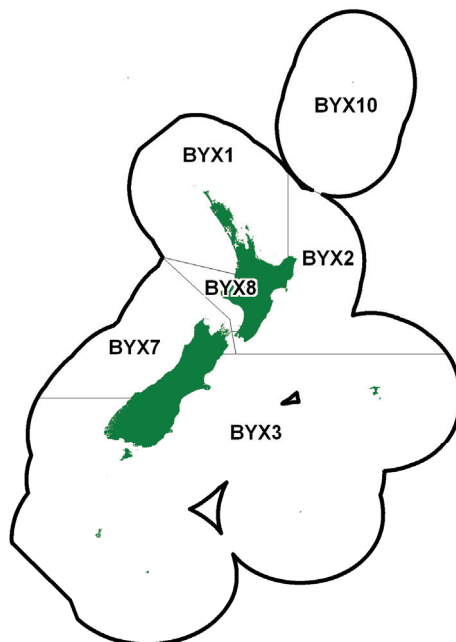


ALFONSINO (BYX)*(Beryx splendens, B. decadactylus)***1. FISHERY SUMMARY****1.1 Commercial fisheries**

The alfonsino fishery is essentially confined to BYX 2 & 3. Alfonsino has supported a major mid-water target trawl fishery off the lower east coast of the North Island since 1983 and is a minor bycatch of other trawl fisheries around New Zealand. The original gazetted TACs were based on the 1983–84 landings except for BYX 10 which was administratively set. Recent reported domestic landings and actual TACCs are shown in Table 1, while Figure 1 shows the historical landings and TACC values for the main BYX stocks.

Prior to 1983, alfonsino was virtually an unfished resource. The domestic BYX 2 target fishery was developed during 1981, and was concentrated on the banks and seamount features off the east coast of the North Island, between Gisborne and Cape Palliser. Major fishing grounds include the Palliser Bank, Tuaheni Rise, Ritchie Banks and Paoanui Ridge. In more recent years, the alfonsino catch and effort has decreased from these areas, and an increasing proportion of the annual catch has been taken from the Madden Banks and Motukura Bank.

Increasing volumes of alfonsino are taken as bycatch in the gemfish trawl fishery, which has exploited new grounds in QMA 2. Alfonsino is also taken as bycatch in the orange roughy and hoki fisheries in QMA 2.

The TACC for BYX 1 was increased for the 2001–02 fishing year from 31 t to 300 t when it was included in the adaptive management programme. The new TACC was attained for the first time in 2004–05 and has been under caught since then.

The TACC for BYX 2 was reduced from 1630 to 1274 t during the 1989–90 fishing year but has increased since then to 1575 t as a result of decisions by the Quota Appeal Authority. The TACC for BYX 2 was consistently overcaught by up to 300 t between 1992–93 and 2000–01, only in 2001–02 were the landings less than the TACC, and this was by only 1 t. The TACC in BYX 2 has been overcaught every year except one from the 2002–03 fishing year through 2008–09.

Table 1: Reported domestic landings (t) of alfonsino by Fishstock from 1985–86 to 2008–09 and actual TACCs (t) from 1986–87 to 2008–09. QMS data from 1986-present.

Fishstock FMA (s)	BYX 1		BYX 2		BYX 3		BYX 7	
	1 & 9		2		3, 4, 5 & 6		7	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1985–86*	11	–	1 454	–	3	–	1	–
1986–87	3	10	1 387	1 510	75	220	4	30
1987–88	8	27	1 252	1 511	101	1 000	2	30
1988–89	6	27	1 588	1 630	64	1 000	4	30
1989–90	24	31	1 496	1 274	147	1 007	21	80
1990–91	17	31	1 459	1 274	202	1 007	26	81
1991–92	7	31	1 368	1 499	264	1 007	2	81
1992–93	6	31	1 649	1 504	113	1 007	12	81
1993–94	7	31	1 688	1 569	275	1 007	31	81
1994–95	11	31	1 670	1 569	482	1 010	59	81
1995–96	11	31	1 868	1 569	961	1 010	66	81
1996–97	39	31	1 854	1 575	983	1 010	77	81
1997–98	14	31	1 652	1 575	1 164	1 010	67	81
1998–99	37	31	1 658	1 575	912	1 010	13	81
1999–00	25	31	1 856	1 575	743	1 010	24	81
2000–01	25	31	1 665	1 575	890	1 010	21	81
2001–02	123	300	1 574	1 575	1 197	1 010	10	81
2002–03	136	300	1 665	1 575	1 118	1 010	7	81
2003–04	219	300	1 468	1 575	884	1 010	11	81
2004–05	300	300	1 669	1 575	1 067	1 010	14	81
2005–06	195	300	1 633	1 575	1 068	1 010	7	81
2006–07	66	300	1 644	1 575	945	1 010	21	81
2007–08	154	300	1 532	1 575	1 030	1 010	32	81
2008–09	172	300	1 589	1 575	895	1 010	18	81

Fishstock FMA (s)	BYX 10			
	10		Total	
	Landings	TACC	Landings	TACC
1985–86*	0	–	1 469	–
1986–87	0	10	1 470	1 800
1987–88	0	10	1 364	2 598
1988–89	1	10	1 663	2 717
1989–90	0	10	1 688	2 422
1990–91	0	10	1 664	2 423
1991–92	<1	10	1 641‡	2 648
1992–93	<1	10	1 780‡	2 653
1993–94	0	10	2 001‡	2 718
1994–95	0	10	2 223‡	2 721
1995–96	0	10	2 906‡	2 721
1996–97	0	10	2 953‡	2 727
1997–98	0	10	2 898‡	2 727
1998–99	0	10	2 624‡	2 727
1999–00	0	10	2 648‡	2 727
2000–01	0	10	2 601‡	2 727
2001–02	0	10	2 904‡	2 925
2002–03	0	10	2 927 ‡	2 925
2003–04	0	10	2 584 ‡	2 925
2004–05	0	10	3 052 ‡	2 925
2005–06	0	10	2 903 ‡	2 925
2006–07	0	10	2 677 ‡	2 925
2007–08	0	10	2 748 ‡	3 000
2008–09	0	10	2 674 ‡	3 000

*FSU data.

‡ Excludes catches taken outside the New Zealand EEZ.

The TACC for BYX 3 was increased for the 1987–88 fishing year from 220 t to 1000 t but annual landings remained low until 1993–94. Since 1995–96, landings have exceeded 900 t, reaching a peak of 1197 t in 2001–02 (187 t over the TACC). The 2002–03 catch of 1118 was also substantially larger

ALFONSINO (BYX)

than the 1010 t TACC. The marked increase in BYX 3 landings since 1994–95 (Table 1) is due mainly to the development of a target trawl fishery exploiting new grounds in BYX 3, and the discovery of new grounds south-east of the Chatham Islands (where a longline fishery for alfonsino, groper and ling has developed). Currently, most of the BYX 3 catch is taken from the target bottom trawl fishery, operating on a complex of underwater features to the south-east of the Chatham Islands. The target fishery is comprised of a small number of vessels targeting alfonsino during the summer period. The remainder of the BYX 3 catch is taken as a small bycatch of the hoki, orange roughy, and hake target trawl fisheries. The target trawl fishery has an associated bycatch of bluenose (Langley & Walker 2002).

Fishing new grounds in BYX 7 resulted in increased catches in the mid 1990's and total landings of up to 77 t were recorded in 1996–97. However, landings have declined substantially since that time, fluctuating between 7 t and 32t after 1999-00.

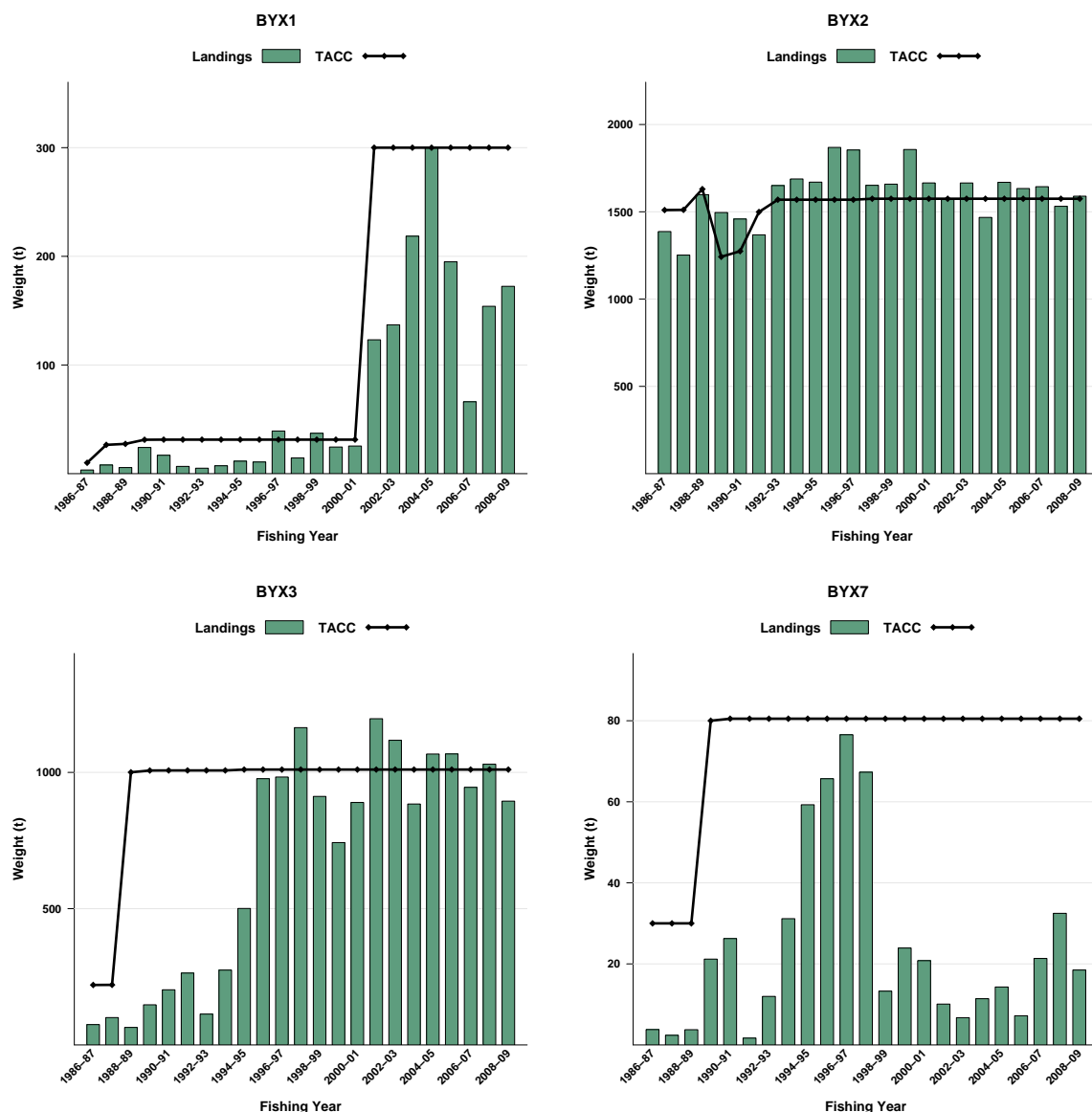


Figure 1: Historical landings and TACC for the four main BYX stocks. From top left to bottom right: BYX1 (Auckland), BYX2 (Central East), BYX3 (South East Coast, South East Chatham Rise, Sub Antarctic, Southland), and BYX7 (Challenger). Note that these figures do not show data prior to entry into the QMS.

1.2 Recreational fisheries

Occasional catches of alfonsino have been recorded from recreational fishers.

1.3 Customary non-commercial fisheries

No quantitative information on the level of customary non-commercial catch is available.

1.4 Illegal catch

No quantitative information on the level of illegal alfonsino catch is available.

1.5 Other sources of mortality

No qualitative information is available.

2. BIOLOGY

Both species of *Beryx* occur throughout the world's tropical and temperate waters, in depths from 25 to 1200 m. In New Zealand waters, most "alfonsino" landings are of alfonsino *B. splendens* and landings of the red bream *B. decadactylus* account for less than 1% of this catch. Red bream is taken mainly in BYX 1 but the biology of this species is poorly known. For the purposes of yield assessment, productivity parameters for alfonsino have been based on *B. splendens*. These species are primarily associated with undersea structures such as the seamounts that occur off the lower east coast of the North Island and on the Chatham Rise, in depths from 300–600 m.

Alfonsino have a maximum recorded age of 17 years and females grow faster than males. Pre-spawning alfonsino have been recorded in New Zealand waters but spawning grounds are unknown. Summer-autumn spawning activity has been noted in the North and South Atlantic and North Pacific Oceans. Juvenile alfonsino have been reported from near New Caledonia, associated with oceanic gyre systems. It is likely that the New Zealand stocks utilise similar pelagic water systems for reproduction and juvenile development. Size-at-sexual maturity is probably about 30 cm fork length (FL) at 4 to 5 years of age. Juvenile fish have been recorded in the pelagic and epipelagic zones in the North Pacific and Indian Oceans. Alfonsino less than 20 cm FL are seldom recorded in New Zealand waters. Differences in length-frequency distributions between fishing grounds off the east coast North Island suggest that some age-specific migration occurs. Fish probably recruit to these grounds at 28–31 cm FL.

Estimates of M from catch curve analysis are not available due to the likelihood that age-specific migration precludes the sampling of the whole population. M was estimated using the equation $M = \log_e 100/\text{maximum age}$, where maximum age is the age to which 1% of the population survives in an unexploited stock. Using a maximum age of 20 years, M equalled 0.23.

Biological parameters relative to the stock assessment are shown in Table 2.

Table 2: Estimates of biological parameters for alfonsino.

Fishstock	Estimate			Source
1. Natural mortality (M)				
BYX 2	0.23			Stocker & Blackwell (1991)
2. Weight = $a(\text{length})^b$ (Weight in g, length in cm fork length).				
	Both Sexes			
	a	b		
BYX 2	0.0226	3.018		Stocker & Blackwell (1991)
3. Von Bertalanffy growth parameters				
	Females			Males
	L_∞	k	t_0	L_∞
BYX 2	57.5	0.08	-4.10	51.1
				0.11
				-3.56
				Stocker & Blackwell (1991)

3. STOCKS AND AREAS

There are no new data which would alter the stock boundaries given in previous assessment documents. No information is available as to whether alfonsino is a single stock in New Zealand

waters. Overseas data on alfonsino stock distributions suggest that New Zealand fish could form part of a widely distributed South Pacific stock.

4. STOCK ASSESSMENT

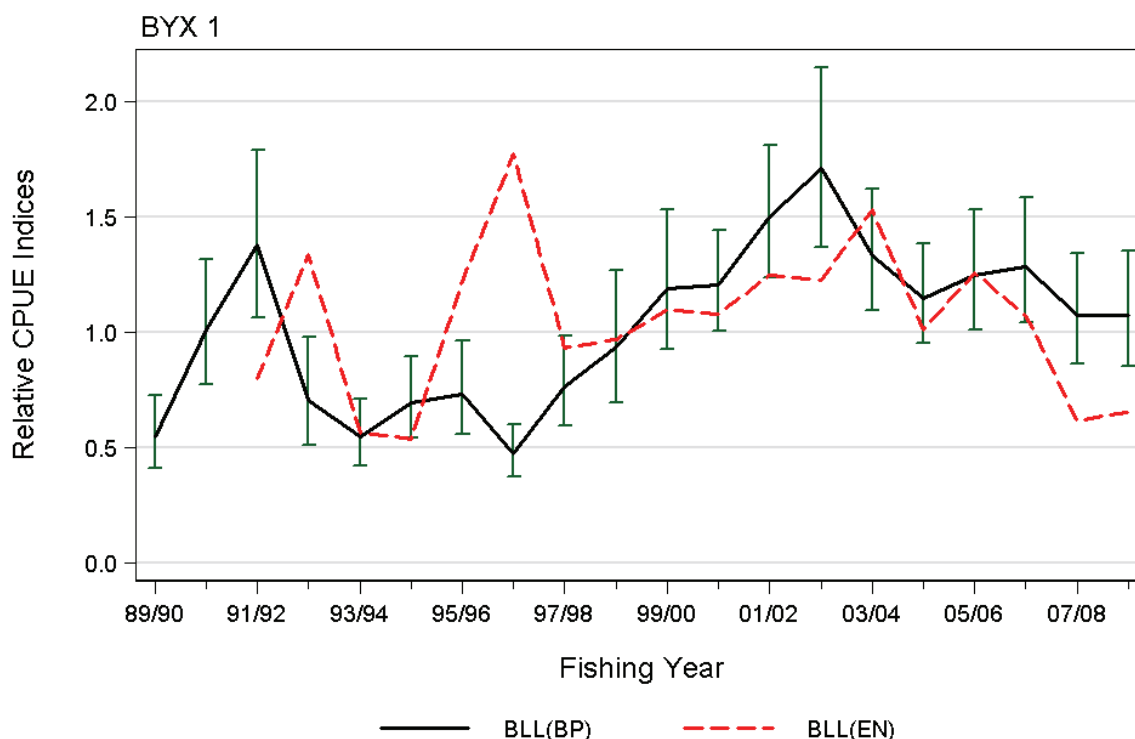
There are no new data which would alter the yield estimates given in the 1996 Plenary Report. Yield estimates are based on commercial CPUE data.

4.1 Estimates of fishery parameters and abundance

i) BYX 1

BYX 1 is largely taken by bottom trawl (BT) (61%), with the remaining catch taken by mid-water trawl (MW) (25%) and bottom longline (BLL) (12%). The primary targets species are alfonsino (81%) and cardinalfish (12%) for bottom trawl; alfonsino (55%), blue nose (21%) and rubyfish (21%) for mid-water trawl; and bluenose (95%) for bottom longline.

BT / MW trawl indices were not considered in 2010, and the BLL indices were updated using the same models as used in 2008. Standardised bottom longline CPUE series were considered by the AMP WG in 2010 to provide credible indices of abundance for BYX 1 in East Northland and Bay of Plenty, particularly after 2001/02. The two bluenose / hapuku/bass targeted BLL series show similar trends with both series increasing to peaks soon after introduction to the AMP - 2002/03 for the BoP and 2003/04 in EN - then declining by 37% (BoP) to 2008/09 (Figure 2). The BoP index is considered to be more reliable as the fishery accounts for most of the longline catch and fishing has been more consistent. BLL is the least important method taking BYX 1 and there are questions regarding how representative these indices are of the BYX 1 stock, or of the size distribution of fish caught in the BT fishery. These CPUE indices are believed to be less reliable prior 2001/02.



Each series scaled so that the geometric mean=1 from 91/92 to 08/09

Figure 2: Comparison of the lognormal indices from the two bottom longline CPUE series for BYX 1: a) BLL[EN]: target bluenose/hapuku in East Northland; b) BLL[BP]: target bluenose/hapuku in Bay of Plenty (Each series is scaled so that the geometric mean = 1)(Starr et al. 2010).

Given the very low catches prior to implementation of the AMP, the WG considered that the stock was lightly fished, and highly unlikely to have been below B_{MSY} , at the time of entry into the AMP.

Noting that one index is currently at average levels, and the other about one-third below average levels, the WG considered that it was unlikely that the stock was currently below B_{MSY} , assuming that B_{MSY} is in the range of 30% to 50% of B_0 . The WG noted that data being collected for this fishery are unlikely to ever be adequate to accurately determine stock status in relation B_{MSY} .

ii) **BYX 2**

A biomass index derived from a standardised CPUE (log linear, kg/day) analysis of the target trawl fishery represented by 7 core vessels (Blackwell 2000) was calculated for BYX 2. However, the analysis was very uncertain, and the model accounted for only 25% of the variance in catch rates. The results of the standardised analysis were not accepted by the Inshore WG as indices of abundance.

The age composition of the commercial landings in BYX 2 was determined in 1998–99, 1999–00, and 2000–01 and 2002–03, 2003–04 and 2004–05. The commercial catch is dominated by 5–11 year old fish. Without linking age structure to specific fishing grounds the age structure of the catch is unlikely to monitor changes in the population.

iii) **BYX 3**

The potential to monitor trends in abundance using catch and effort data from the target BYX 3 fishery has recently been investigated (Langley & Walker 2002). However, it was concluded that the high variation in catch rates, the relatively small number of catch and effort records, and the complex nature of the fishery precluded the development of a reliable CPUE index.

4.2 Biomass estimates

Biomass estimates are discussed in the section on estimation of MCY. Estimates of current biomass are not available.

4.3 Estimation of Maximum Constant Yield (MCY)

i) **BYX 2**

MCY was estimated at 1110-1200t in 1991 using a stock reduction model based on an unstandardised CPUE index (Stocker & Blackwell 1991) and has not been updated. Subsequent CPUE analyses (Blackwell 2000) were not accepted as a measure of abundance for BYX 2 and as a result these estimates of yield may be unreliable.

These estimates of MCY have not changed since the 1991 Plenary Report.

The level of risk to the stock by harvesting the population at the estimated MCY value cannot be determined.

ii) **Other areas**

MCY cannot be determined.

4.4 Estimation of Current Annual Yield (CAY)

No estimates of current biomass are available for any stock and it is not possible to estimate CAY.

4.5 Other yield estimates and stock assessment factors

Long-term sustainable yield using an $F_{0.1}$ fishing strategy was estimated for BYX 2 using the simulation model with the two estimates of M (Table 3). $F_{0.1}$ has been estimated as 0.25 and 0.32 for $M = 0.2$ and $M = 0.23$, respectively, for both sexes combined in BYX 2 (Stocker & Blackwell 1991). The biomass at this long-term equilibrium yield is about 35% B_0 and the $F_{0.1}$ yield is about 8–9% B_0 .

4.6 Other factors

The current assessment for BYX 2 is based upon the historical fishery areas. In recent years the fishery has expanded to new areas not previously fished. Subsequent CPUE analyses have been rejected by Working Groups and it is no longer thought possible to monitor abundance in BYX 2 using trawl CPUE.

ALFONSINO (BYX)

Current data on alfonsino movements are inconclusive. It is not known whether the fish on the east coast of the North Island spend some part of their life cycle in other New Zealand waters, or whether the east coast–Chatham Rise region is just one of several pre–reproductive regions. It is possible that the domestic trawl fishery may be exploiting part of a wider South Pacific stock. Catches may be expected to increase in BYX 3 due to the discovery of new grounds. However, the potential for expansion may be constrained by availability of BNS 3 quota to cover likely bluenose bycatch.

Yield estimates are summarised in Table 4.

Table 4: Yield estimates (t).

Parameter	Fishstock	Estimate
MCY	BYX 2	1 110–1 200
F _{0.1} yield	BYX 2	1 320–1 800
CAY	All	Cannot be determined

5. STATUS OF THE STOCKS

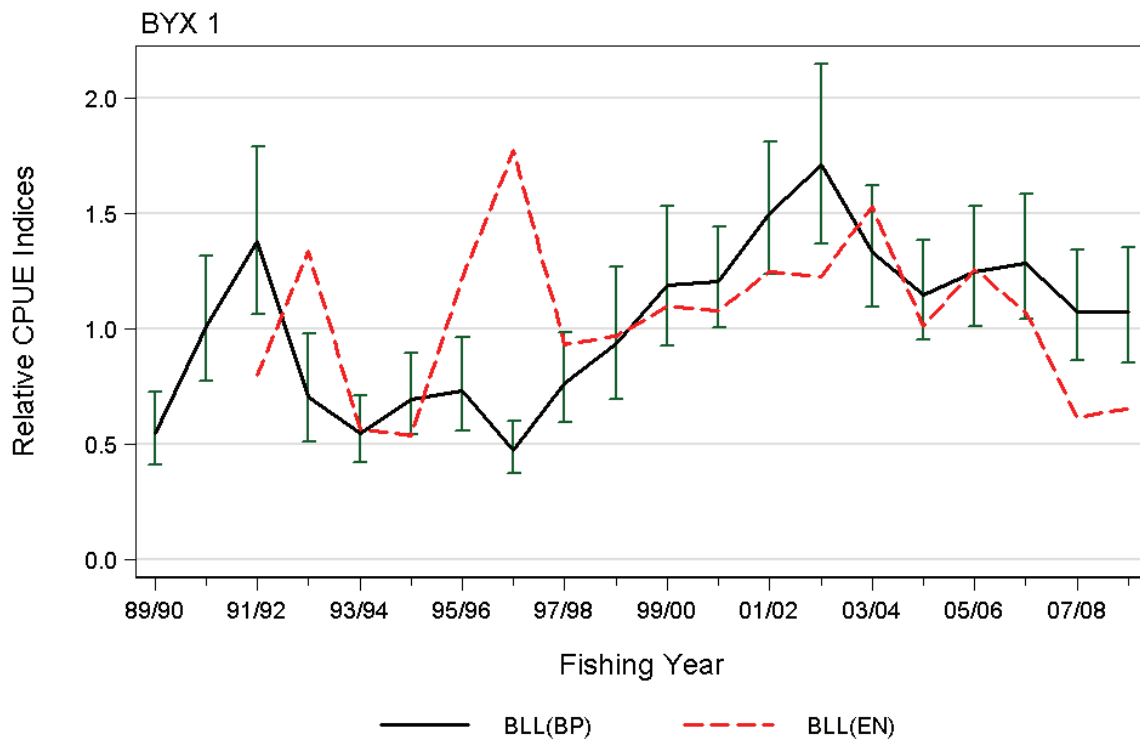
BYX 1

Stock Structure Assumptions

No information is available as to whether alfonsino is a single stock in New Zealand fishery waters. Overseas data on alfonsino stock distributions suggest that New Zealand fish could form part of a widely distributed South Pacific stock. The BYX administrative fishstocks also consist of landings of more than one species (alfonsino *Beryx splendens* and red bream *B. decadactylus*). Information in this summary is provided for an assumed alfonsino Fishstock across FMA 1.

Stock Status	
Year of Most Recent Assessment	2010
Reference Points	Target(s): Not established Soft Limit: 20% B ₀ Hard Limit: 10% B ₀
Status in relation to Target	Likely (> 40%) to be above B _{MSY} , assuming that B _{MSY} is in the range of 30% to 50% of B ₀ .
Status in relation to Limits	Soft Limit: Very Unlikely (< 10%) to be below. Hard Limit: Very Unlikely (< 10%) to be below.

Historical Stock Status Trajectory and Current Status



Each series scaled so that the geometric mean=1 from 91/92 to 08/09

Comparison of the lognormal indices from the two bottom longline CPUE series for BYX 1: a) BLL[EN]: target bluenose/hapuku in East Northland; b) BLL[BP]: target bluenose/hapuku in Bay of Plenty (Each series is scaled so that the geometric mean = 1).

Fishery and Stock Trends

Recent Trend in Biomass or Proxy

Standardised bottom longline (BLL) CPUE series were considered to provide credible indices of abundance for BYX 1 in East Northland and Bay of Plenty, particularly after 2001/02. The two bluenose / hapuku/bass targeted BLL series show similar trends with both series increasing to peaks soon after introduction to the AMP - 2002/03 for the BoP and 2003/04 in EN - then declining by 37% (BoP) to 2008/09. The BoP index is considered to be more reliable as the fishery accounts for most of the longline catch and fishing has been more consistent.

Recent Trend in Fishing Mortality or Proxy

Projections and Prognosis

Stock Projections or Prognosis

Stock size is Likely (> 60%) to decline towards B_{MSY} under current catches and TACCs.

Probability of Current Catch or TACC causing decline below Limits

Soft Limit: Unknown
Hard Limit: Unlikely (< 40%)

Assessment Methodology

Assessment Type

Level 2: Standardised CPUE abundance index.

Assessment Method

Standardised CPUE indices

Main data inputs

Catch and effort data derived from the Ministry of Fisheries catch reporting.
Length frequency data summarised from logbooks compiled under

ALFONSINO (BYX)

	the industry Adaptive Management Programme.	
Period of Assessment	Latest assessment: 2010	Next assessment: 2013
Changes to Model Structure and Assumptions	Bottom / Midwater trawl indices were not considered in 2010, and the BLL indices were updated using the same models as used in 2008.	
Major Sources of Uncertainty	BLL is the least important method taking BYX 1 and there are questions regarding how representative these indices are of the BYX 1 stock, or of the size distribution of fish caught in the BT fishery. These CPUE indices are believed to be less reliable prior 2001/02.	

Qualifying Comments

Fishery Interactions

Bottom and mid water trawl fisheries that target bluenose, black cardinalfish and rubyfish also catch alfonsino. The bluenose target bottom longline fishery has alfonsino as a small bycatch.

BYX 2

Annual landings from 1986 to 2008-09 have remained reasonably stable at or above the level of the TACC. Catch at this level appears to be sustainable in the short to medium term.

BYX 3

Alfonsino on the Chatham Rise (BYX 3) were lightly fished prior to 1995–96 when catches increased to near the TACC, due to the development of new fishing grounds. Catch has fluctuated around the TACC since then. It is not known if the recent catch levels or the current TACC are sustainable.

Yield estimates and reported landings are summarised in Table 5.

Table 5: Summary of yield estimates (t), TACCs (t) and reported landings (t) for Alfonsino for the most recent fishing year.

Fishstock	QMA	MCY	F _{0.1} yield	2008–09	2008–09
				Actual TACC	Reported landings
BYX 1	Auckland (East) (West)	1 & 9	–	300	172
BYX 2	Central (East)	2	1 110–1 200	1 575	1 589
BYX 3	South–East (Coast)	3, 4, 5,	–	1 010	895
	Southland & Sub–Antarctic	& 6			
BYX 7	Challenger	7	–	81	18
BYX 8	Central (West)	8	–	20	<1
BYX 10	Kermadec	10	–	10	0
Total				2 996	2 674

7. FOR FURTHER INFORMATION

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