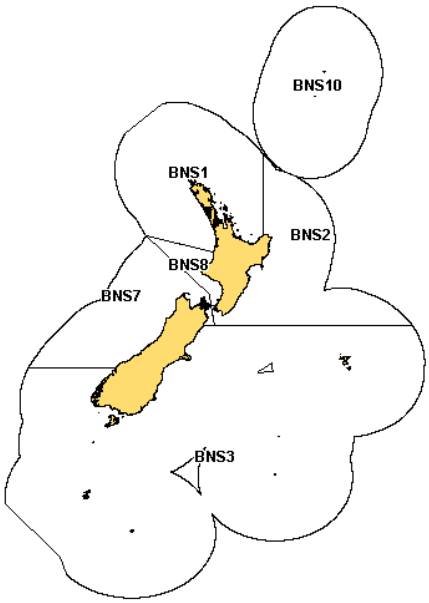
BLUENOSE (BNS)

(Hyperoglyphe antarctica)
Matiri



1. FISHERY SUMMARY

1.1 Commercial fisheries

The most important domestic bluenose trawl fisheries occur off the Wairarapa Coast (BNS 2), where bluenose was a major bycatch in the alfonsino and gemfish target trawl fisheries, and has been increasingly targeted in recent years. There is substantial targeting of bluenose by the line fishery in the Bay of Plenty and off Northland (BNS 1). Line fisheries for bluenose also exist in BNS 2 north and east of East Cape and to the west of Cook Strait in BNS 7 and BNS 8. About half of the BNS 2 catch is taken by longline and the remainder by bottom trawl. After 2001 a targeted fishery for bluenose developed on the Chatham Rise using both trawl and line gear. About two thirds of BNS 3 landings are taken as a bycatch in the hoki bottom trawl and ling longline fisheries. Bluenose supports a small target line fishery off the Wairarapa Coast and a small amount of target setnet fishing for bluenose occurs in the Bay of Plenty and off the east and south coasts of the South Island.

Prior to 1981, bluenose were sometimes recorded as bonita, or mixed with hapuku/bass/groper, and not reported separately as bluenose, so landings data for this early period are inaccurate. Landings before 1986–87 have been grouped by statistical area that approximates the current QMAs. Total annual bluenose landings were relatively constant at an average level of 1 406 t from 1984 to 1989–90, and then rose to an average 2 324 t from 1992–93 to 1995–96. Total landings from 2002–03 to 2004–05 exceeded 3 000 t, but dropped to 2 475 t in 2005–06 and 2 425 t in 2006–07.

TACCs were first established for bluenose upon establishment of the QMS in 1986–87, with TACCs for all bluenose stocks totalling 1 350 t. Over the past 15 years, all bluenose Fishstocks have been managed under Adaptive Management Programmes (AMPs). BNS 3 was the first stock to enter an AMP in October 1992, with a TACC increase from 175 t to 350 t. This was further increased within the AMP to 925 t in October 2001, plus an additional transitional 250t of ACE provided to Chatham Islands fishers in 2001–02 and 2002–03 only. BNS 7 (TACC increase from 97 t to 50 t) and BNS 8 (TACC increase from 22 t to 100 t) entered AMPs in October 1994. BNS 1, the second largest bluenose fishery, entered an AMP in October 1996, with a TACC increase from 705 t to 1 000 t. BNS 2, the largest bluenose fishery, was the most recent entry into an AMP in October 2004, with a TACC increase from 873 t to 1 048 t. Reported landings and TACCs since 1981 are given in Table 1.

Table 1: Reported landings (t) of bluenose by Fishstock from 1981 to 2003–04 and actual TACCs (t) from 1986–87 to 2006–07.

Fish stock	BNS 1		BNS 2		BNS 3		BNS 7		BNS 8	
FMA (s)	1 & 9		2		3, 4, 5 & 6		7		8	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1981*	146		101		36		12			
1982*	246		170		46		22			
1983†	250		352		51		47		1	
1984†	464		810		81		30		1	
1985†	432		745		73		26		1	
1986†	440		1 009		33		53		1	
1986–87‡	286	450	953	660	93	150	71	60	1	20
1987–88‡	405	528	653	661	101	166	104	62	1	22
1988–89‡	480	530	692	768	90	167	135	69	13	22
1989–90‡	535	632	766	833	132	174	105	94	3	22
1990–91‡	696	705	812	833	184	175	72	96	5	22
1991–92‡	765	705	919	839	240	175	62	96	5	22
1992–93‡	787	705	1 151	842	224	350	120	97	24	22
1993–94‡	615	705	1 288	849	311	350	79	97	27	22
1994–95‡	706	705	1 028	849	389	357	83	150	79	100
1995–96‡	675	705	953	849	513	357	140	150	70	100
1996–97‡	966	1 000	1 100	873	540	357	145	150	86	100
1997–98‡	1 020	1 000	929	873	444	357	123	150	67	100
1998–99‡	868	1 000	1 002	873	729	357	128	150	46	100
1999–00‡	860	1 000	1 136	873	566	357	114	150	55	100
2000–01‡	890	1 000	1 097	873	633	357	87	150	14	100
2001–02‡	954	1 000	1 010	873	733	925+	70	150	17	100
2002–03‡	1 051	1 000	933	873	876	925+	76	150	66	100
2003–04‡	1 030	1 000	933	873	915	925	117	150	96	100
2004–05‡	870	1 000	1 162	1 048	844	925	94	150	42	100
2005–06‡	699	1 000	1 136	1 048	536	925	84	150	20	100
2006–07‡	742	1 000	957	1 048	511	925	164	150	50	100

Fish stock	BNS 10		Total	
FMA (s)	10			
	Landings	TACC	Landings	TACC
1981*	0		295	
1982*	0		484	
1983†	0		701	
1984†	0		1 386	
1985†	0		1 277	
1986†	0		1 536	
1986–87‡	7	10	1 411	1 350
1987–88‡	10	10	1 274	1 449
1988–89‡	10	10	1 420	1 566
1989–90‡	0	10	1 541	1 765
1990–91‡	12	10#	1 781	1 831
1991–92‡	40	10#	2 031	1 837
1992–93‡	29	10#	2 335	2 016
1993–94‡	3	10#	2 323	2 023
1994–95‡	0	10	2 285	2 161
1995–96‡	0	10	2 351	2 161
1996–97‡	9	10#	2 846	2 480
1997–98‡	30	10#	2 613	2 480
1998–99‡	2	10#	2 775	2 480
1999–00‡	0	10#	2 731	2 480
2000–01‡	0	10#	2 721	2 480
2001–02‡	0	10#	2 784	3 048
2002–03‡	0	10	3 002	3 058
2003–04‡	0	10	3 091	3 058
2004–05‡	0	10	3 012	3 233
2005–06‡	0	10	2 475	3 233
2006–07‡	0	10	2 425	3 233

* MAF data, † FSU data, ‡ QMS data, # Includes exploratory catches in excess of the TAC.+ An additional transitional 250t of ACE was provided to Chatham Islands fishers, resulting in an effective commercial catch limit of 1 175t in 2001–02 and 2002–03.

AS a result of these TACC increases under AMPs, the combined total TACC for all bluenose stocks increased from an initial 1 350 t in 1986–87 to 3 233 t by 2004–05. Catch performance against this TACC has varied, with the combined TACC being under-caught by an average 9% (average landings 1 504 t / year) over 1987–88 to 1990–91, over-caught by an average 11% (average landings 2 501 t / year) over 1991–92 to 2000–01, and under-caught by an average 18% (average landings 2 637 t / year) since 2003–04. 2006–07 landings (2 425 t) were 75% of the combined TACC of 3 233 t.

1.2 Recreational fisheries

The annual recreational catch of BNS 1 was estimated from diary surveys to be 2 000 fish in 1993–94 (Teirney *et al*. 1997), 5 000 fish in 1996 (Bradford 1998) and 11 000 fish in 1999–00 (Boyd & Reilly 2005). The Recreational Working Group has concluded that the methodological framework used for telephone interviews produced incorrect eligibility figures for the 1996 and previous surveys. Consequently the harvest estimates derived from these surveys are considered to be ureliable. This group also indicated concerns with some of the harvest estimates from the 2000–01 survey. The group recommended: "*that the harvest estimates from the diary surveys should be used only with the following qualifications: a) they may be very inaccurate; b) the 1996 and earlier surveys contain a methodological error; and, c) the 2000 and 2001 harvest estimates are implausibly high for many important fisheries.*"

Minor recreational catches of bluenose are landed in other areas.

1.3 Customary non-commercial fishing

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

1.4 Illegal catch

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

1.5 Other sources of mortality

No information is available on any other sources of bluenose mortality.

2. BIOLOGY

2.1 Depth distribution

Bluenose have a pelagic juvenile phase. Otolith stable isotope ratios indicate that bluenose move sequentially deeper as they grow, from pelagic waters as juveniles (1–2 years), to 700 m – 1000 m for large adults (Horn *et al*. unpublished). That study hypothesised that the larger adults may be distributed below usually fished depths on underwater topographic features, but potentially available to fisheries as a result of regular vertical feeding migrations.

The depth distribution of bluenose extends from near-surface waters to about 1 200 m. Research trawl surveys record their main depth range as 250–750 m, with a peak at 300–400 m, and they regularly occur to about 800 m (Anderson *et al*. 1998). Commercial catches recorded in logbook programmes implemented for some of the bluenose stocks under AMPs, and TCEPR data for these fisheries, confirm that bluenose catches range in depth from <100 m to about 1 000 m, depending on target species, but with a strong peak around 400 m for bluenose targeted fishing by any method.

The depth distribution of bluenose changes with size, with small juveniles known to occur at the surface under floating objects (Last *et al*. 1993, Duffy *et al*. 2000). Larger juveniles probably live in coastal and oceanic pelagic waters for one or two years. Fish 40–70 cm in length are caught between 200 m and 600 m, while larger fish, particularly those larger than 80 cm, are more often caught deeper than 600 m. A sequential move to deeper waters as bluenose grow has been confirmed by analysis of the stable radio-isotope ratios in otolith sections. Oxygen isotope ($\delta^{18}O$) ratios of bluenose otolith cores confirm residence of juvenile fish within surface waters. Changes in oxygen isotope ratios across otolith sections indicate changes in preferred mean depth with age of each fish

(Horn *et al*. 2008). The largest adults appear to reside in 700–1 000 m deeper than most trawl or longline fishing for bluenose. However, adult bluenose are also known to associate closely with underwater topographic features (hills and seamounts), which would facilitate diurnal migrations into shallower depths to feed.

2.2 Age and growth

Recent ageing validation work by Horn *et al.* (2008) has resulted in substantially revised estimates of maximum age and size at maturity for bluenose. Radiocarbon (^{14}C) levels in core micro-samples from otoliths that had been aged using zone counts were compared with a bomb-radiocarbon reference curve which provided independent estimates of the age of the fish. This study estimated a maximum age for bluenose in the range of 50–60 years, approximately twice the previously quoted maximum age estimate, with an estimated age at maturity (probably closer to100% maturity than 50% maturity) of 10 years. This maximum age range is not inconsistent with the recently developed maximum age of 85 years for the closely related barrelfish (*Hyperoglyphe perciformis*) in the western North Atlantic, also determined, in part, using the bomb chronometer method (Filer & Sedberry, in press). Previous under-estimates of bluenose ages appears to have resulted from the incorrect interpretation of paired, fine 'split rings' as single growth zones, when they probably represent two separate growth zones.

Growth curves for bluenose have not yet been updated using this new validated zone-count methodology, and additional ageing work needs to be done to obtain the otolith readings required to generate new growth formulae

The updated estimate of maximum age of 60 years determined by Horn *et al.* (2008) results in an estimate of natural mortality $M = 0.08$ for a lightly exploited population ($p = 0.01$), and an estimate of $M = 0.06$ for a moderately exploited population ($p = 0.03$), using the method of Hoenig (1983). This range is substantially lower than previous estimates of M for bluenose reported in Plenary reports, such as the 2004 estimate of 0.18 based on a maximum age of 25 years (Paul *et al*. 2004), or the earlier estimate of 0.3 based on a maximum age of 15 years (Horn & Massey 1989).

2.3 Maturity and reproduction

Little is known about the reproductive biology of bluenose. The otolith age validation study by Horn *et al.* (2008) found an estimated age-at-maturity (probably closer to 100% maturity than 50% maturity) of 10 years. This agrees closely with indicated sizes at maturity from gonad staging in commercial logbook programmes implemented under AMPs, which indicate that bluenose sampled in QMAs 1, 3, 7 and 8 mature at between 60 cm and 65 cm, which approximately corresponds with age 10. Analysis of gonad maturity stage proportions for bluenose sampled by commercial logbook programmes in BNS 1 and BNS 7&8 indicate that spawning probably extends from spawn January to April annually. These logbook programmes have sampled reproductively active fish across the eastern North Island BNS 1 area from Bay of Plenty to North Cape, and across the inshore BNS 7&8 region from Cape Egmont in the north around to Jackson's Bay in the south (excluding the central section from Cape Farewell to near Cook Canyon). However, no distinct spawning grounds have yet been identified for this species in New Zealand waters. Biological parameters relevant to stock assessment are summarised in Table 2.

Table 2: Estimates of biological parameters for bluenose.

Fishstock	Estimate						Source
1. Natural mortality (M)							
BNS	0.08*						Revised estimate from 2008; see text.
2. Weight = a(length)^b (Weight in g, length in cm fork length).							
	Both sexes						
BNS 2	a = 0.00963	b = 3.173					Horn (1988a)
3. Von Bertalanffy growth parameters							
	Females			Males			
	K	t_0	L_∞	K	t_0	L_∞	
BNS 2†							

† Recent age validation studies show previous growth parameter estimates to be incorrect, see text.

3. REVIEW OF ADAPTIVE MANAGEMENT PROGRAMMES (AMP)

The Ministry of Fisheries revised the AMP framework in December 2000. The AMP framework is intended to apply to all proposals for a TAC or TACC increase, with the exception of fisheries for which there is a robust stock assessment. In March 2002, the first meeting of the new AMP Working Group was held. Two changes to the AMP were adopted:

- A new checklist was implemented with more attention being made to the environmental impacts of any new proposal;
- The annual review process was replaced with an annual review of the monitoring requirements only. Full analysis of information is required a minimum of twice during the 5 year AMP.

With the move towards fisheries plans, it has been decided that no new AMPs will be implemented, but that stocks will remain under existing AMPs until such time as they are incorporated into fisheries plans. The distinction between medium-term and full-term AMP reviews has been replaced with full reviews of each AMP stock every two years, while the AMPs still operate. Full-term reviews of all bluenose stocks were conducted in 2006, and so all bluenose AMPs were again fully reviewed in 2008 (Starr *et al*. 2008a,b,c; Jiang & Bentley 2008). Key results of these reviews are summarise here for each stock.

3.1 AMP reviews

BNS 1

Fishery Characterization

Based on total accumulated landings from 1989–90 to 2006–07, 86% of BNS 1 are caught using bottom longline (BLL), and a further 5% by Dahn line. Relatively small amounts are caught using midwater trawl (MWT), bottom trawl (BT), setnet (SN) or trot line (TL). BNS 1 landings have been evenly distributed from north of the Hauraki Gulf (East Northland) to the Bay of Plenty. Less than 10% of landings have come from the West Coast North Island (WCNI) region, and only negligible amounts from the Hauraki Gulf. The majority of the midwater and bottom trawl landings of BNS 1 all come from the Bay of Plenty, although there has been an increase in the last two fishing years in the East Northland bottom trawl catch of BNS 1.

Bottom longline effort appears to have increased in 2004–05 in both the Bay of Plenty and East Northland, even as landings dropped. Bottom trawl effort appears to be declining in the Bay of Plenty in recent years. Recent BNS targeted BLL effort (number of hooks) has stayed relatively constant in the Bay of Plenty. BLL catches are mainly made in summer and autumn months, but there are usually significant landings at the end of the fishing year. Fishermen who target bluenose also target tuna and the bluenose fishery tends to occur when tuna are less abundant, or after tuna fishing has ceased.

The BNS 1 BLL fishery is almost entirely targeted at BNS, with less than 10% of landings from sets targeted at hapuku/bass. Dahn lining is also primarily a bluenose target fishery, although with relatively more targeting towards hapuku/bass. Midwater trawl fishing for BNS 1 is almost all targeted at bluenose or alfonsino, while bottom trawl catches of BNS 1 are more widely distributed among a range of target fisheries, including alfonsino, gemfish, scampi and hoki. Most BNS taken while target fishing for BYX has been taken using bottom trawls, including sporadic BT landings of bluenose on the WCNI.

CPUE Analysis

There has been a long history of CPUE analyses for the BNS 1 longline fishery. Since 2002, separate CPUE analyses have been conducted for BLL targeted at bluenose, hapuku/bass or ling off East Northland (BLL(EN)), or off Bay of Plenty (BLL(BP)). Analyses conducted in 2004 indicated that the number of hooks deployed by the fleet was increasing over time, particularly in East Northland. Langley (2002) proposed that there is an inverse relationship between catch/hook and the number of hooks set, implying that kg/hook may not be an appropriate abundance index for bluenose.

2006 analyses for both East Northland and the Bay of Plenty used log(catch/set) as the dependent variable. Analyses conducted for this review decided to use the more conventional log(catch) as the dependent variable and offering both log(set) and log(hooks) as explanatory variables. This change in analytical approach was adopted on the basis of preliminary analyses which demonstrated that log(catch) appeared to increase linearly with log(hooks), over the range of effort used, rather than asymptotically as previously demonstrated. This approach resulted in steeper estimated declines for the BLL(EN) analysis than those estimated in 2006, while the trajectory for the BLL(BP) analysis was similar to that estimated in 2006.

The East Northland index remained at a high level up to 1997–98 and then dropped precipitously to nearly half its original level by 1999–00. After three years of stability, it then dropped again from 2002–03 to the lowest point in the series in 2006–07. The Bay of Plenty CPUE index declined from initial levels from 1992–93 to 1996–97, and then remained stable or increased gradually to a minor peak in 2002–03. Thereafter, there was a 50% decline in CPUE to the lowest point in 2005–06. Both the BLL(EN) and BLL(BoP) indices are now at about one-third of their historical 1992–93 high levels. The lognormal and combined CPUE index series are very similar in both BNS 1 sub-regions, with the binomial regression adding little information, probably due to the relatively the low proportion of zero records in both analyses. Participants in this fishery do not appear to have been conducting shorter trips, nor using less sets, nor using fewer hooks, over the period of recent declines in CPUE.

Logbook Programme

The BNS 1 logbook programme was introduced as a pilot scheme in 1995–96 and fully implemented from 1996–97 onwards. This programme was maintained at a reasonable level up to 2005–06, but participation was very poor in 2006–07. Nine to 15 vessels participated in this programme up to the 2004–05 fishing year, achieving coverage levels of 50% of total QMR catch in 1996–97, averaging 20% over the period 1995–96 to 2006–07, and monitoring 1 960t of BNS catch and sampling 25 721 fish. However, coverage has declined from 21% in 2000–01 to only 4.6% in 2006–07.

At region level, historical spatial coverage of this programme has been good. In recent years, coverage on the west coast North Island has been poor as a result of decreasing fishing in that area, with a tendency to over-sample the Bay of Plenty area. Seasonal logbook coverage was excellent up to 2004–05. Plots of locations fished by fishing year show that main concentrations of the fishery in the areas northeast and east of Great Barrier Island and the western Bay of Plenty. Fishing off North Cape and the west coast of the North Island has been sporadic.

Length-frequency data suggest that the mode in female length distributions has shifted to smaller fish in successive years up to 2004–05, although there were still large fish being caught. This decline in modal size is most apparent in the Bay of Plenty, the area with most data. There is an apparent gradual declining trend in the mean length of females in the Bay of Plenty, East Northland and total BNS 1. There is also some evidence of increasing mean size with depth, with male and female bluenose appearing to be larger below 475m. Size-at-maturity data indicate a shift from immature to mature fish around 60cm for males, and 60cm - 65cm for females; slightly smaller than found in BNS 7&8. BNS 1 data also appear to show a clear spawning season, extending from January - May.

BNS 2

Fishery Characterization

The two trawl methods (MW and BT) have predominated in this fishery since its beginning up to 2003–04, after which line methods, particularly bottom longline, have exceeded the combined trawl methods in importance. Over the history of the fishery, MWT catches have accounted for 41% of the total catch, followed by BLL (39%) and BT (15%). Midwater trawl landings dominated the fishery until 2002–03, and exceeded bottom trawl landings until 2006–07 The midwater trawl fishery has mainly targeted area 014, with catches declining rapidly after 2001–02, causing the total catch to decline below the TACC for the first time since 1990–91. In contrast, BLL catches increased steadily

since 1996–97, exceeding the MWT catch from 2003–04 onwards, and accounting for 70% of landings in 2006–07. Bottom trawl catches from area 014 have varied without trend. BT catches reached almost 35% of the total catch in 1996–97, but have since declined significantly. Despite this decline, BT catches in 2006–07 exceeded midwater trawl landings for the first time since 1989–90.
In recent years there has been increased BNS targeting. On average, target catches have contributed 42% of the BNS 2 total, with 35% taken by fisheries targeting BYX and the remainder while targeting other species (ORH, SKI and HOK). Most targeted BNS 2 catches have been made by BLL, with a steady increase in BNS 2 targeting since 2000–01, and a decline in bycatches.

There has been a clear shift in effort from the trawl to bottom longline fisheries since the late 1990's. Since then, both hours fished and number of vessels have decreased in the trawl fisheries. In contrast, although the number of BLL vessels has only increased slowly, there has been a steady increase in number of hooks in the bottom longline fishery, with rapid increase after 2002–03. This increase in hook numbers has been associated with shifts in targeting in some areas, with a significant effort increase targeting BNS in area 013, and a substantial reduction in hook numbers targeting LIN in areas 014 and 015. For most fishing years, catch from the first half of the fishing year (October - March) constituted 60%–70% of the total annual catch. Prior to 1993–94 there were also significant catches from August and September, but these have since declined.

CPUE Analysis

A number of fishery definitions / CPUE indices was explored, including:

- LI (BNS): lining targeting bluenose. This fishery caught 33% of the total BNS 2 catch, and was the preferred index for BLL.
- LI(OTH): lining not targeting bluenose. This bycatch fishery mainly targeted LIN and HPB/BAS, and only caught 6% of the BNS 2 catch.
- TR(BNS.BYX): all BT and MWT targeting bluenose or alfonsino. This fishery caught 45% of the total BNS 2 catch, and was the preferred index for the trawl fisheries.

The three indices considered the most reliable suggest a slow decline in CPUE from the early-1990s to the late-1990s, followed by a gradual increase from 1997–1998 to 2001–02. Thereafter, all series show consistent declines from 2002–03 onwards, being steepest for the LI(BNS) index, considered to be the most reliable for this stock. In 2006–07, the LI(BNS) index was the lowest level observed since 1989–1990, being at 36.8% of its overall geometric mean. The LI(OTH)index was also at its lowest level in 2006–07, at 42.5% of its geometric mean.

The primary effect on the main LI(BNS) index was the number of hooks which showed a strongly increasing cumulative effect on CPUE over time as the number of hooks increased over time. In contrast, the effect of vessel fluctuates without trend over the time series. The effect of number of lines set reinforces the effect of number of hooks, showing that effort has two levels of effect in this fishery, both with an increasing trend from 1989–90 to 1996–97 which steepens the decline in standardised CPUE. For the LI(OTH) index, while vessel is accepted as the main influencing variable, this again fluctuates without trend over the history of the fishery. Number of hooks has the main cumulative effect over time, increasing steadily throughout the fishery. In this non-BNS targeted fishery, target species is the only other factor having a minor effect, reflecting past shifts in targeting between species such as SKI and HPB.

Numerous influencing variables enter the TR(BNS.BYX) model, including trawl shots, vessel, method, region and month. However, it is the number of shots which has the major effect, showing a marked trend in cumulative effect over time, decreasing from high to moderate levels over the history of the fishery. The vessel effect appears to be driven by the brief participation of a few vessels with low catch rates in the fishery between about 1990–91 and 1994–95. The effect of method results from a substantial shift from MWT to BT from 2004–05 onwards. Most of these effects, particularly in the line fishery models, result in steepening the decline in CPUE in recent years.

Logbook Programme

In contrast to the other BNS QMAs (1, 3 and 7&8), where there have been logbook programmes which have varied in effectiveness across fishing years, there has been no logbook coverage of the BNS 2 fishery. The lack of biological data from BNS 2 is a concern, and QMA 2 has had the worst record of performance with regard to implementation of logbook programmes under AMPs.

BNS 3

Fishery Characterization

Reported catches exceeded the TACC prior to first entry into an AMP in 1991–92, and then from 1994–95 to 2000–01, prior to the increase in the effective commercial catch limit to 1 175t in 2001–02. Since then, the catch has remained below the TACC of 925t, reaching a peak of 915t in 2003–04. Catches declined sharply after that, to 511 t by 2006–07. Assessment of the BNS 3 stock is complicated by the fact that several bycatch and target BNS fisheries have developed across QMA 3 since the introduction of BNS 3 into the QMS, many with small and sporadic catches. These fisheries include:

- An auto-longline bycatch fishery for ling which covers all the waters from the western Chatham Rise to the sub-Antarctic;
- A large bycatch bottom trawl fishery for hoki on the Chatham Rise;
- A mid-water and bottom trawl bycatch fishery for alfonsino on the Chatham Rise;
- The scampi trawl fishery on both the western and eastern Chatham Rise.
- A target line fishery for bluenose and the hapuku/bass species on the northern Chatham Rise;
- A target line fishery primarily using Dahn line gear in Fiordland; and
- A target bottom trawl fishery on the Chatham Rise.

BNS 3 is the third most important of the BNS stocks after BNS 2 and BNS 1, contributing about 20% of the total BNS catch over 1989–90 to 2006–07. This catch is primarily taken by BLL and BT, each taking about 40% of the total historic catch. 10% has been taken by SN, with DL, TL and MWT taking the remainder. 56% of BNS 3 catches come from the eastern Chatham Rise, with the remaining catches distributed across QMA 3, except for sub-Antarctic and southern South Island, where negligible catches are made. Most BLL BNS 3 landings were caught in the east Chatham-Rise, peaking in the early 2000s. A reasonable amount of BNS is also caught off the SW South Island. Significant BLL effort in west Chatham Rise and sub-Antarctic is largely targeted at other species (such as ling), and BNS bycatches in these areas are small.

BT and MWT BNS 3 catches are mostly made on the east Chatham-Rise, although effort in both fisheries extends across much of the Rise. Much of this effort is targeted at other species, with BNS being taken as a minor bycatch. Setnet BNS catches are made in inshore FMA 3, but this fishery has declined. In contrast, a new Dahn line fishery has developed off the SW South Island since the advent of the BNS 3 AMP. BLL BNS catches are spread throughout the year, peaking during the autumn spawning season. BT catches are mainly made in the first half of the fishing year. DL catches are mainly made in the second half of the fishing year, and SN and MWT catches show no seasonal patterns.

BNS 3 catches are made in association with a wide range of target species. Line methods mainly target BNS, HPB/BAS and LIN. BYX, BNS and HOK targeted trawls account for 90% of the BT bluenose landings. BLL targeting differs between regions, with LIN being the main declared target on the Chatham Rise and the sub-Antarctic ocean. The only area with a long-term targeted BNS longline fishery has been a small fishery off the SW South Island. However, several regions show development of targeted BLL BNS fisheries in recent years, including NE, SE and SW South Island and both ends of the Chatham Rise. Prior to this, the BLL fishery off the Chatham Islands targeted LIN and HPB. BT catches are made primarily in BYX or BNS targeted trawls on both ends of the rise, but with the development of a targeted BT BNS fishery on the east Chatham-Rise since the second TACC increase in 2000–01.

CPUE Analysis

The main fisheries used to generate standardised CPUE indices for BNS 3 were the Chatham-Rise trawl fisheries targeting alfonsino or bluenose (T-CHAT-OR), and the Chatham-Rise bottom longline fishery targeting bluenose or hapuku/bass (BLL-TARG). Primary CPUE standardisations for these fishery definitions used a lognormal model based on non-zero catches. Alternative analyses were conducted on the trawl fishery either using data amalgamated to a "trip stratum" level (consistent with the information in CELR forms) or , the original to-by-tow data only for TCEPR data. A binomial model was used to investigate the effect of changing proportion of zero catches in the both data sets.

Trends in the primary T-CHAT-OR fishery, which is considered one of the reliable indices of BNS abundance on the Chatham Rise, show consistent declines since 2001–02. A declining trend is also evident in the other reliable series, the BLL target BNS/HPB series, which arguably begins in the late 1990s. In both of the above CPUE series, uncertainties are high prior to 2000–01, but indices become increasingly certain with the increase in BNS catch observations. The indices considered to have the most potential to monitor BNS abundance on the Chatham Rise show close correspondence between the series, all indicating a steady decline in CPUE since at least 2003–04, and perhaps since 2000–01.

Logbook Programme

Logbook programmes to collect biological information from BLL, DL and trawl fisheries in BNS 3 started in 1994–95 with a logbook for the ling autoline fishery, which ran until the late 1990's. This was augmented by a trawl logbook programme which ran from 1997–98 to 2003–04, after which it stopped functioning when the participating vessels left the fishery. Coverage levels of the trawl logbook programme averaged about 19% of total QMR catch (ranging from 3% - 43%) over the period 1997–98 to 2003–04. Coverage of actual BNS targeted catches averaged 24% (3% - 64%) over the period. Under this programme the two main participating vessels measured 7 193 fish.

Spatial coverage of statistical areas was good, but seasonal coverage did not match MFish catch/effort data well, except in 2003–04. Plots of spatial coverage show that all sampled catches were made in two small areas of fishery focus, one on the SW Chatham Rise, around 175°-176°E, and the SE Chatham Rise, around 175°-176°W. These are the same areas where the TCEPR data indicate the fishery has operated. The BLL logbook programme targeting BNS 3 largely supplanted the ling logbook programme in the early 2000s. Although over 14 000 sets were sampled under the two longline programmes, BNS catches were low, resulting in only 1 793 fish sampled from 1994–95 to 2006–07, over a very narrow depth range (262 m–366 m).

Because the majority of sampled effort was targeted at ling, coverage of total QMR BLL catch was very low, averaging only 0.7% (0% - 2.8%) over the 13 year period, and only exceeded 2% in the early 2000s. Coverage of BLL BNS targeted catch averaged 2.4% in the nine years in which BNS targeted catches were sampled. Because the majority of the sampling of the target fishery occurred in Fiordland, this sampling did not manage to representatively sample the increase in longline BNS catch on the Chatham Rise. The longline logbook programme only managed to sample the spatial or seasonal coverage of the fisheries in a few years. In particular, much of the sampling effort concentrated on the west coast South Island, largely missing the dominant fishery on the Chatham Rise, although sampling a wider depth range (231m - 476m) than the trawl logbooks.

While there is variation between annual trawl length-frequency distributions, with a shift to smaller fish of both sexes in 2003–04, there also appears to be a systematic shift in size composition over time. Bottom longline length-frequencies are sparse and separated in time and space, and also suggest a shift in mean size but may not likely be entirely representative of the fishery. As a result of a increasing shift to marketing of fresh fish, in recent years, longline caught fish have been landed whole, and are not sexed, requiring sexes to be combined for analysis.

BNS 7 and 8

Fishery Characterization

Catches in BNS 7 fluctuated around the TACC from 1986–87 to 1996–97, declined steadily to 70t in 2001–02, and then increased to slightly exceed the TACC in 2006–07. Prior to the increase in TACC in 1994-95, BNS 8 catches were very low, only reaching the TACC in 1992–93 and 1993–94. Catches increased to 79t when the TACC was increased in 1994–95 but, since then, have fluctuated well below the TACC, except for 2003–04 when landings were only 4 t below the TACC. BNS 7 & 8 are the least important of the BNS fishing areas, contributing only 2 600t, or < 6% of the total bluenose catch, over 1989–90 to 2006–07.

Bottom longlining accounted for 62% of the total BNS 7 landings and 94% of BNS 8 landings since 1989–90. Midwater and bottom trawling have landed about 30% of the total BNS 7 landings but less than 0.5% of the BNS 8 landings. Small quantities of BNS 7 are taken by BT or DL, with minor landings of BNS 7 or 8 made by other methods. 70% of BNS 7 landings come from the central west coast of the South Island (Areas 033 and 034), with relatively less BNS 7 from northern South Island. Over 75% of BNS 8 landings come from the combined Areas 041 and 801 in the northern Taranaki bight, with the remainder coming from the southern Taranaki bight, south of Cape Egmont.

BNS 7 bottom longline landings show no seasonal pattern. Midwater trawl landings are confined to the last three months of the fishing years, coinciding with the winter hoki spawning fishery. The majority of BNS 7 bottom trawl landings are made at the end of the fishing year, also probably as a bycatch in the winter hoki fishery. There is no clear pattern in the seasonal landings of bluenose in the BNS 8 bottom longline fishery. The BNS 7 and BNS 8 line fisheries mainly target bluenose, and in BNS 7 secondarily target ling and hapuku/bass while, in BNS 8, ling is not targeted and hapuku/bass is relatively more important. BNS 7 trawling primarily targets hoki, which accounts for nearly 90% of the total midwater and bottom trawl landings. BNS 7 bottom trawl fishing which takes bluenose also targets orange roughy, barracouta and jack mackerel.

CPUE Analysis

Standardised CPUE analyses were conducted on a combined dataset for BNS 7 and 8 based on three fishery definitions. The main index was for BLL targeted at BNS or HPB/BAS (BLL_TARG). Alternative indices explored were BNS bycatch in the LIN targeted longline fishery (BLL_LIN) and an extended longline fishery, including the SW corner of South Island (stat areas 30, 31 and 32), targeting BNS, HPB/BAS or LIN (BLL_EXT). The last series included the data used in the other two series, and was intended to explore a wider definition of the west coast bluenose population. Two analyses were conducted for each fishery definition: a lognormal regression on the positive catch records and a binomial regression on the presence/absence of bluenose by trip stratum. Explanatory variables offered to each model included fishing year (forced), month, vessel, statistical area, target species and duration of fishing.

Standardisation steepened a decline in CPUE in the BLL(TARG) fishery over the last 6 years, but with an upturn in the final year 2006–07. This series also shows a decline from 1993–94 to 1998–99, but with considerable uncertainty due to the relatively few observations, with an increase thereafter to 2001–02. Standardisation of the BLL(LIN) series turned an essentially flat trend in unstandardised CPUE since 1997–98, with increased catch rates since 2003–04, into a gradual decline over the period, with a downturn in the last two years. A third series [BLL(WCSI-COMB)], which combined the data from the first two series, and which extended the spatial coverage to include data from the SW South Island part of BNS 3, showed the same trends as the other two series.

There has been a steady decline in the proportion of trips with zero landings of bluenose over time, resulting from a steady decline in targeting on HPB/BAS, and an increase in targeting on BNS. This shift in targeting has the strongest influence on the standardisation models, and is the main cause of the steeper declines in CPUE in the standardised series, compared to the unstandardised data. There is substantial correspondence between the two series explored. Both series are highly variable and uncertain prior to 2001–02, but then show similar declines thereafter. Despite the small and variable

catches in this area, the coincidence between trends for targeted and bycatch fisheries gives some confidence in these indices.

Logbook Programme

A programme to collect BNS 8 longline information operated from 1994–95 to about 2000. A comprehensive logbook programme introduced by the Challenger Finfish Management Company in the early 2000s addressed at trawl and setnet fisheries was gradually extended to the line fisheries. BLL logbook coverage has varied as participants have left the programme, or new participants have been recruited, ranging from 6% to 44% (average 23%) of the total declared BNS 7&8 bottom longline landings, and sampling 9 043 fish over 1994–95 to 2006–07. Coverage of the targeted catch reached a peak of 53.6% in 2005–06. This programme was directed towards BNS 8 in the first years of operation, only recording effort in BNS 7 in 1998–99.

The programme covered most of the relevant statistical areas after 1998–99, although coverage did not always match the proportional spatial distribution of catches. Seasonal coverage has also been reasonable. Spatial analysis shows effort along the edge of the shelf from the South Taranaki Bight, through the western entrance to Cook Strait, to the northern end of Fiordland, continuing down into BNS 3. In comparison with the very small areas targeted in BNS 3, the bluenose line fishery in QMAs 7&8 extends over a large area, from Cape Egmont in the north right around to Puysegur Point in the south (except for an area from Cape Farewell to Cook Canyon). The depth range fished by BLL in BNS 7&8 is broader than sampled in BNS 3, ranging from 213 m to 562 m (5%–95%-iles).

There appears to be no trend in the mean size of fish taken over time, although interpretation of the length-frequency data is complicated by a shift in sampling from north to south over time, and a recent decrease in the proportion of fish sexed. The WG requested additional length-frequency analyses to deal with these changes. Analysis of industry-reported maturity information show a shift from immature to mature fish at around 65cm–70cm, and a peak in proportion of mature / active gonads in February, suggesting a summer spawning season.

3.2 Effects of fishing under AMP Programmes

Bluenose fisheries overlap with a range of endemic seabirds including black petrel, *Procellaria parkinsoni*, Flesh-footed shearwater *Puffinus carneipes*, and grey-faced petrel *Pterodroma macroptera gouldi*. However, the bluenose longline fishery appears to have a low incidence of seabird interactions due to the weighting and rapid sinking of the bottom longlines used. The greatest concern regarding BNS 1 has been for any possible interactions with black petrels which has a stable but small population estimated at between 2 750 and 5 000 breeding pairs. The BNS 3 FMA includes two important breeding and feeding areas for New Zealand seabirds (the Chatham Rise and sub-Antarctic), raising concerns at possible interactions with fisheries. however, over the three year period since 2004–05, only 2 albatrosses and 13 petrels have been reported caught in the BNS 3 area., FMA 7 and FMA 8 appear to support lower numbers of seabirds and the tuna longline fishery in this area has a relatively low incidence of seabird interactions south of 38°S). In 2004–05, 23 sets were observed in the bluenose targeted BLL fishery off the east and west coasts of the North Island (FMAs 8 and 2), during which no seabird captures were observed.

DOC CSP observer coverage in longline fisheries since 2004–05 has been distributed across FMAs 1, 2, 3, and 7, with interactions mostly recorded in FMA 3. Inshore Observer coverage for LIN/BNS/HPB in 2007–08 will be spread throughout the year in FMAs 1, 2, 7, and 9, with increased coverage in FMAs 1 and 9 to monitor interactions with Black petrels. 250 longline observer days have been allocated to inshore longline fishing in 2008–09, which would cover about 5% of the effort recorded in 2006–07.

No known/observed interactions with marine mammals have been recorded for the BNS 1, BNS 7 ro BNS 8 longline fisheries, although observer coverage has been very low. Trawling rarely interacts with fur seals on the South Island east coast. Less than 1% of observed tows caught fur seals in 2001–02 or 2002–03. Only one capture of a Hector's dolphin was reported by a fisherman in the red

cod trawl fishery in QMA 3 in the 1997 - 98 fishing year. Inshore setnets pose the most serious risk to dolphins, but only about 9% of the BNS 3 TACC is caught by setnets. Setnet BNS catches have not increased under the AMP, and have declined steadily since 1995–96.
The draft Hector's and Maui Dolphin Threat Management Plan (TMP) was released for consultation at the end of 2007. This plan proposes an extension to the existing Banks Peninsula marine mammal sanctuary, which would increase protection of these mammals in the area. New seabird sustainability measures designed to reduce interactions with seabirds have also been gazetted. From 1 June 2008, trawlers may not discharge offal on more than one occasion per tow or during shooting or hauling. From 1 September 2008, bottom longliners must use a tori line and can only fish during the day if they are using approved line weighting. No offal or fish can be discharged during line setting, and offal or fish can only be discharged when hauling provided the discharge is on the opposite side of the vessel to the hauling point.

Much of the bluenose fishing in all fished areas is conducted using bottom longlines or Dahn lines, neither of which is considered to have serious impacts on seabed habitats or biological diversity. In contrast, bottom trawling is known to damage fragile seabed ecosystems, such as cold water corals, sponges or bryozoan communities. Targeted trawl fishing for bluenose, which are typically associated with underwater features likely to support such vulnerable marine ecosystems, is therefore potentially of concern. Analysed catch distribution data indicate that there has been increased effort on specific areas of the Chatham-Rise under this AMP, but that these are small compared to the total trawled area.

4 STOCKS AND AREAS

Stock boundaries are unknown, but similarity in trends in catch and CPUE across fisheries occurring in each of the five New Zealand BNS QMAs suggests the possibility that there may be a single BNS stock across all these areas, or of some close relationship between stocks in these QMAs. There is a possibility that the long period of relatively stable CPUE observations in the face of increasing catches before the period of decline may be evidence of hyper-stability caused by the replenishment of adult stocks on specific areas or features.

Recent increases in BNS targeting in some areas and increasing catches, could have exceeded the replenishment rate, causing the rapid and synchronous declines observed since 2001–02. Alternatively, there could be a simultaneous drop in recruitment due to coincident environmental factors. An environmental mechanism simultaneously affecting availability or catchability of BNS across all QMAs is considered to be less likely than the possibility of a single stock, or of correlated recruitment across sub-stocks in the various areas. The synchronous recent declines in BNS CPUE were probably caused by high F's and a possible coincidental decline in recruitment.

5. STOCK ASSESSMENT

5.1 AMP Assessments of Individual Stocks

The 2008 full reviews of all BNS stocks drew the following conclusions regarding status of the various stocks.

BNS 1

Catch rates of bluenose in the Bay of Plenty were high over 1990–91 to 1992–93, declined steadily to 1996–97, increased slowly to 2002–03, and have since declined sharply to their lowest level, which is about 33% of the historic high. Catch rates in the East Northland fishery remained at historically high levels until 1997–98, declined by about 50% up to 1999–00, remained stable for a few years, and have since declined to their lowest level, which is also about one-third of the historic high.

The strong and fairly simultaneous recent drops seen in both fisheries indicate that these fisheries are likely to be having an effect on the population, whether it is combined or separate. This decline is corroborated by a gradual reduction in the proportion of mature fish (> 60 cm) in the sampled catch, particularly in the Bay of Plenty. These effects may be localised to the heavily fished areas of Bay of Plenty and East Northland. However, similar recent declines in catch rates in other BNS fisheries within the New Zealand EEZ may point to a wider stock definition for this species that goes beyond the boundaries of BNS 1.

BNS 2

There has been a substantial increase in BLL fishing effort, both in terms of number of sets and numbers of hooks, in the BNS 2 fisheries. This has been partially associated with increased targeting on BNS since 2001–02, although there has always been a substantial fishery in this area targeted at BNS. This increased effort and targeting has been associated with a simultaneous and sustained decline in standardised catch rate since 2001–02, with CPUE indices reaching their historically lowest levels in the past year or two.

The key factor influencing CPUE indices in the BLL fishery is substantially increased effort in recent years. Current analyses do not indicate that catch rates decline with increasing number of hooks (as was previously thought in BNS 1), and standardisation incorporating the number of hooks has resulted in steeper declining trends, particularly for the LI(BNS) targeted index, which is considered to be the most reliable for this fishery.

In contrast with BNS 1, and even more so with BNS 3, BNS fishing effort has been widely distributed across BNS 2. The CPUE indices explored are therefore considered to be representative of the BNS population in BNS 2. Close coincidence in declines in all of the indices explored indicates that these indices may be indexing a real decline in BNS abundance in the area.

BNS 3

Since entry of BNS into an AMP, and particularly since the substantial TACC increase in 2000–01, there has been an increase in targeted fishing for BNS. Most significant of these has been a targeted BT fishery on the east Chatham-Rise. However, there has also been a substantial (from 10%–86%) switch from targeting LIN and HPB to BNS in longline fisheries, a targeted Dahn line fishery has developed off the SW South Island and there was targeting on BNS using MWT from 2001–02 to 2004–05.

Corresponding with this increased targeting, and despite increased line effort (no. of hooks), there has been a decline in catches and catch rates of BNS over at least the past five years. This decline has primarily occurred in FMA 4 in the main targeted BT fishery on the east Chatham-Rise, but declines have also been observed in MWT, SN and DL in recent years. The decline in BT BNS catches has occurred at a time when BYX catches have tripled. BLL catches of BNS have been maintained on the Chatham Rise due to the increase in effort expended.

BNS 7 and 8

Previous AMP reviews for BNS 7&8 concluded that "BNS 7 and BNS 8 is a large area that has been lightly fished and recent catch levels and the current TACC are likely to be sustainable" (2000) and that "Recent catch levels and the current TACC are having no apparent effect on stock size and are probably sustainable" (2001). However, the combined CPUE indices in BNS 7&8 explored this year show that, while the indices are highly variable, particularly in earlier years, the indices now indicate that catch rates are declining, particularly for the target bluenose line fishery, in which CPUE appears to have declined by over 50% since the mid-1990s.

5.2 Overview of all bluenose stocks

An overlay plot of the six standardised CPUE indices considered to be most reliable and representative of the BNS 1, BNS 2, BNS 3 and BNS 7&8 fisheries is shown in Figure 1. Each of the CPUE analyses are based on a suite of core vessels selected so that there was continuity of effort in

the fishery over the entire time period in the analysis, including the period of the decline. Each of these indices is also shown separately, together with an index of the associated catch history, in Figure 2.

Whereas most indices show high variability, but little trend, over the period 1989–90 to 2000–01, all indices show markedly similar declines in the period beginning 2001–02. Linear regressions through declines in each index over the most recent six years are shown in Figure 3. For the six most reliable CPUE series (Figure 1 and Figure 2), declines appear to have started around 2001–02 to 2002–03, with the indices declining 43%–79% (mean 64%) over the six years from 2001–02 to 2006–07 (Table 3).

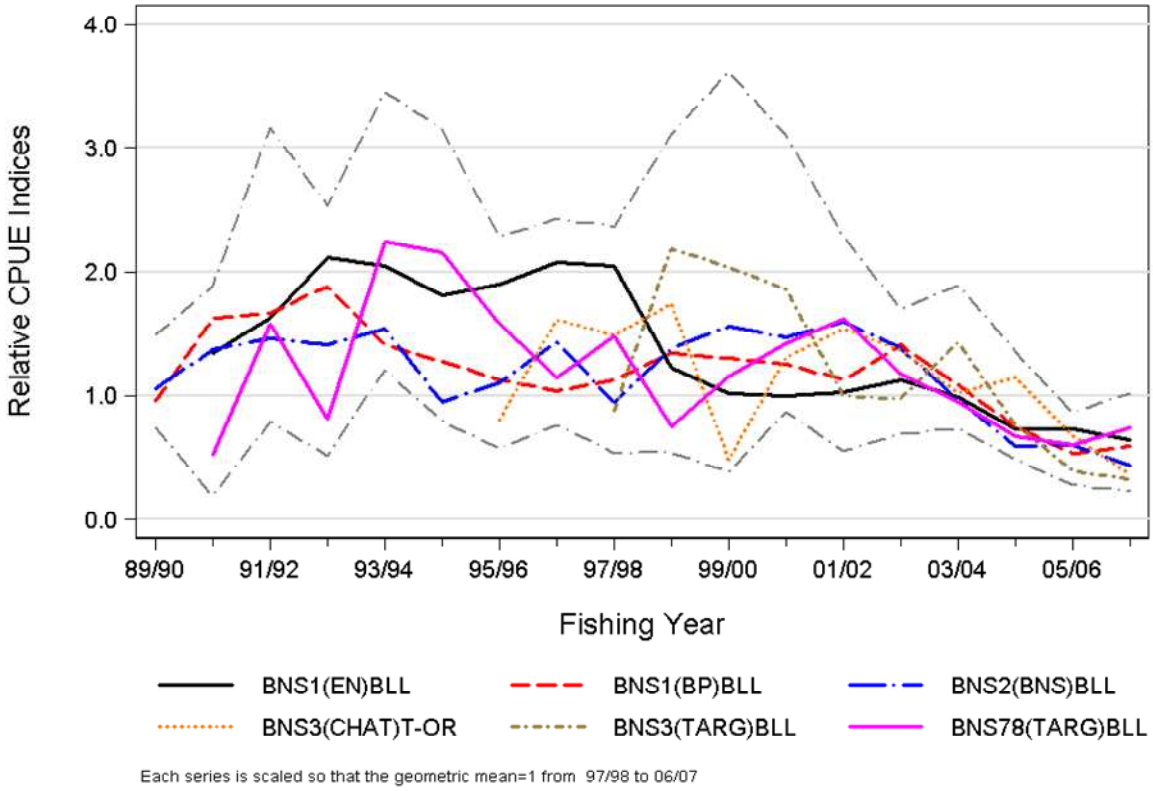
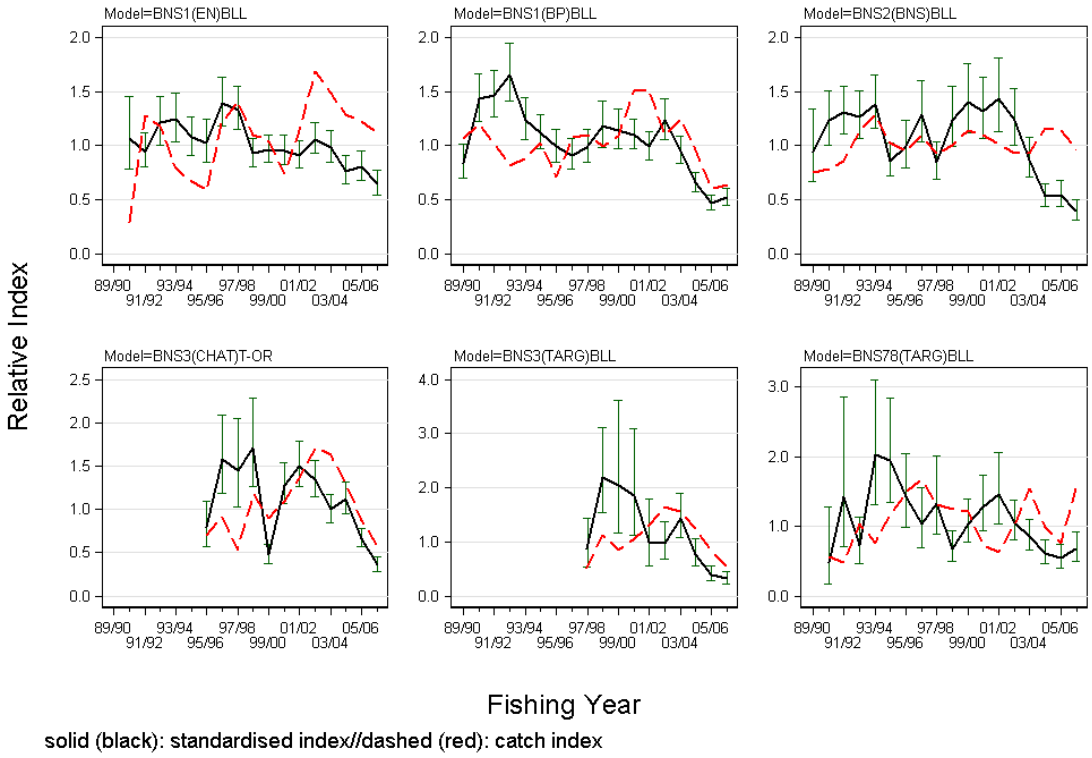


Figure 1: Overlay plots of relative CPUE indices from six bluenose fisheries operating in five New Zealand QMAs, standardised to the 1997–98 to 2006–07 geometric mean.



solid (black): standardised index//dashed (red): catch index

Figure 2: Comparison plots of standardised CPUE indices with catch histories for the six main bluenose fishery definitions used for determining standardised CPUE indices in five New Zealand QMAs shown in Figure 1. Bars show 5% and 95% bounds by fishing year for each standardised index. (All indices standardised so that the geometric mean = 1)

High variability in the earlier period of these fisheries is primarily seen in areas 7&8, where catch and effort were sporadic and low. In most areas, there have been steady increases in BNS catch in the period preceding the declines, attributable to the AMP TACC increase, and there has also been a general increase in the amount of target fishing for BNS throughout the entire New Zealand EEZ, particularly from around 2000 in BNS 2 and BNS 3.

Table 3: Estimates of CPUE decline over the most recent six years for the six CPUE models fitted to the years 2001–02 to 2006–07 (Figure 1) were obtained from the end points of linear models (Figure 2).

CPUE Model	Decline (% over 6 years)
BNS1(EN)BLL	-43 %
BNS1(BP)BLL	-61 %
BNS2(BNS)BLL	-79 %
BNS3(CHAT)T-OR	-71 %
BNS3(TARG)BLL	-67 %
BNS78(TARG)BLL	-64 %
Average	-64 %

The decline in CPUE in BNS 3 appears to coincide with the TACC increase in 2001–02. The steep decline in the East Northland fishery between 1997–98 to 1998–99 coincides with the entry of BNS 1 into the AMP in 1996–97 and the accompanying TACC increase. However, the Bay of Plenty fishery was stable up to around 2003–04 as was the East Northland fishery after the first decline. There was a long period of catches in excess of the TACC in BNS 2, beginning in the early 1990s. However, the decline in BNS 2 CPUE coincides closely with the increase 2003–04 increase in the BNS 2 TACC. The increased TACCs substantially pre-dated the decline estimated for BNS 7&8.

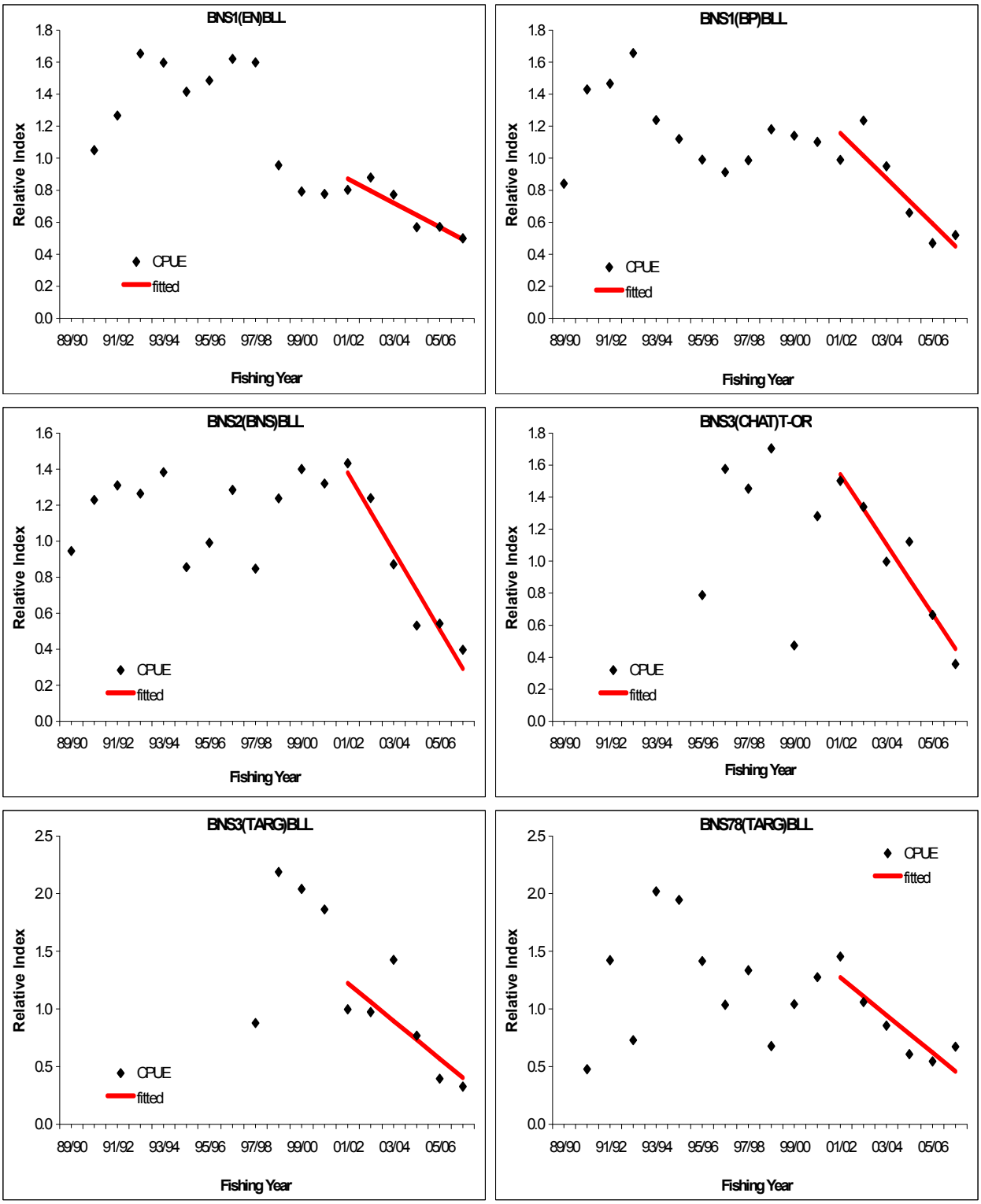


Figure 3: Plots of the six main standardised CPUE series for BNS from five BNS QMAs with linear regressions fitted to the period of recent declining catch rate.

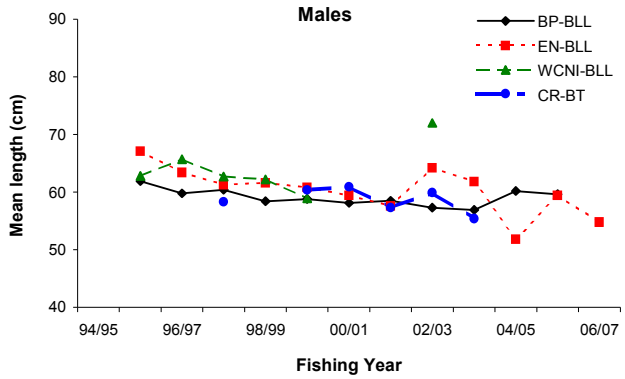


Figure 4: Mean length by year across four of the Industry BNS logbook programmes for males.

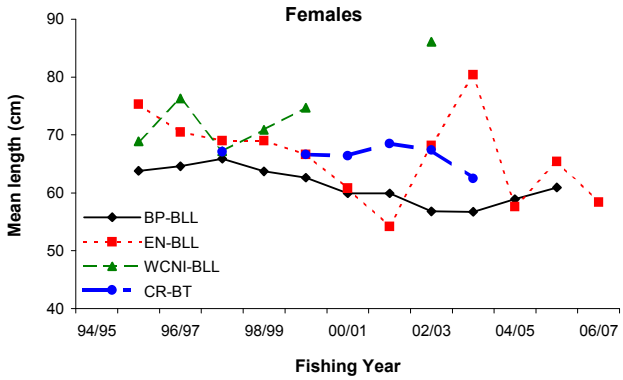


Figure 5: Mean length by year across four of the Industry BNS logbook programmes for females.

There has been a decline in the mean length of bluenose in both of longline fisheries operating in FMA 1 for males (Figure 4). A similar decline can be seen in the male length data collected from the Chatham Rise, although mean lengths for females appear to be more variable in all areas and show less of a trend (Figure 5). Declining mean lengths combined with declining CPUE are indicative of an abundance decline probably caused by the loss of the larger fish in the population. There has been no decline in the mean lengths of bluenose sampled on the west coast of the South Island.

5.3 Estimation of Maximum Constant Yield (MCY)

Previous estimates of MCY are not considered reliable, and new MCY estimates have not been produced.

5.4 Other yield estimates and stock assessment factors

The previous estimate of $F_{0.1} = 0.36$ for BNS 2, which assumed an M of 0.3, is incompatible with revised estimates of $M = 0.08$ generated using the revised maximum age of 60 years from Horn *et al.* (2008). $F_{0.1}$ for all BNS stocks is likely to be similar to, or slightly greater than, this revised estimate of M (Mace 1988).

5.5 Other factors

The fishing industry has noted that there have been recent changes in bluenose fishing patterns in some QMAs, including changes in quota holdings, company structures and vessel operators. The industry reports that the shift from trawl fishing to longlining for fresh markets has resulted in catch and effort being more evenly distributed through the year. Some of the larger autolining vessels introduced more recently may also not be as efficient as traditional longliners. The industry has also noted increasing *Orca* predation on longline bluenose catches. These factors may have influenced catch rates and total catches in some areas, and contributed to some extent to the observed CPUE declines.

6. STATUS OF THE STOCKS

CPUE has previously not been considered to be a reliable indicator of abundance of BNS stocks. However, close coincidence observed in declining trends in most CPUE indices in recent years has increased confidence in their value as indices. Standardised CPUE series, based on data from six fisheries which span most of major fisheries taking BNS in the NZ EEZ, have declined an average of 64% over the period 2001–02 to 2006–07 (Table 3).

If this decline is indicative of the overall abundance of bluenose in these areas, then BNS abundance could have declined by more than 50% across all areas over these six years. If there has been

replenishment of the features being fished in the period prior to the decline, the overall decline in abundance could be even larger. Although factors other than abundance may have contributed to the declines in CPUE and catches, current BNS catches and TACCs do not appear to be sustainable.

There is currently no stock assessment available for any BNS stock to allow estimation of B_{MSY} and B_{CURR}. Further, uncertainty regarding the extent of the stock which is contributing to the bluenose fisheries in the various QMAs makes it difficult to estimate B_{MSY} for these stocks. The current status of the bluenose populations in each of the BNS QMAs relative to B_{MSY} is unknown.

The concurrent decline of six independent CPUE series covering all the main NZ EEZ bluenose fisheries may indicate that there is a single New Zealand stock of bluenose. The Plenary noted that declines in CPUE have been observed even in areas that are relatively lightly fished such as BNS 7 and BNS 8. The existence of a single NZ-wide bluenose stock declining in all areas would imply not only that current catches are unsustainable, but that the overall combined TACC is also unsustainable.

More detailed conclusions for individual stocks are provided below.

BNS 1

Standardised CPUE indices for the East Northland and Bay of Plenty sub-areas within BNS 1 have each declined to 50% of the respective historical means, with close coincidence in trends observed in both of these fishing areas. While some of this decline may represent localised depletion, particularly in heavily fished areas such as the Bay of Plenty, the fishery has operated over a fairly wide area in these BNS 1 sub-areas. Current harvests are therefore unlikely to be sustainable over the short to medium term.

BNS 2

The declines observed in CPUE indices for BNS 2 fisheries are more severe than those seen in adjacent BNS 1 sub-areas. Fishing has been conducted intensively over most of BNS 2 since the mid-1980s and, although the CPUE index held steady until 2001–02, it has since declined steeply the declines have been observed over a longer period, similar to the declines observed in the heavily fished Bay of Plenty area in BNS 1. There is therefore a high probability that recent catch levels and the TACC are not sustainable.

BNS 3

The BYX / BNS targeted trawl and BNS / HPB targeted longline CPUE indices, which are considered most reliable for the portion of this stock which inhabits the Chatham Rise, indicate that, at least in FMA 4, recent catches are not sustainable for the currently fished Chatham Rise component of the stock. The nature of the trawl fishery, coupled with the sharp decline in the associated indices, suggest that some of the decline can be attributed to localised depletion in the heavily fished areas. It is not known how catch and CPUE declines in these fished areas on the Chatham Rise relate to bluenose abundance in the remainder of QMA 3.

BNS 7 and 8

Previous AMP reviews concluded that the low catches in these QMAs were having no apparent effect on stock size. However, the coincidence of the observed declines in the target and by-catch CPUE indices since 2001–02, and similarity of these declines with those observed in the other BNS fisheries, may indicate that these indices are tracking a real decline in abundance in the BNS 7&8 area.

Bluenose TACCs and landings by BNS stock for the most recent fishing year are summarised in Table 4.

Table 4: Summary of TACCs (t) and reported landings (t) for bluenose for the most recent fishing year.

Fish stock	QMA		2006–07 TACC	2006–07 Reported Landings
BNS 1	Auckland (East) (West)	1 & 9	1 000	742
BNS 2	Central (East)	2	1 048	957
BNS 3	South-East (Coast) (Chatham), Southland and Sub-Antarctic	3, 4, 5, 6	925	511
BNS 7	Challenger	7	150	164
BNS 8	Central (West)	8	100	50
BNS 10	Kermadec	10	10	0
Total			3 233	2 425

7. FOR FURTHER INFORMATION

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