Current data available for the South African horse mackerel resource

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This document serves to describe and report the data currently available for assessment purposes. A further document (see BEN/DEC04/HM/SA/6a) lists additional data that could become available in the future.

1. Catch data

Catch data are reported in Table 1. Data are broken down into various categories. The current ASPM model uses the total demersal and total pelagic catch data as input into the model. The demersal category can however be broken into the Japanese demersal trawl catch series, the South African mid-water catch series and the South African demersal trawl catch series. A further category, termed "other" is also available, which contains catches made by various foreign countries.

Further detail of the catch breakdown is reported in the appendix.

2. Biomass survey data – from demersal swept area surveys

These data are reported in Table 2. The data are from demersal trawl swept area surveys.

Survey 1
This is the South Coast Spring survey, and is limited to within the 200m isobath.

Survey 2
This is produced by adding the data for the South Coast autumn and West Coast summer surveys for 1988, 1991-1997, and using the South Coast spring surveys for 1987 and 1990. These survey covered an area to the 500m isobath.

These demersal survey biomass estimates are most likely negatively biased. Survey 1 (the South Coast survey) is limited to the 200m isobath. Horse mackerel are however acoustically detectable out to at least the 500m isobath. These surveys also sample only the bottom 2-3 metres of the vertical distribution of horse mackerel in the water column. However, it is known that the species is semi-pelagic, and forms part of the

pelagic fishery. Thus it is highly likely that a fairly substantial portion of the fish are too far off the sea bottom to be detected by the bottom trawl gear in these surveys.

3. Catch-at-age data

Kinloch *et al.* (1986) extracted age-compositions from annual commercial length frequencies for 1975-1983 by means of a distribution mixture analysis technique. The growth curve used to estimate the number of age classes in the annual catches and to predict the mean length of each is from M. Kinloch, unpublished. Armstrong continued this procedure at a later stage for data from 1984-1988. These data are reported in Table 3.

4. CPUE data

The only reliable CPUE series is that from the Japanese (demersal trawl) fleet for the period 1976-1987 (Table 4). These data were extracted from ICSEAF documents.

Other CPUE series obtained from multi-species fishery trawlers are not considered reliable for the following reasons:

- In a multi-species fishery, trawlers will only target on horse mackerel when a large shoal is located during fishing operations. The catch rate could therefore remain fairly constant in spite of decreasing abundance, because searching time is not taken into account.
- The CPUE is determined from the landed catch and does not take into account discarding, which could be substantial.

For these reasons there is a lack of confidence in the CPUE series for the South African demersal fleet, for which recorded information on targeting is also questionable. Therefore, the CPUE from the Japanese fleet, which targeted horse mackerel, is deemed to be more reliable. Unfortunately, this CPUE series was terminated when Japanese fleets were excluded from fishing in South African waters in the early 1990s.

References

Kinloch, M.A., Armstrong, M.J., Crawford, R.J.M. and R.W. Leslie. 1986. Status of the horse mackerel resource in ICSEAF subarea 2. ICSEAF Colln scient. Pap. Int. Commn SE. Atl. Fish. 13(1): 233-246.

Table 1: Annual landings (‘000 t) of horse mackerel by coast and gear. Note that demersal landings for 1990-1997 may contain some midwater trawl landings.

Year	West Coast			South Coast		Total	
	Pelagic	Demersal	Midwater	Demersal	Midwater	Pelagic	Trawl
1950	49.90	0.316		0.129		49.90	0.445
1951	98.90	0.905		0.200		98.90	1.105
1952	102.60	1.109		0.117		102.60	1.226
1953	85.20	1.407		0.049		85.20	1.456
1954	118.1	2.478		0.072		118.1	2.550
1955	78.80	1.733		0.193		78.80	1.926
1956	45.80	1.006		0.328		45.80	1.334
1957	84.60	0.769		0.190		84.60	0.959
1958	56.40	1.836		0.237		56.40	2.073
1959	17.70	1.636		0.439		17.70	2.075
1960	62.90	3.283		0.429		62.90	3.712
1961	38.90	3.174		0.453		38.90	3.627
1962	67.70	2.525		0.554		67.70	3.079
1963	23.30	0.880		0.521		23.30	1.401
1964	24.40	1.151		8.371		24.40	9.522
1965	55.00	1.188		5.829		55.00	7.017
1966	26.30	1.472		6.124		26.30	7.596
1967	8.80	1.296		4.893		8.80	6.189
1968	1.40	0.309		8.807		1.40	9.116
1969	26.80	1.382		10.870		26.80	12.252
1970	7.90	3.600		14.272		7.90	17.872
1971	2.20	6.087		27.261		2.20	33.348
1972	1.30	2.323		18.233		1.30	20.556
1973	1.60	10.604		24.711		1.60	35.315
1974	2.50	7.070		29.584		2.50	36.654
1975	1.60	19.236		50.609		1.60	69.845
1976	0.40	2.445		32.369		0.40	34.814
1977	1.90	6.593		62.223		1.90	68.816
1978	3.60	3.284		32.091		3.60	35.375
1979	4.30	7.956		52.112		4.30	60.068
1980	0.40	2.614		40.013		0.40	42.627
1981	6.10	1.273		32.610		6.10	33.883
1982	1.10	0.824		32.267		1.10	33.091
1983	2.10	1.393		40.114		2.10	41.507
1984	2.80	1.989		36.828		2.80	38.817
1985	0.70	0.873		30.407		0.70	31.280
1986	0.50	1.146		34.666		0.50	35.812
1987	2.80	3.551		38.421		2.80	41.972
1988	6.30	2.502		31.831		6.30	34.333
1989	25.50	3.216		30.947		25.50	34.163
1990	7.20	4.546		39.101		7.20	43.646
1991	0.50	3.742		20.232		0.50	23.974
1992	1.90	4.140		19.137		1.90	23.276
1993	11.64	3.590		14.836		11.64	18.426
1994	8.21	2.019		6.460		8.21	8.479
1995	1.98	2.047		4.655		1.98	6.702

1996	18.98	2.633		7.074		18.98	9.707
1997	12.70	2.528		8.804		12.70	11.332
1998	26.66	2.791	0.029	6.885	4.177	26.66	13.882
1999	2.05	1.876	0.036	7.372	0.890	2.05	10.174
2000	4.80	1.077	0.007	8.643	14.775	4.80	24.502
2001	0.90	1.036	0.008	8.764	15.256	0.90	25.064
2002	8.15	0.791	0.000	5.410	9.472	8.15	15.673
2003	1.00	0.617	0.003	3.640	28.045	1.00	32.305

Table 2: Swept area survey biomass estimates (MT) for the spring (Survey 1) and autumn (Survey 2) biomass series (R.W. Leslie, pers. commn).

Year	**Survey 1**	**CV**	**Survey 2**	**CV**
1987	308300	0.15	308816	0.15
1988	-	-	203625	0.23
1989	501100	0.23	510281	0.24
1990	579900	0.18	431275	0.19
1991	467000	0.24	518211	0.19
1992	320200	0.18	529152	0.19
1993	373500	0.23	422911	0.23
1994	279400	0.23	241648	0.28
1995	-	-	320342	0.71
1996	-	-	290338	0.24
1997	-	-	220849	0.24
1998	-	-	-	-
1999	-	-	327409	0.25
2000	-	-	321512	0.33
2001	293221	0.20	-	-
2002	-	-	-	-
2003	230957	0.20	141698	0.24
2004	-	-	213530	0.33

Table 3: Catch-at-age data for South African horse mackerel. Data for 1975-1983 are from Kinloch *et al.* (1986), and those for 1984-1988 are from M.J. Armstrong (pers. commn.) – calculated using the methods presented in Kinloch *et al*. (1986). Units are millions.

	Age							
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1975	0	3.64	8.19	23.65	15.46	32.75	6.37	0.73
1976	0	0	13.29	20.28	15.39	13.29	6.99	0.21
1977	0	3.81	52.98	76.29	33.91	21.19	19.07	2.12
1978	0	9.18	11.62	13.46	9.79	3.67	6.73	3.06
1979	0	24.35	12.94	9.89	10.65	2.28	9.13	5.33
1980	0	2.69	11.67	28.72	31.41	7.18	6.28	1.79
1981	0	0.64	9.54	20.36	19.09	7.00	5.09	1.91
1982	0	1.32	9.25	20.48	12.55	5.94	3.96	12.55
1983	0	1.89	3.78	17.00	17.63	10.71	3.15	7.56
1984	1.46	3.10	8.63	16.35	12.82	14.45	5.29	3.65
1985	0	2.14	2.14	15.96	16.33	5.44	3.58	0.93
1986	0	0.10	7.58	14.45	15.78	7.84	4.15	1.33
1987	0	1.15	17.58	14.73	18.26	6.45	8.14	1.56
1988	0	0.21	26.35	20.45	11.58	8.59	3.12	0.71

Table 4: CPUE series – Japanese OTB-8 series.

	Japanese CPUE (tons day^{-1})
1976	16.43
1977	17.67
1978	9.55
1979	11.59
1980	13.97
1981	13.33
1982	9.95
1983	14.03
1984	15.61
1985	11.97
1986	23.27
1987	14.61
1988	12.41

Appendix: Detailed historic catch breakdown of the South African horse mackerel fishery (R.W. Leslie, pers. commn).

Table A1: Pelagic catches.

Purse-seine catches ('000 t) on the RSA West coast

Year	Geldenhuys	de Villiers	Armstrong	MCM data	ICSEAF
1950	50.352	49.154	49.90	49.90	
1951	100.963	99.357	98.90	98.90	
1952	102.636	101.572	102.60	102.60	
1953	94.496	84.552	85.20	85.20	
1954	118.142	118.137	118.1	118.1	
1955	78.822	78.822	78.80	78.80	
1956	45.571	45.752	45.80	45.80	
1957	84.565	84.615	84.60	84.60	
1958	56.418	56.415	56.40	56.40	
1959	17.676	17.676	17.70	17.70	
1960	64.384	62.926	62.90	62.90	
1961	39.859	38.935	38.90	38.90	
1962	67.226	66.649	67.70	67.70	
1963	23.950	23.168	23.30	23.30	
1964	24.747	24.241	24.40	24.40	
1965	57.646	55.294	55.00	55.00	
1966	26.827	26.742	26.30	26.30	
1967	8.552	8.552	8.80	8.80	
1968	1.318	1.318	1.40	1.40	
1969	25.772	25.772	26.80	26.80	
1970	7.523	7.522	7.90	7.90	
1971	1.603	1.603	2.20	2.20	
1972		0.96	1.30	1.30	
1973		0.257	1.60	1.60	
1974		1.616	2.50	2.50	
1975		0.804	1.60	1.60	
1976			0.40	0.40	
1977			1.90	1.90	
1978			3.60	3.60	
1979			4.30	4.30	
1980			0.40	0.40	
1981			6.10	6.10	6.054
1982			1.10	1.10	1.116
1983			2.10	2.10	1.417
1984			2.80	2.80	2.488
1985			0.70	0.70	0.816
1986			0.50	0.50	0.415
1987			2.80	2.80	3.188
1988			6.30	6.30	
1989			25.50	25.50	
1990				7.20	
1991				0.50	
1992				1.90	
1993				11.64	
1994				8.21	
1995				1.98	
1996				18.98	

1997		12.70
1998		26.66
1999		2.05
2000		4.80
2001		0.90
2002		8.15
2003		1.00

Table A2: Demersal catches on the West coast.

Horse mackerel catches on West coast

Year	South Africa					JPN	Oth
	Bottom de Villiers	Gear N.K. ICSEAF	Trawl ICSEAF	"Trawl" MCM	Midwater MCM	Trawl ICSEAF	Trawl ICSEAF
1950	0.316						
1951	0.905						
1952	1.109						
1953	1.407						
1954	2.478						
1955	1.733						
1956	1.006						
1957	0.769						
1958	1.836						
1959	1.636						
1960	3.283						
1961	3.174						
1962	2.525						
1963	0.880						
1964	1.151						
1965	1.188						
1966	1.472						
1967	1.296						
1968	0.309						
1969	1.382						
1970	3.600						
1971	2.057					0.073	3.957
1972	1.259	0.960				--	1.064
1973	1.814	0.257				0.032	8.758
1974	1.721	3.474				0.001	5.348
1975	1.657	2.765				0.078	16.393
1976		2.442				0.003	0
1977		6.012				0.581	0
1978		2.728				0.556	0
1979		7.909				0.047	0
1980		2.601				0.013	0
1981			1.273			--	0
1982			0.822			0.002	0
1983			1.381			0.012	0
1984			1.989			--	0
1985			0.853			0.018	0.002
1986			1.061			0.016	0.069
1987			3.441			0.015	0.095
1988			2.496			0.003	0.003

1989				3.216				
1990				4.546				
1991				3.742				
1992				4.140				
1993				3.590				
1994				2.019				
1995				2.047				
1996				2.633				
1997				2.528				
1998				2.791	0.029			
1999				1.876	0.036			
2000				1.077	0.007			
2001				1.036	0.008			
2002				0.791	0.000			
2003				0.617	0.003			

Table A3: Demersal catches on the South coast.

Year	ZAF Trawl de Villiers	ZAF Trawl ICSEAF	ZAF "Trawl" MCM	ZAF Midwater MCM	JPN Trawl ICSEAF	JPN Trawl Sato	JPN Trawl Hatanaka	Oth Trawl ICSEAF
1950	0.129							
1951	0.2							
1952	0.117							
1953	0.049							
1954	0.072							
1955	0.193							
1956	0.328							
1957	0.19							
1958	0.237							
1959	0.439							
1960	0.429							
1961	0.453							
1962	0.554							
1963	0.521							
1964	0.801					7.570		
1965	1.119					4.710		
1966	1.524					4.600		
1967	2.083					2.810		
1968	2.997					5.810		
1969	4.43					6.440		
1970	3.562					10.710		
1971	5.678				21.351	21.350		0.233
1972	3.693				14.544	14.540		0
1973	5.203				19.427	19.430		0.078
1974	8.697	8.713			20.819	20.820		0.051
1975	6.815	6.815			43.792	43.790	38.892	0.004
1976		9.086			28.536		21.410	1.873
1977		11.082			27.99		25.715	25.426
1978		12.696			21.309		19.395	0
1979		28.601			24.576		23.511	0
1980		18.192			22.246		21.821	0
1981		9.913			23.967		22.697	0

1982	16.136			16.589	16.131	0
1983	22.864			18.475	17.250	0
1984	15.141			21.736	21.687	0
1985	17.381			13.063	13.026	0
1986	19.27			14.87	14.816	0.58
1987	26.916			11.335	11.316	0.189
1988	19.484			12.347		0
1989		22.947		8.000		
1990		39.101				
1991		20.232				
1992		19.137				
1993		14.836				
1994		6.460				
1995		4.655				
1996		7.074				
1997		8.804				
1998		6.885	4.177			
1999		7.372	0.890			
2000		8.643	14.775			
2001		8.764	15.256			
2002		5.410	9.472			
2003		3.640	28.045			

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Hatanaka	Hatanaka, H. 1989 - Japanese fisheries and research report for 1987. Colln scient. Pap. Int Commn S.E. Atl. Fish. 16(3): 25-33
ICSEAF	Statistical Bulletin of the International Commission for the Southeast Atlantic Fisheries (mostly as reported in Punt and Leslie (1990), but with some additional data)
MCM	Marine and Coastal Management unpublished data.
Sato	Sato, T. 1977 - Japanese research report for 1975. Colln scient. Pap. int. Commn S.E. Atl. Fish. 4: 7-11
Punt	Punt, A.E. and R.W.Leslie 1990 - Data for Cape horse mackerel (Trachurus trachurus capensis). WG/Oct/90/D/14