 1995 to 1999, a conversion factor of 1.5 was chosen to estimate carcass weight. Richard Saul's figures were used to estimate the proportion of gulper sharks livers for each year's landing because no alternative estimates were available for the period. A factor of 1/0.85 was then applied to estimate total catch landed in Victoria (Table 3, Figure 3).

Figure 1 presented the annual catch of 'roughskin shark' **(***Centroscymnus spp* and *Deania spp*) sold at the Sydney Fish Markets from 1992 to 2000. This catch was sourced from both vessels operating from southern NSW ports and eastern Victorian ports. Although actual figures by year are not available, the total catch between Feb 1992 and November 1999 was 684 t (approximately 80 t per year).

Figure 2 presents the estimates by Daley *et. al.* (2002) of black shark sold at the Melbourne fish markets from 1997 to 2000. These figures are significantly lower than recorded from Consolfish books, as access to records of liver sales by processors was not available to them (Daley *et al* 2002). Daley *et al* (2002) recorded 54 t carcass weight landed during 1998 increasing to 158 t during 2000.

Figure 3 presents the catch figures of all sources of data. Ocean Oils and Consolfish show a peak during 1996, a gradual decline to 2004 then a sharp drop when a significant lower quota was introduced to the landing of these species.

Daley *et al* (2002) did not tabulate data by year. For the Sydney market, an average of 80 t per year from the Sydney market is shown, with the combined Sydney and Melbourne landings added for the period 1998 to 2000. This is made of 54 t and 158 t reported in 1998 and 2000 respectively, and an estimate of 106 t for 1999.

Ocean Oil recorded higher landings in 2000–2004 than our estimates, due to the inclusion of landings in Tasmania where a company was processing livers, and possibly re-extraction of oil from frozen livers as technology for extraction improved.

Conclusion

The main source of uncertainty in the estimates of black shark landed presented in this paper is whether it is a valid assumption that 80–90% of shark livers went through Consolfish. We believe this is a reasonable assumption given: 1) the limited outlets for shark liver at the time; 2) shark livers were not a major part of the catch for most fishers; and 3) sales of livers through Consolfish was favoured due to ease of handling.

While Richard Saul's estimates of the proportion of the livers attributed to gulper shark is difficult to verify, the combination of declining trends at the Sydney market, the assessment of squalene levels, and the rapid declining catch of gulper sharks by shark fishers in the early 1990's (Walker *et al* 2002), would indicate it is a reasonably sound estimate.

References

Daley, R. Stevens, J. and Graham, K. (2002). Catch analysis and productivity of the deepwater dogfish resource in southern Australia. CSIRO Hobart, FRDC project no. 1998. 108. 112 pp.

Walker TI, Taylor BL, Gason AS (2003) 'Southern shark catch and effort 1970–2002 report to Australian Fisheries Management Authority.' Marine and Freshwater Resources Institute, Queenscliff, Victoria, Australia.

Table 1 Source of data and period available.

Source	Period	Landings		
		Vic	NSW	Tas
Ocean oil	1993–2006	Yes	No	yes[A]
Consolfish	1995–2006	Yes	No	No
Daley et al. 2002 (Sydney)	1992–2000	No	Yes	No
Daley et al. 2002 (Melb.)B	1998–2000	Yes	No	No

[A]estimated only

Table 2 Annual harvest of livers and estimated carcass weight determined from Consolfish and Ocean Oil records by Richard Saul

Year	Catch (t)			
	Liver oil black shark species	Liver oil gulper sharks	Liver weight black shark species	Carcass weight black shark species
1993	12	0	14	24
1994	20	12	24	40
1995	41	20	48	82
1996	175	11	206	350
1997	168	10	197	336
1998	177	9	208	354
1999	157	7	184	313
2000	172	5	202	343
2001	130	3	153	260
2002	149	4	176	299
2003	130	3	153	265
2004	141	4	166	281
2005	74	4	87	148
2006	73	2	85	145

Table 3 Annual harvest of livers and carcass weight determined from Consolfish records.

Year	Liver oil combined species	Liver weight combined species	Liver weight black shark species	Carcass weight black shark species Consolfish[A]	Estimates of Carcass weight Black shark for all Vic.[B]
1993	n/a	n/a		n/a	n/a
1994	n/a	n/a		n/a	n/a
1995	75	88	59	89	105
1996	186	219	206	309	363
1997	190	224	212	317	373
1998	192	225	214	321	378
1999	176	207	198	297	349
2000			159	238	280
2001			126	189	222
2002			143	214	252
2003			124	187	220
2004			148	222	261
2005			84	126	148
2006			76	114	134

[A]conversion of 1.5 Daley

[B]assuming 85% landed in Vic

Figure 2.4: Monthly sales of roughskin shark—Sydney Fish Market

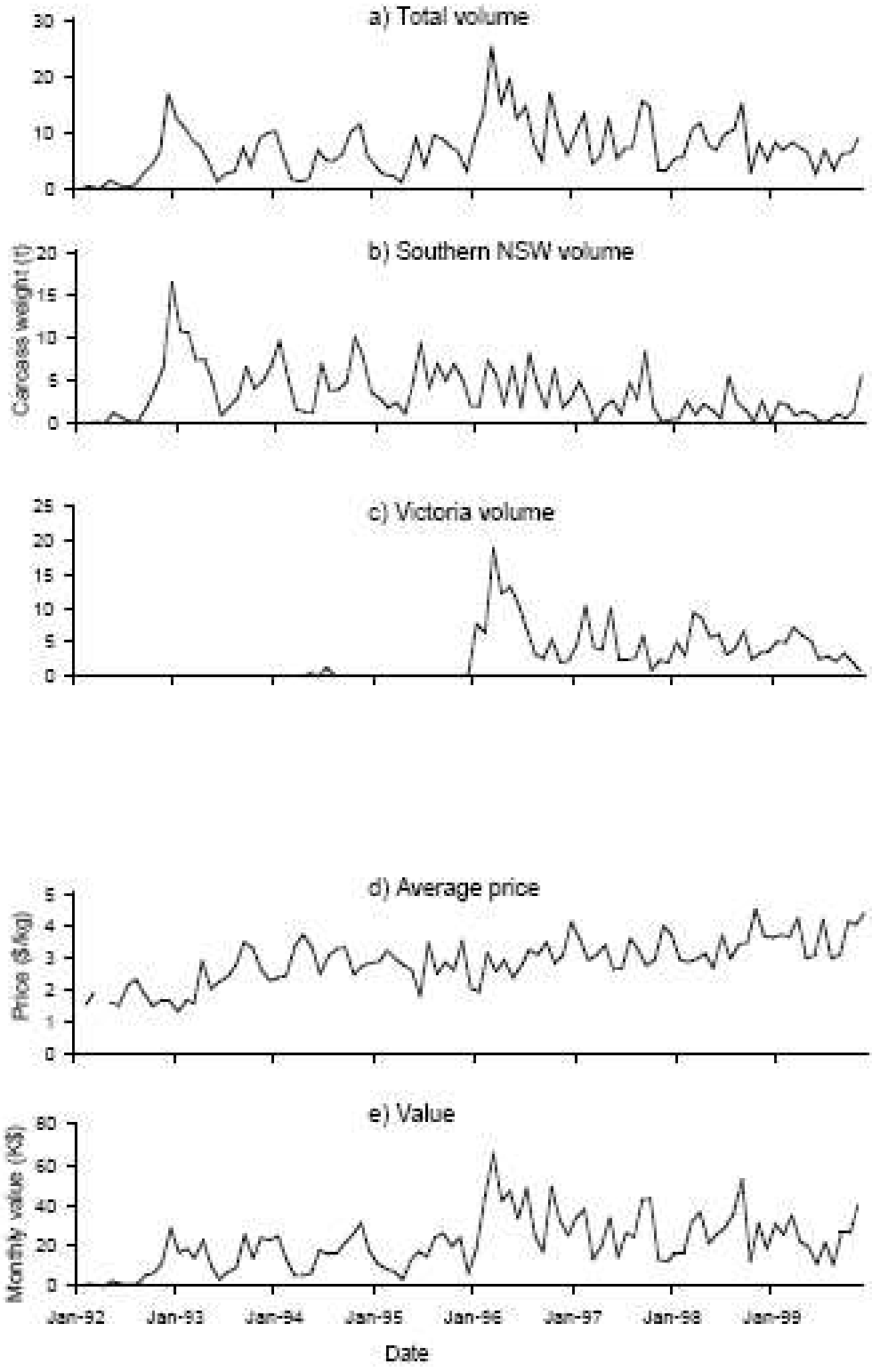

Figure 1 Catch figures for roughskin shark sold at the Sydney Fish Market 1992–2000.

Figure 2.5: Monthly sales of roughskin (black/pearl) shark—
Melbourne Fish Market

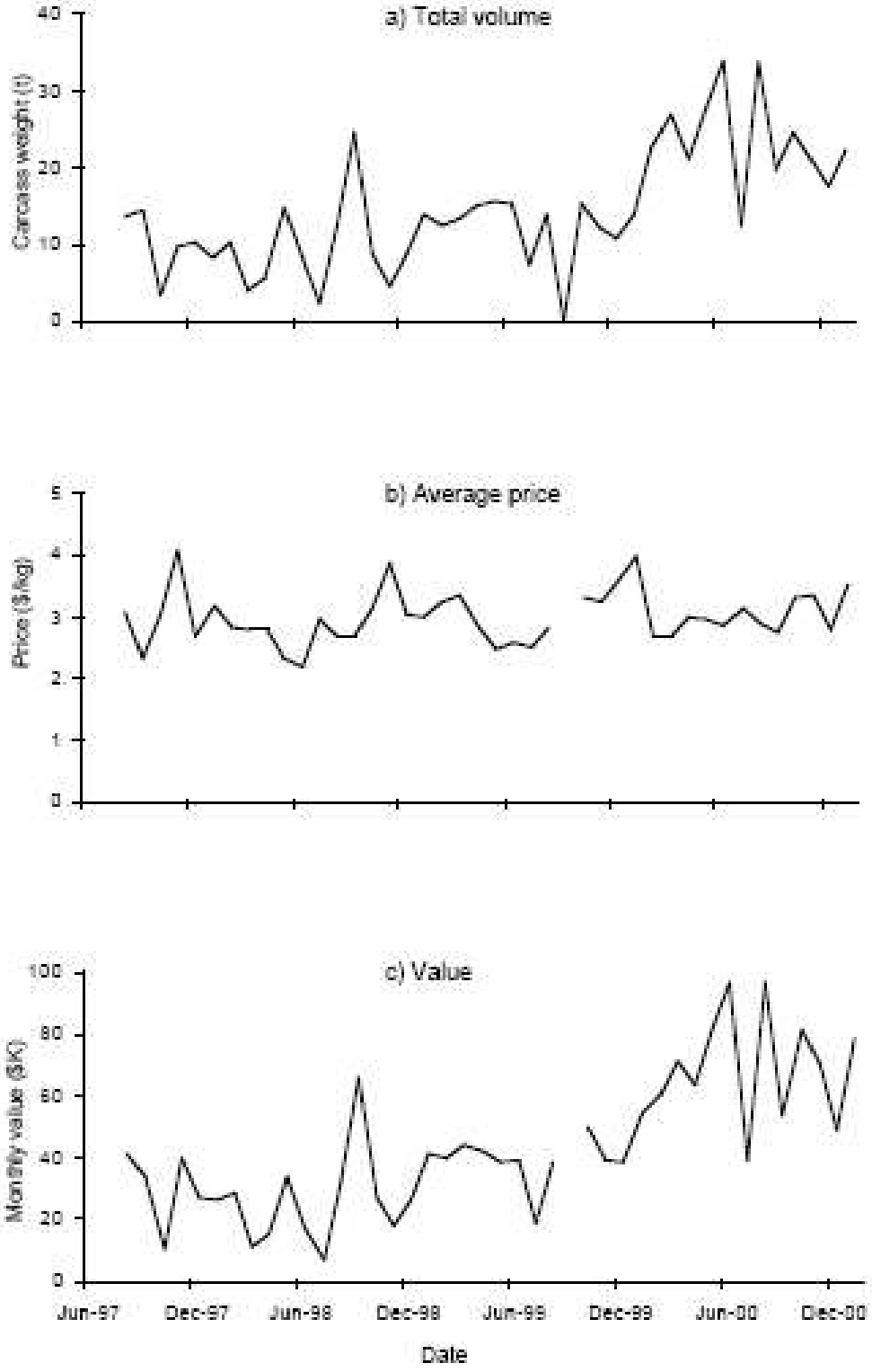

Figure 2 Catch figures for Black shark sold at the Melbourne Fish Market June 1997–2000.

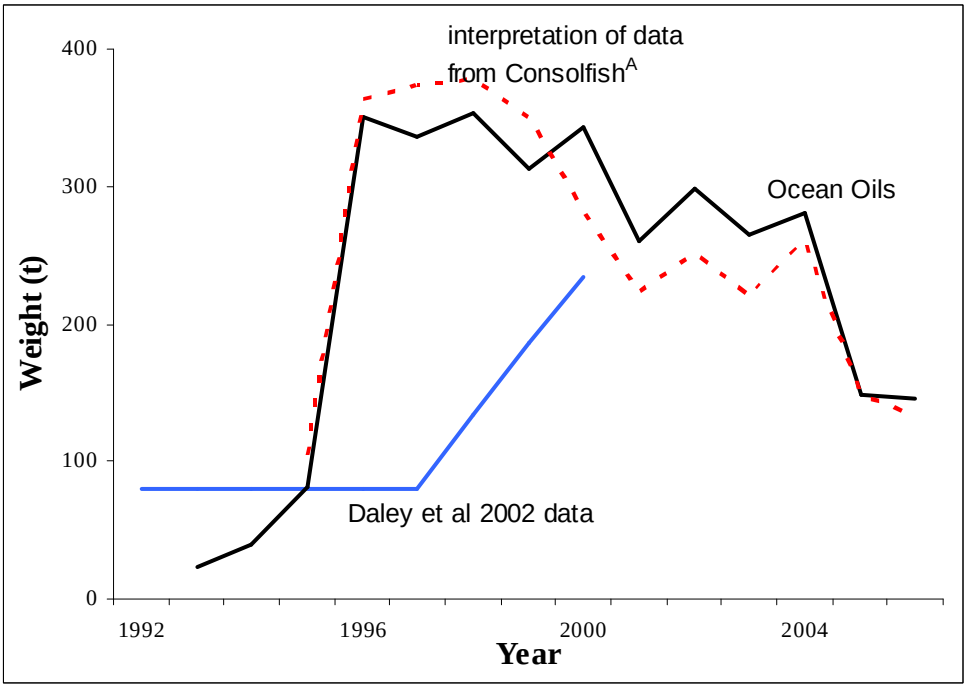

Figure 3 Estimated catch of black shark species 1992–2006

[A]Conversion of 1.5 used to convert liver weight to carcass weight and 1/0.85 to estimate total catches for Vic.