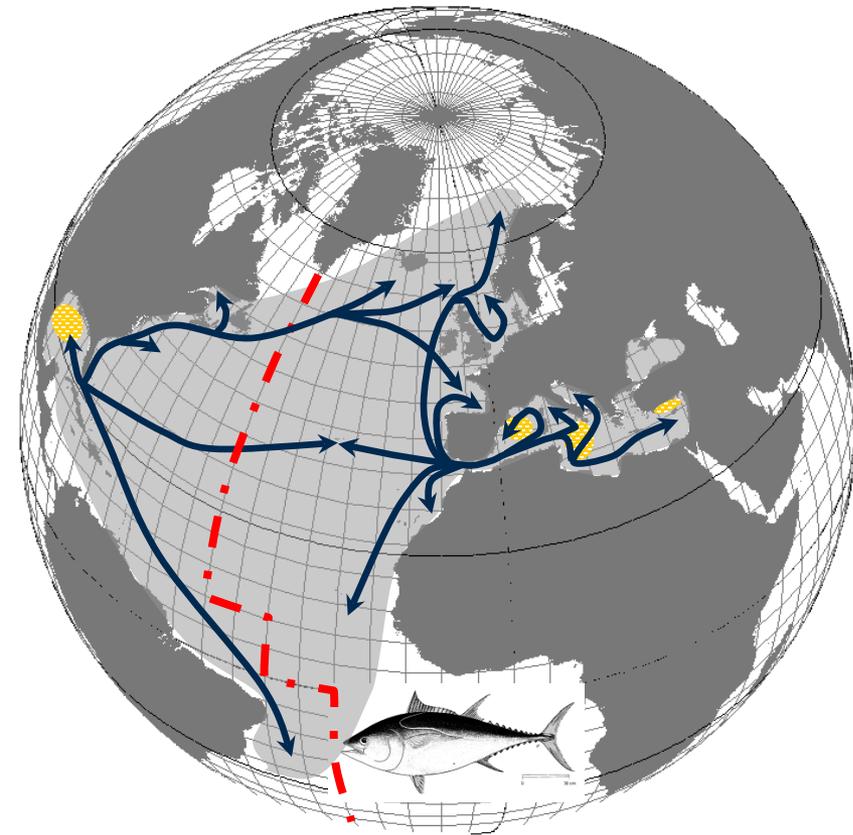
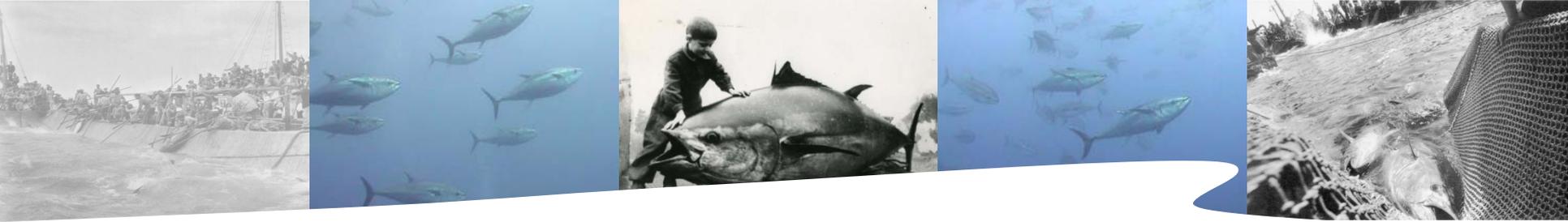




ICCAT ■ INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS

2010 Atlantic Bluefin Tuna

***ICCAT ADVISORY COMMITTEE,
Fall meeting, 2010***



- **Widely distributed:** North Atlantic and Mediterranean.
- **Highly migratory:** complex movements
- **Restricted spawning:** shows fidelity to spawning areas in Mediterranean and Gulf of Mexico. Small spatial and temporal window (April-June in restricted areas).
- **Long-lived:** > 40 years
- **Late maturing:** 4 years (~ 25 kg) in Med. and 9 years (~ 145 kg) in Gulf of Mexico, but ...

Likely to be more susceptible to exploitation than many other tunas

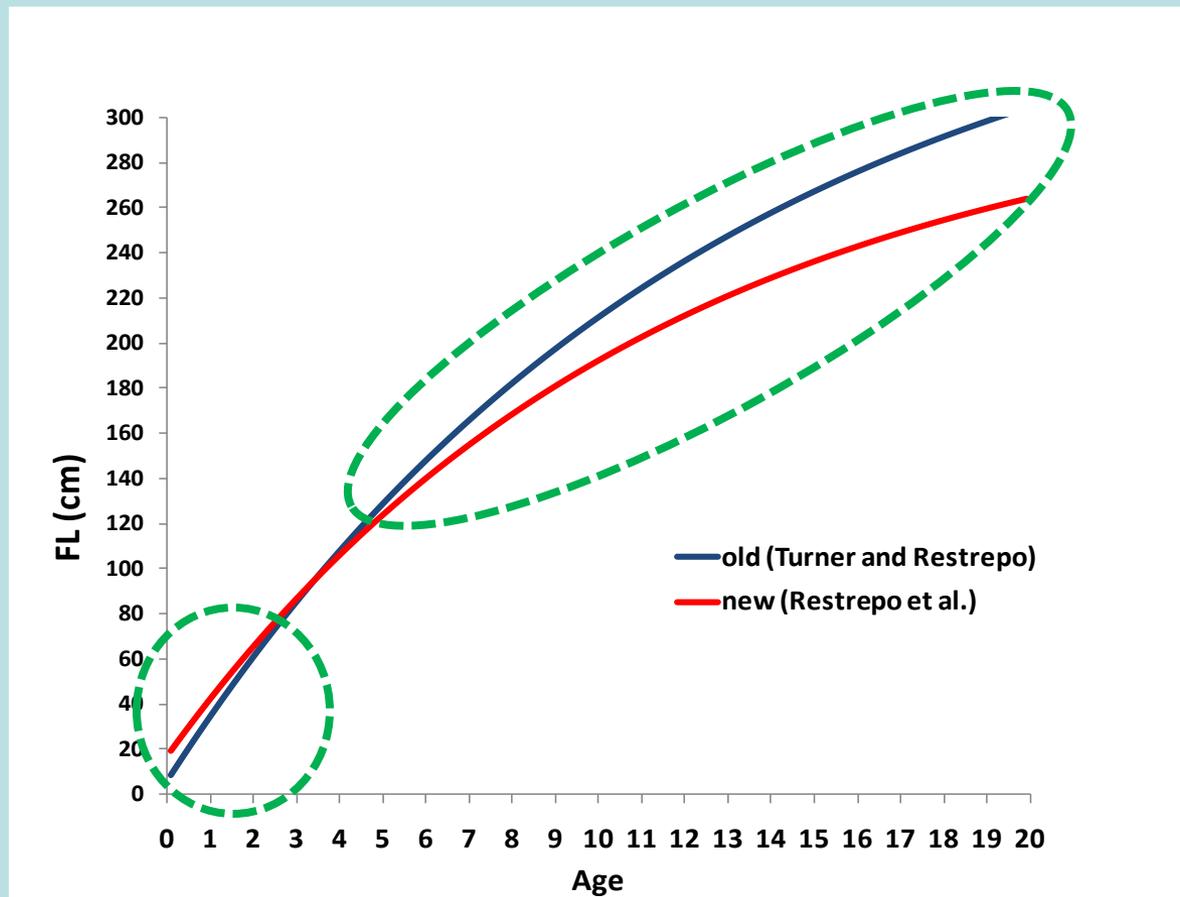
Western Atlantic Bluefin Tuna



BIOLOGY

GROWTH

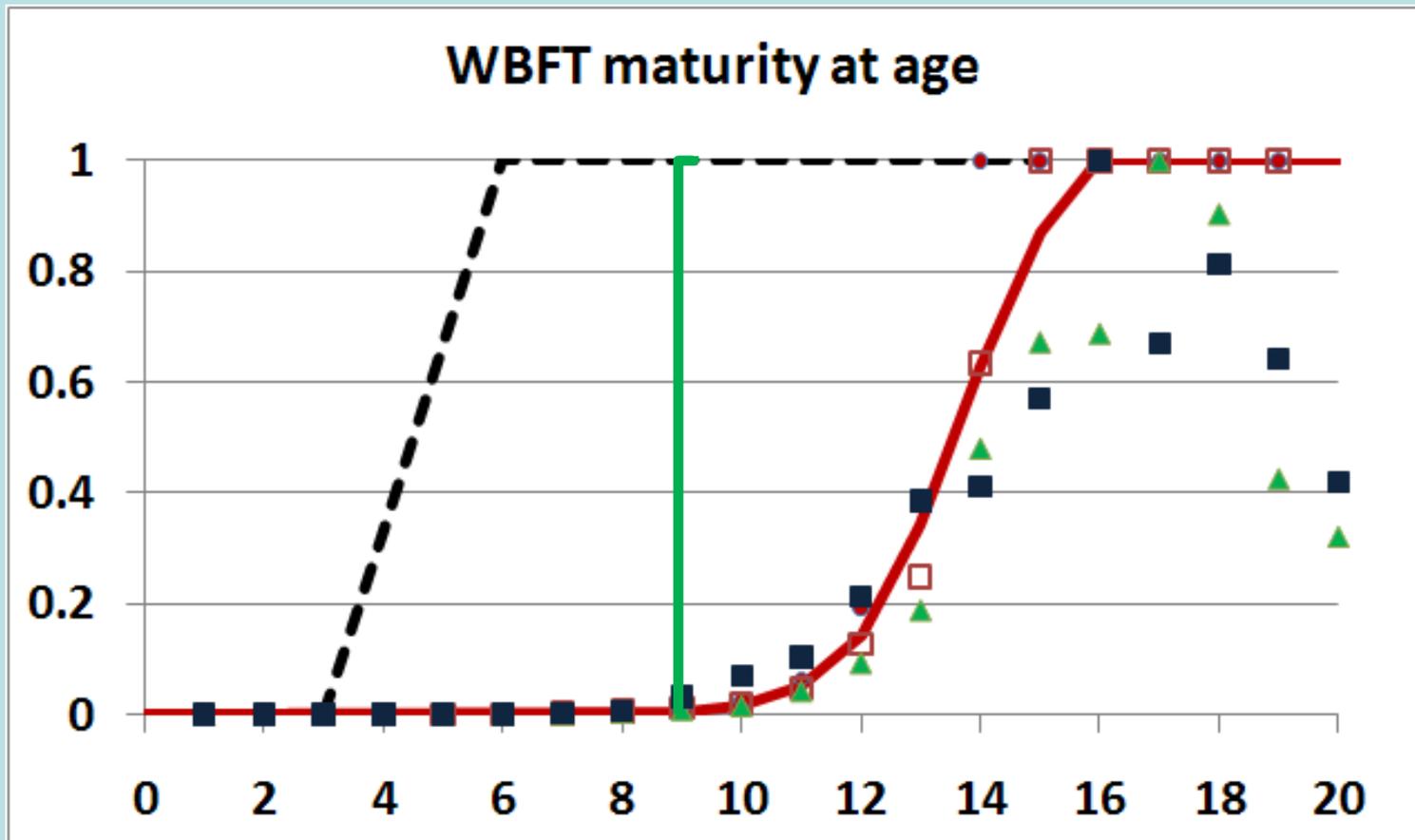
New growth curve based on otolith and length-frequency data



BIOLOGY

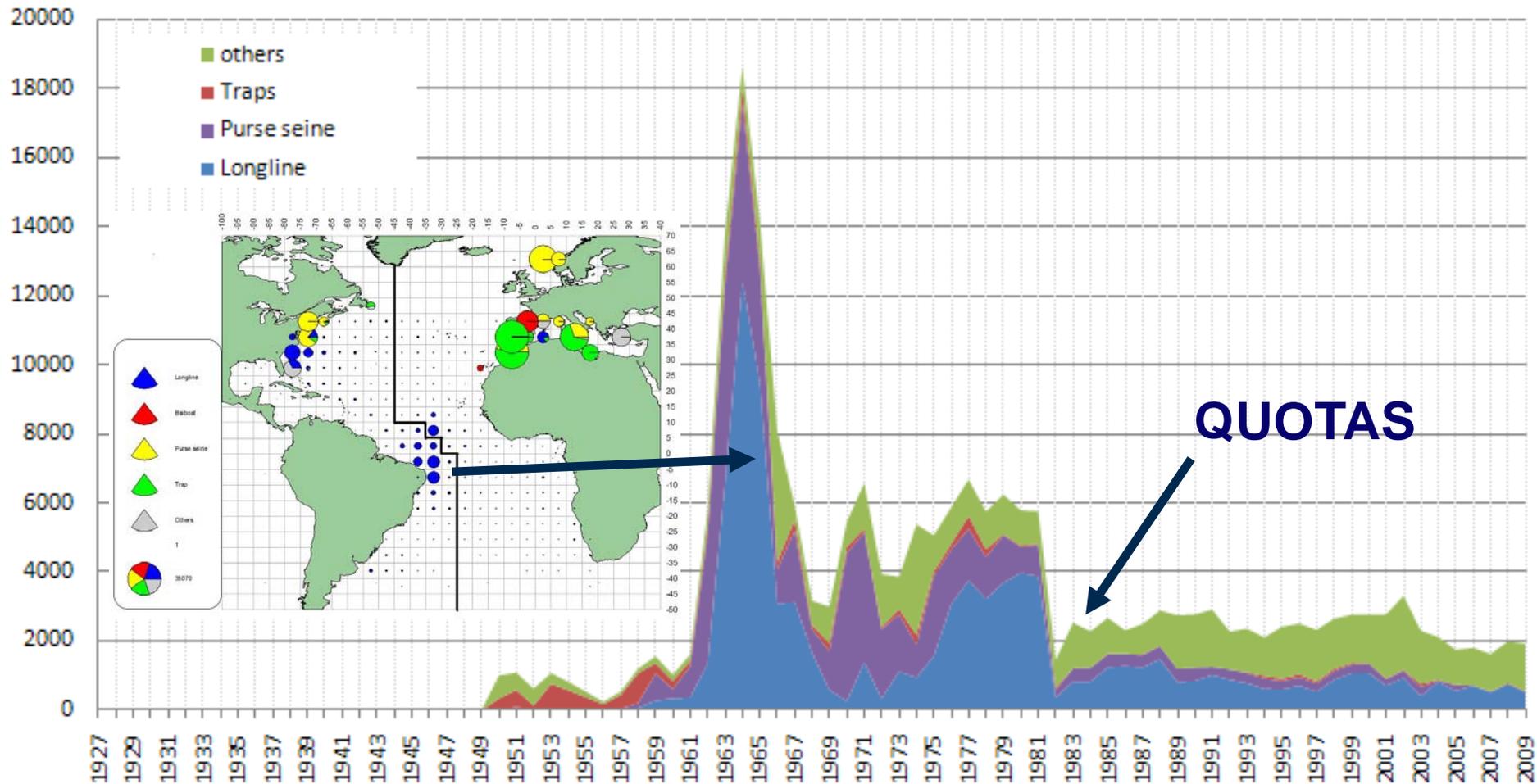
MATURITY

New growth curve based on otolith and length-frequency data

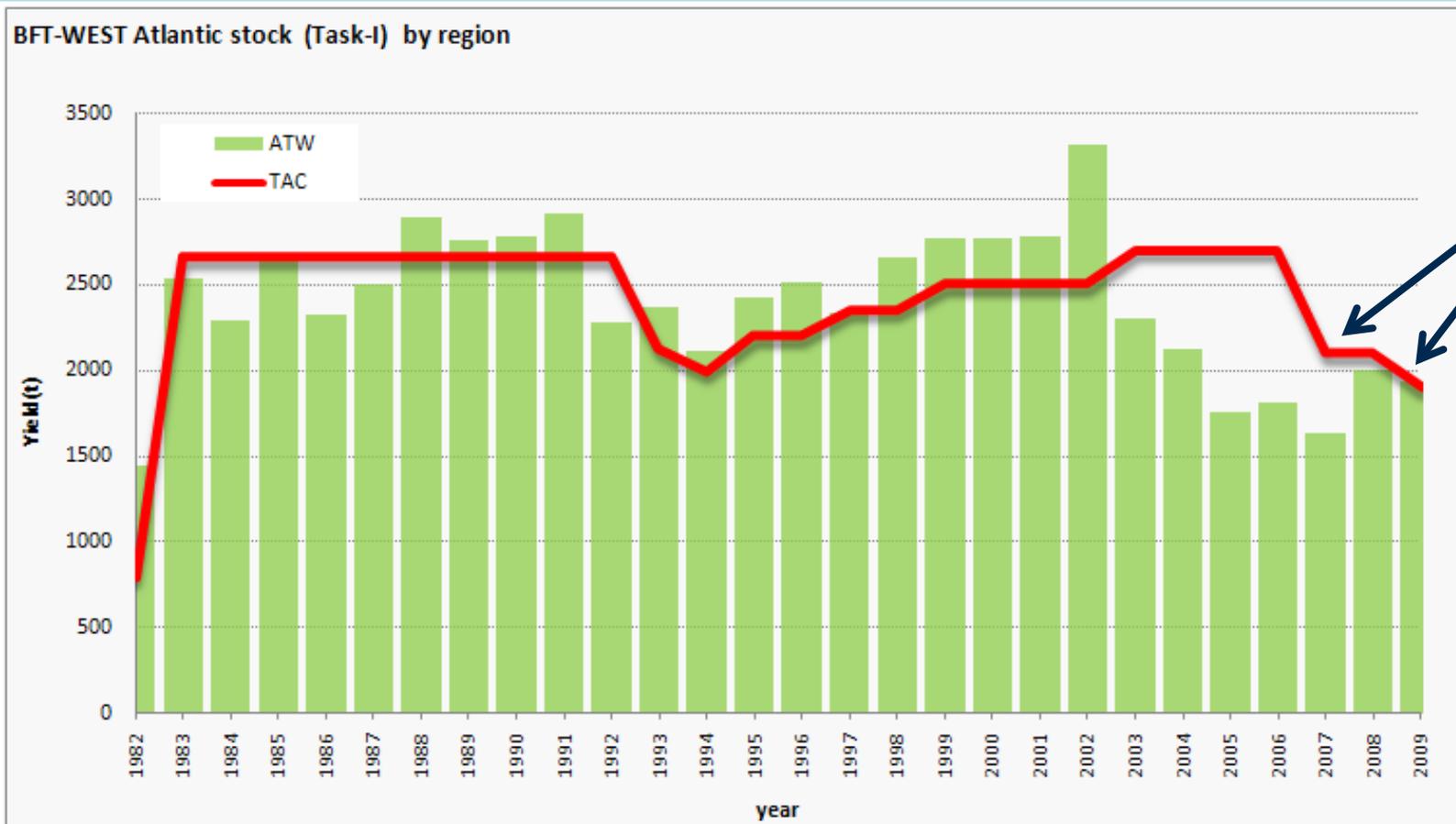


FISHERY INDICATORS

BFT-WEST Atlantic stock (Task-I) by region

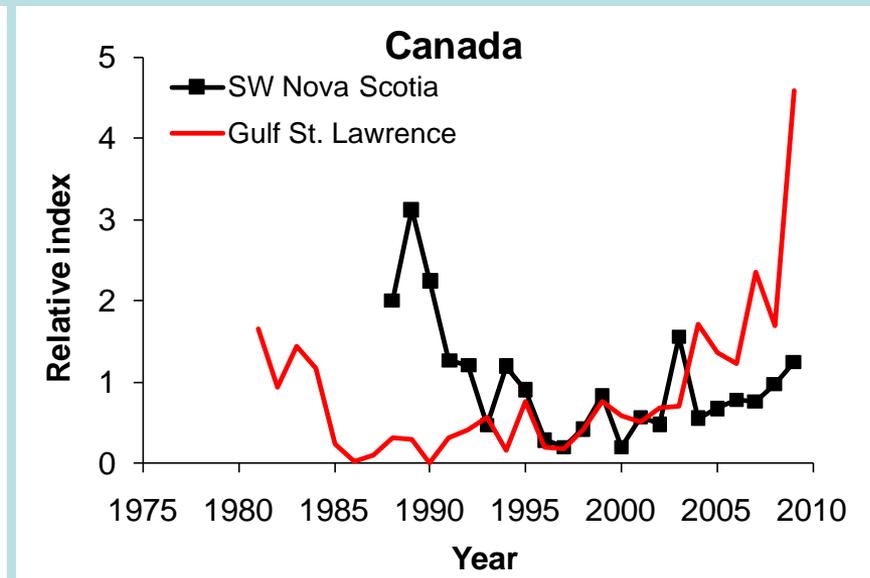
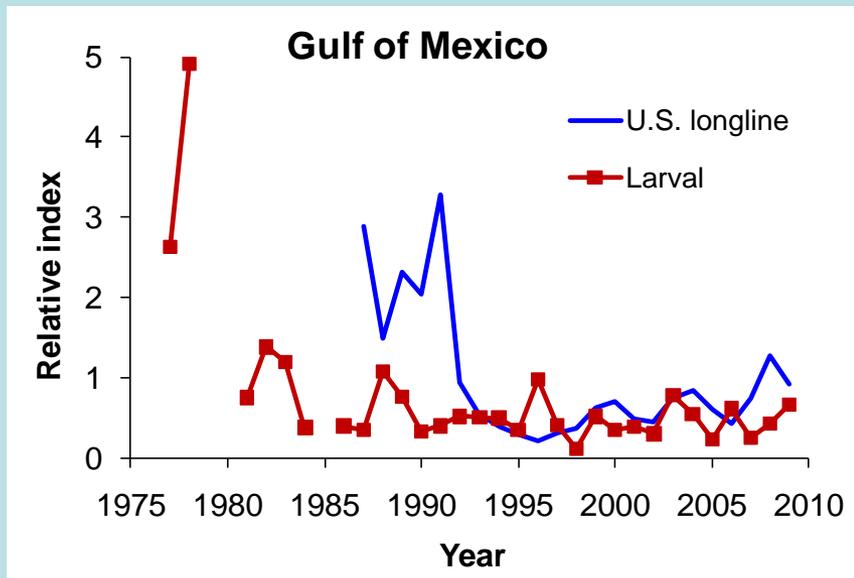
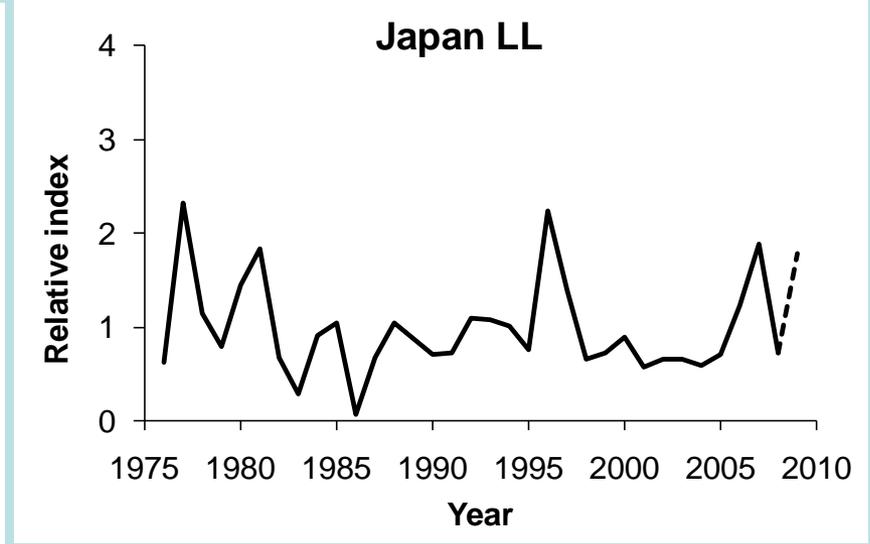
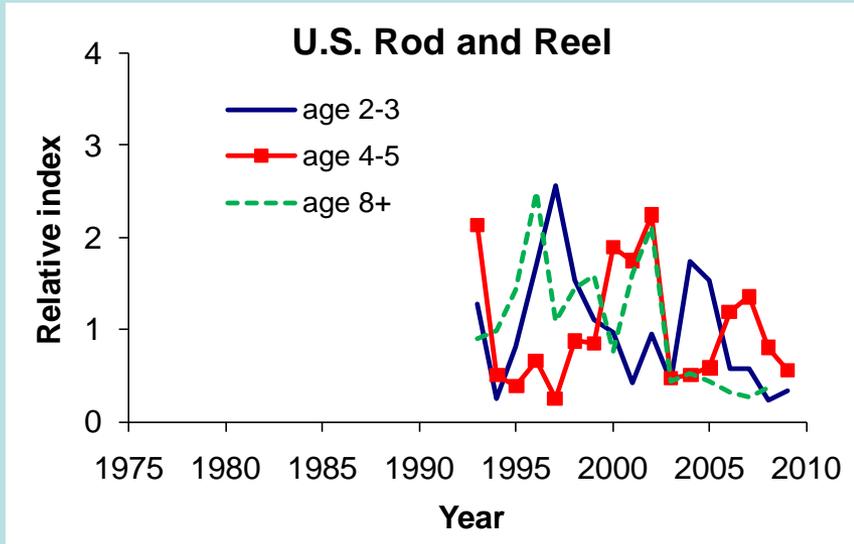


FISHERY INDICATORS



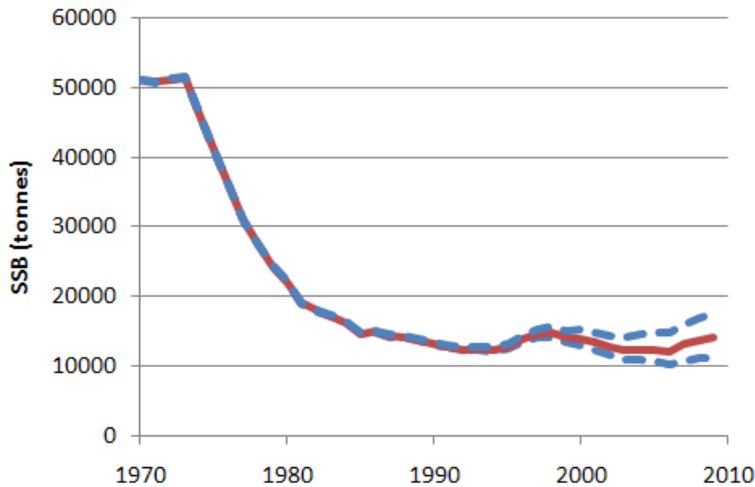
Rec. 06-06
Rec. 08-04

FISHERY INDICATORS



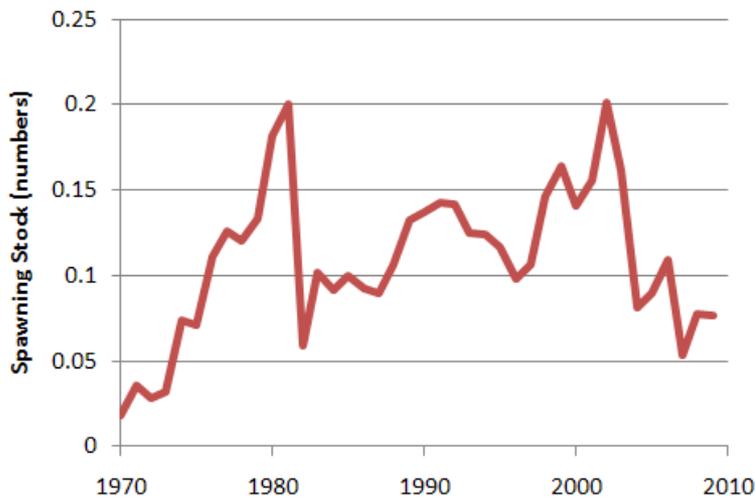
STATUS OF STOCK

Spawning Stock Biomass



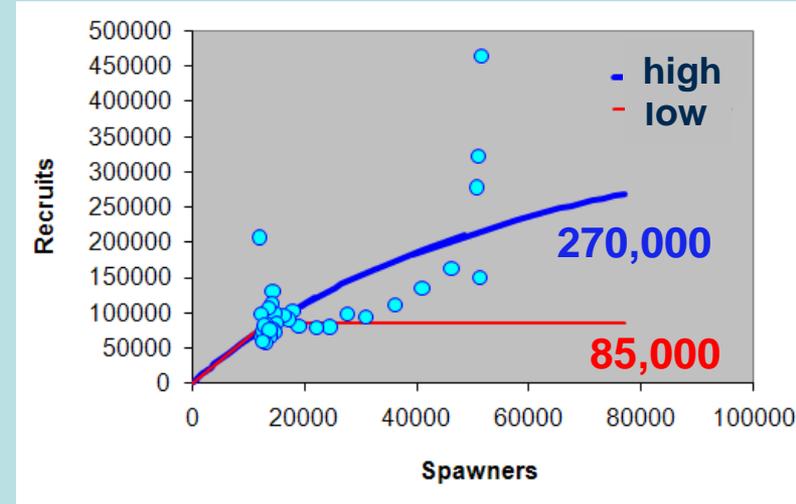
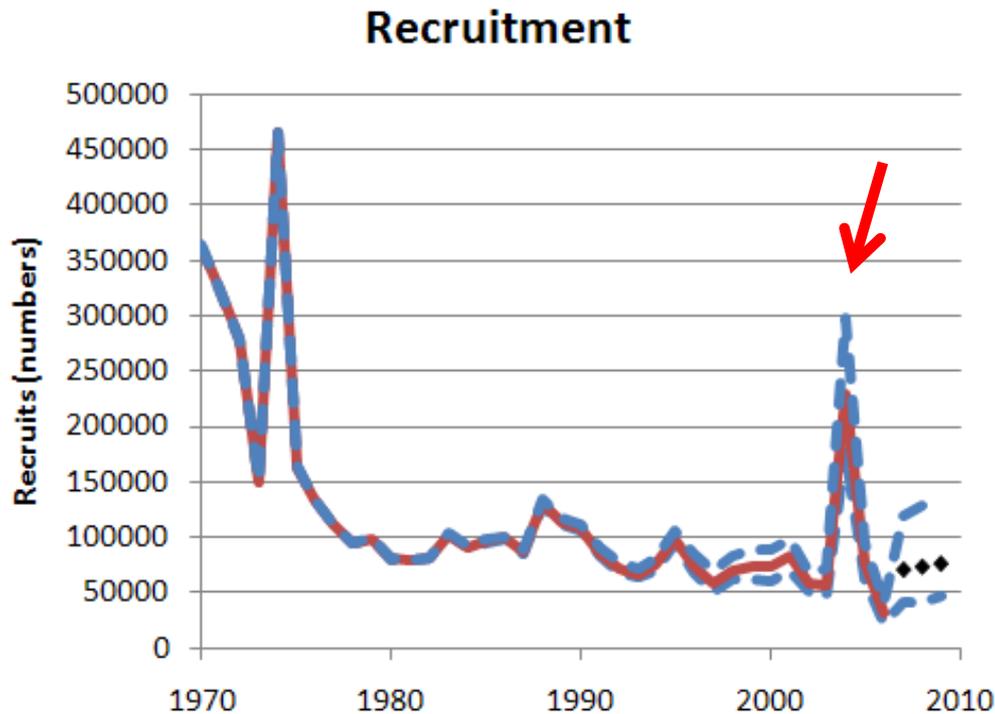
Estimates of spawning stock biomass suggest slow progress towards rebuilding (SSB in 2009 estimated to be 4% below the SSB in 1998)

F on Spawners (Age 9+)



Estimates of fishing mortality on spawners continue to show decrease in recent years

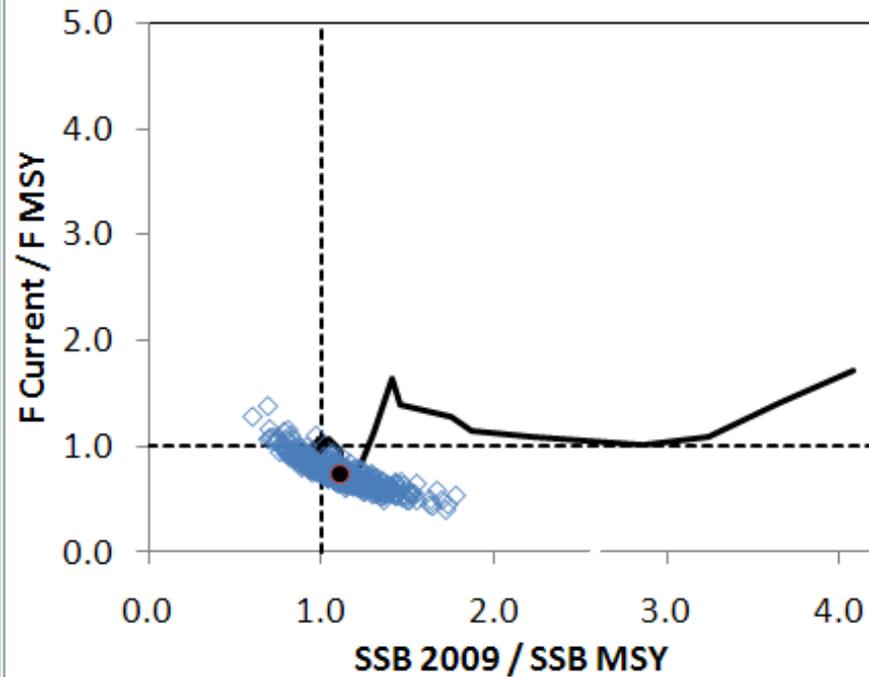
STATUS OF STOCK



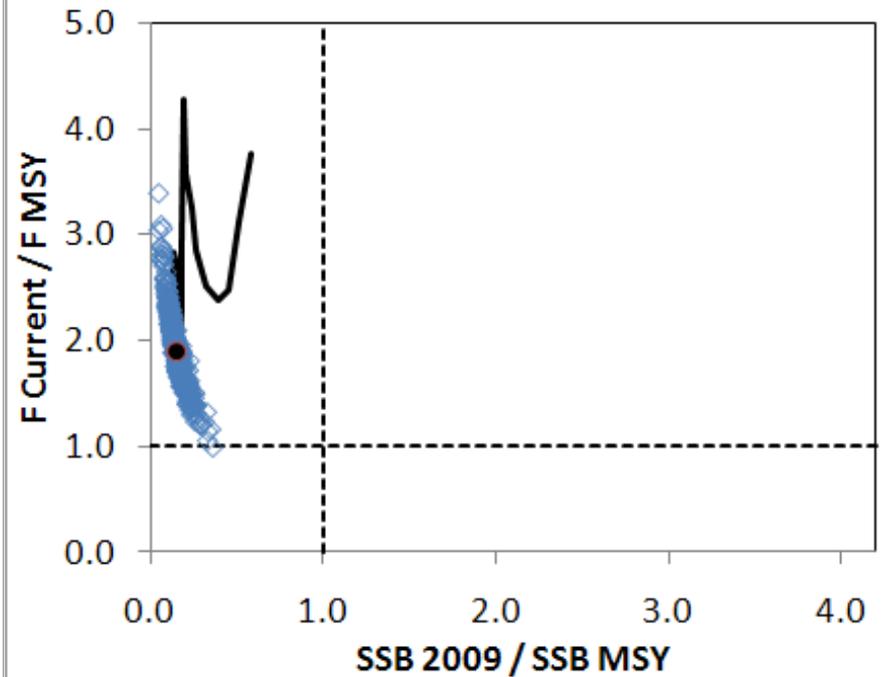
“The Committee has no strong evidence to favor either scenario over the other and notes that both are reasonable (but not extreme) lower and upper bounds on rebuilding potential.”

STATUS OF STOCK

Low Recruitment Potential



High Recruitment Potential



LOW: $F/F_{MSY}=0.7$, $B/B_{MSY}=1.1$

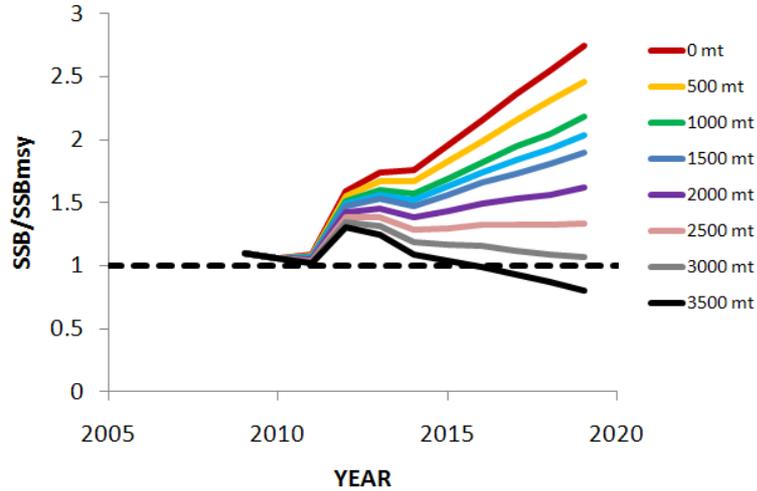
HIGH: $F/F_{MSY}=1.9$, $B/B_{MSY}=0.15$

PROJECTED OUTLOOK

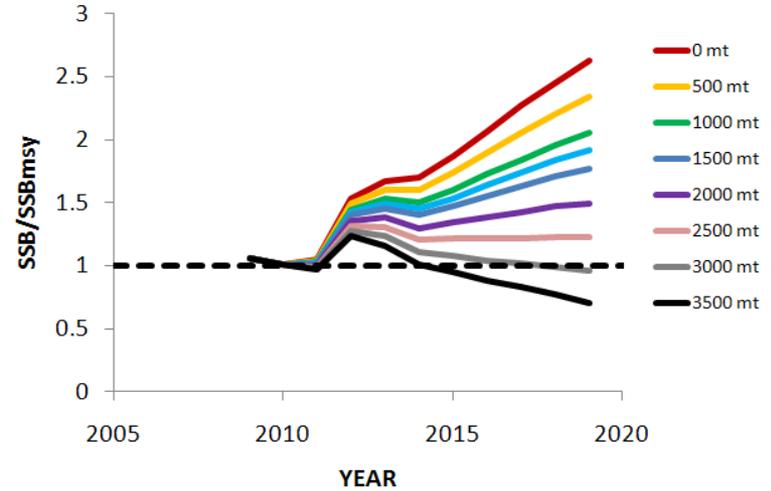
Low recruitment potential

High recruitment potential

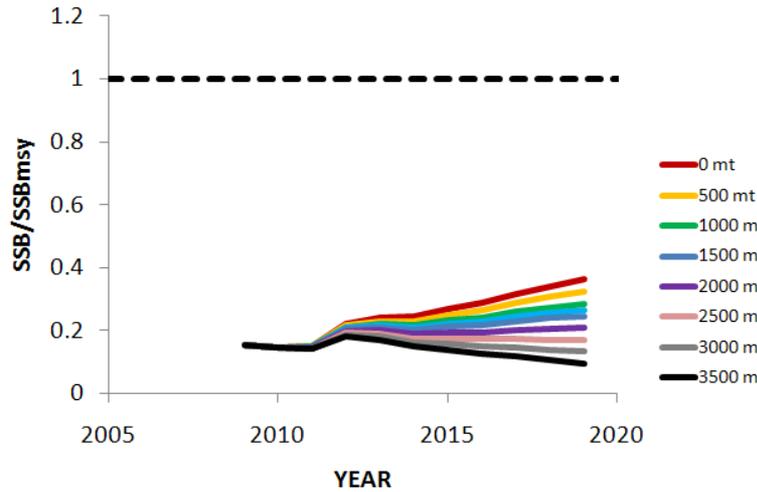
50%, low recruitment potential



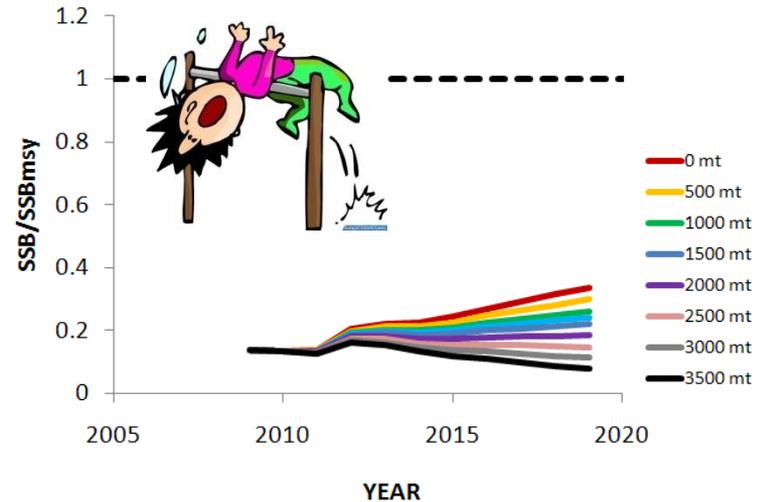
60%, low recruitment potential



50%, high recruitment potential



60%, high recruitment potential



KOBE II Matrix: Chance that spawning stock biomass (SSB) will exceed the level that will produce MSY for a given year and TAC

Low Recruitment Scenario

TAC	2011	2012	2013	2014	2015	2016	2017	2018	2019
0 mt	67.8%	98.4%	99.4%	99.4%	99.8%	100.0%	100.0%	100.0%	100.0%
250 mt	66.8%	98.2%	98.8%	98.8%	99.8%	99.8%	100.0%	100.0%	100.0%
500 mt	66.0%	98.0%	98.8%	98.8%	99.0%	99.8%	99.8%	100.0%	100.0%
750 mt	65.6%	97.4%	98.4%	98.0%	98.8%	99.0%	99.4%	99.6%	100.0%
1000 mt	64.6%	97.0%	97.6%	97.0%	98.2%	98.8%	99.0%	99.0%	99.4%
1250 mt	63.8%	96.4%	97.0%	96.2%	97.8%	98.2%	98.4%	98.4%	98.8%
1500 mt	63.2%	96.2%	96.4%	95.2%	95.8%	97.0%	97.6%	97.4%	97.6%
1750 mt	61.6%	95.2%	95.4%	93.2%	93.6%	94.0%	94.4%	95.0%	95.8%
2000 mt	60.6%	94.8%	94.6%	90.4%	91.0%	91.8%	92.0%	92.4%	92.6%
2250 mt	59.6%	94.4%	93.2%	87.4%	87.8%	86.8%	86.4%	86.6%	86.2%
2500 mt	58.8%	93.2%	91.4%	84.2%	81.8%	81.2%	81.2%	78.6%	78.2%
2750 mt	57.6%	92.8%	88.6%	78.4%	76.4%	74.0%	73.4%	69.6%	68.0%
3000 mt	56.4%	91.2%	86.4%	74.0%	69.0%	66.2%	62.4%	59.8%	56.8%
3250 mt	54.6%	89.6%	83.2%	68.2%	62.2%	57.4%	53.0%	48.2%	44.0%

Green $P \geq 60\%$, Yellow $60\% > P \geq 50\%$, Red $P < 50\%$

KOBE II Matrix: Chance that spawning stock biomass (SSB) will exceed the level that will produce MSY for a given year and TAC

High Recruitment Scenario

TAC	2011	2012	2013	2014	2015	2016	2017	2018	2019
0 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
250 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
500 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
750 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1000 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1250 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1500 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1750 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2000 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2250 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2500 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2750 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3000 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3250 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Green $P \geq 60\%$, Yellow $60\% > P \geq 50\%$, Red $P < 50\%$

KOBE II Matrix: Chance that spawning stock biomass (SSB) will exceed the level that will produce MSY for a given year and TAC
Combined Low and High Recruitment Scenarios

TAC	2011	2012	2013	2014	2015	2016	2017	2018	2019
0 mt	33.9%	49.2%	49.7%	49.7%	49.9%	50.0%	50.0%	50.0%	50.0%
250 mt	33.4%	49.1%	49.4%	49.4%	49.9%	49.9%	50.0%	50.0%	50.0%
500 mt	33.0%	49.0%	49.4%	49.4%	49.5%	49.9%	49.9%	50.0%	50.0%
750 mt	32.8%	48.7%	49.2%	49.0%	49.4%	49.5%	49.7%	49.8%	50.0%
1000 mt	32.3%	48.5%	48.8%	48.5%	49.1%	49.4%	49.5%	49.5%	49.7%
1250 mt	31.9%	48.2%	48.5%	48.1%	48.9%	49.1%	49.2%	49.2%	49.4%
1500 mt	31.6%	48.1%	48.2%	47.6%	47.9%	48.5%	48.7%	48.7%	48.8%
1750 mt	30.8%	47.6%	47.7%	46.6%	46.8%	47.0%	47.5%	47.5%	47.9%
2000 mt	30.3%	47.4%	47.3%	45.2%	45.5%	45.9%	46.2%	46.2%	46.3%
2250 mt	29.8%	47.2%	46.6%	43.7%	43.9%	43.4%	43.3%	43.3%	43.1%
2500 mt	29.4%	46.6%	45.7%	42.1%	40.9%	40.6%	39.3%	39.3%	39.1%
2750 mt	28.8%	46.4%	44.3%	39.2%	38.2%	37.0%	34.8%	34.8%	34.0%
3000 mt	28.2%	45.6%	43.2%	37.0%	34.5%	33.1%	29.9%	29.9%	28.4%
3250 mt	27.3%	44.8%	41.6%	34.1%	31.1%	28.7%	24.1%	24.1%	22.0%

Green $P \geq 60\%$, Yellow $60\% > P \geq 50\%$, Red $P < 50\%$

EFFECT OF CURRENT REGULATIONS

- **There has not yet been enough time to detect with confidence the population response to measures 06-06 or 08-04 (which was implemented in 2009).**
- **Some of the available fishery indicators as well as the current assessment suggest the spawning biomass of western bluefin tuna may be slowly rebuilding.**

MANAGEMENT ADVICE

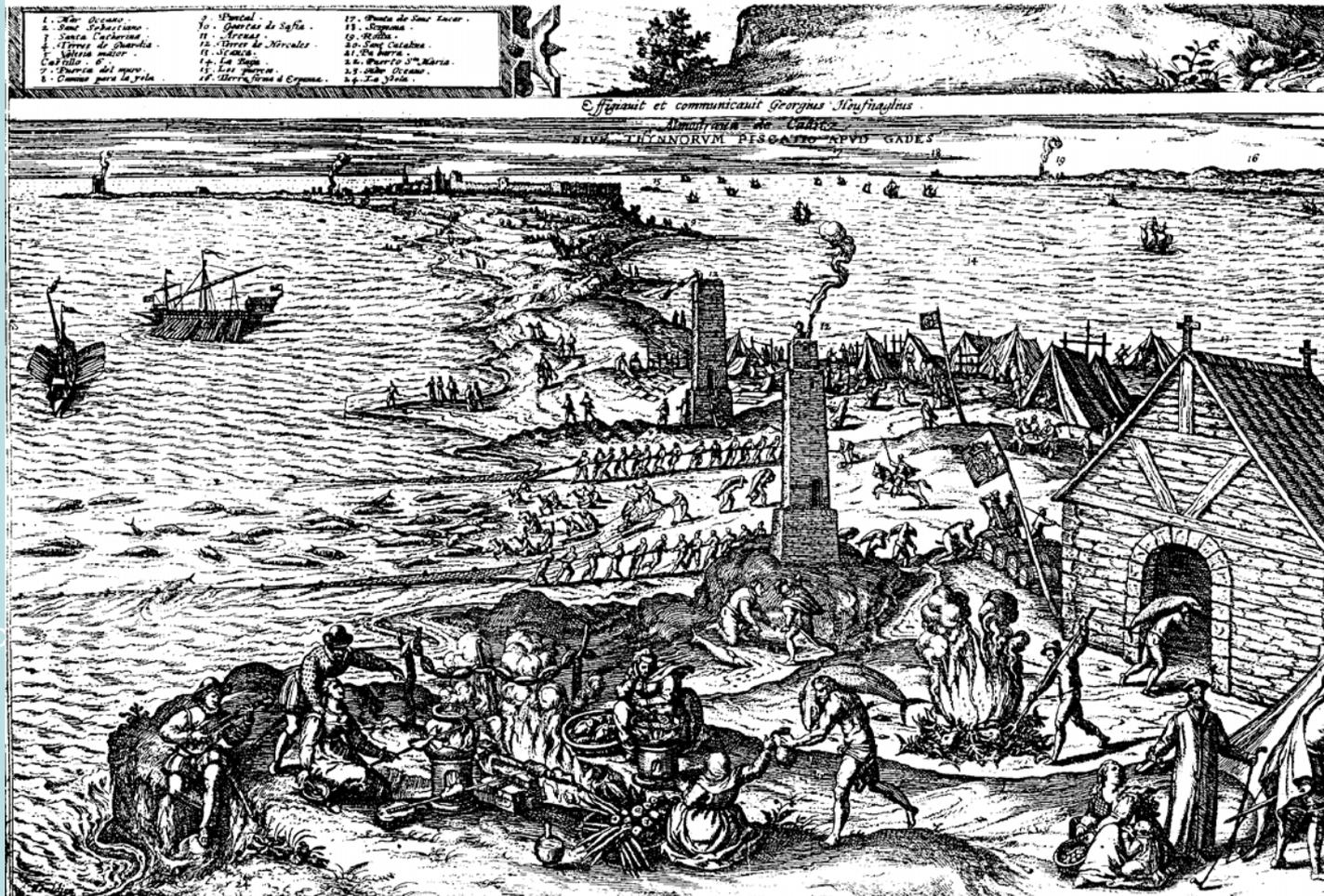
- First time that the strong 2003 year-class has been clearly demonstrated; more observations required to confirm
- Subsequent year-classes, although less well estimated, are the lowest observed values in the time series.
- The Commission may wish to protect the 2003 year class until it reaches maturity and contributes to spawning .
- Low recruitment scenario suggests biomass is currently sufficient to produce MSY
- High recruitment scenario suggests that B_{MSY} has a very low probability of being achieved within the rebuilding period (but overfishing stopped with 1100 mt)
- Current catches will allow the biomass to continue to increase.

MANAGEMENT ADVICE

“As noted previously by the Committee, both the productivity of western Atlantic bluefin and western Atlantic bluefin fisheries are linked to the eastern Atlantic and Mediterranean stock. Therefore, management actions taken in the eastern Atlantic and Mediterranean are likely to influence the recovery in the western Atlantic... even small rates of mixing from East to West can have significant effects on the West because the Eastern resource is much larger than that of the West.”



Eastern Atlantic and Mediterranean Bluefin Tuna



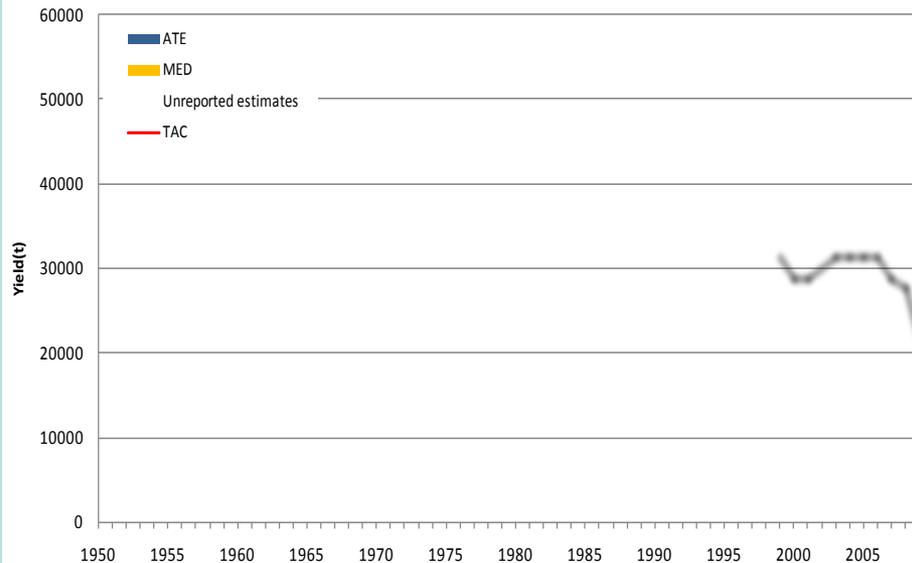
BIOLOGY

- Conventional and electronic **tagging** experiments in confirm high residency in the Mediterranean
- **Genetic** analyses tend to confirm population structure within the Mediterranean
- Updated and new (historical) CPUE indices (but still lacking for Mediterranean Purse-seine)
- **National aerial surveys** in 2009 and 2010 indicated higher abundance and/or concentration in the Western Mediterranean than a decade ago

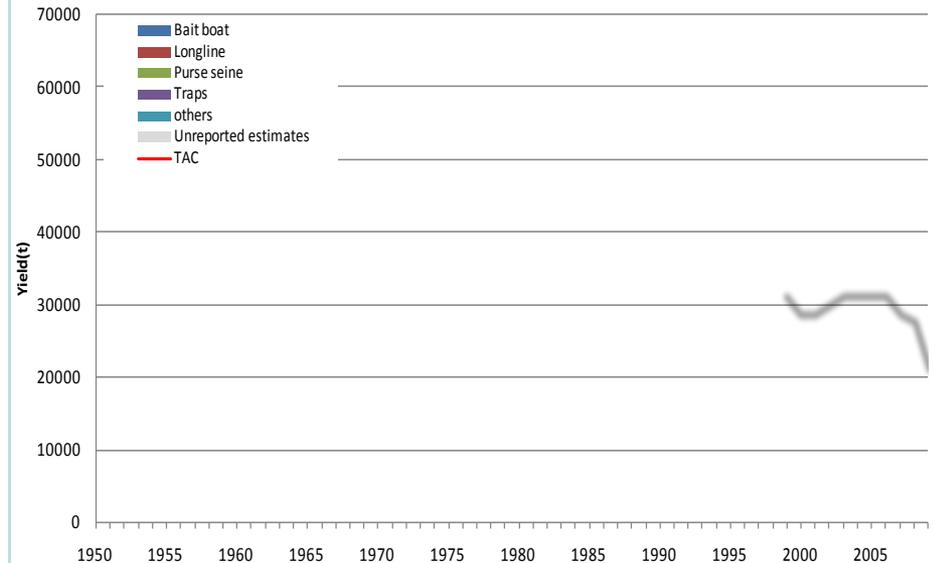
FISHERY INDICATORS

- Decrease in catch (mostly in Mediterranean) since 2007, probably in **response to improved enforcement**
- However, the 2008 & 2009 catch estimate does not take into account **potential IUU catch**

BFT-East Atlantic stock (Task-I) by region



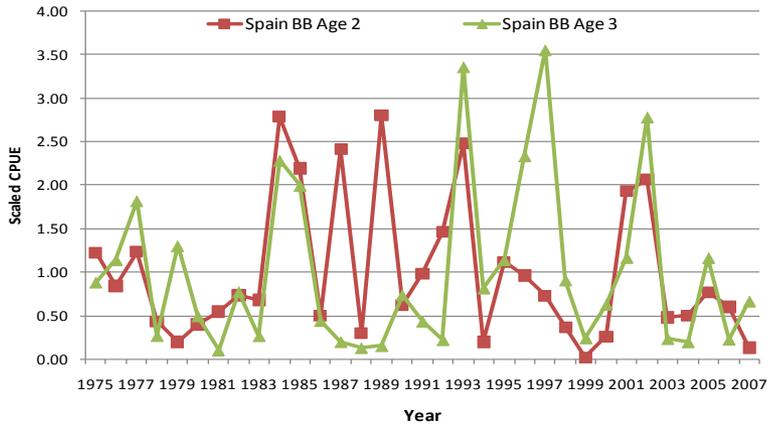
BFT-EAST Atlantic stock (Task-I) by major gear



FISHERY INDICATORS

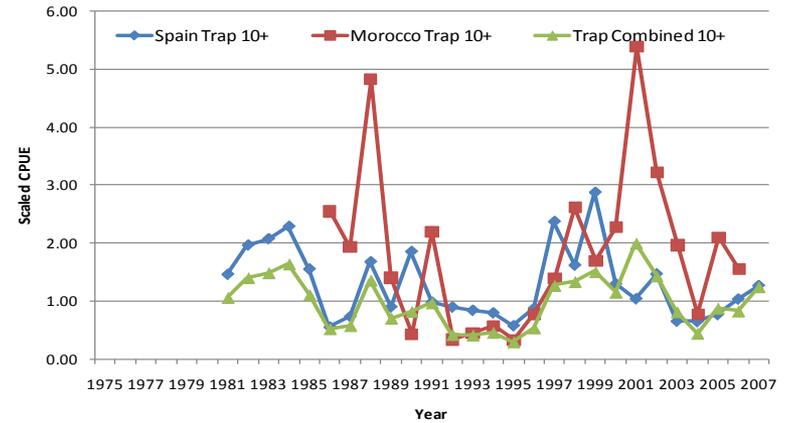
Juveniles

East Atlantic CPUE

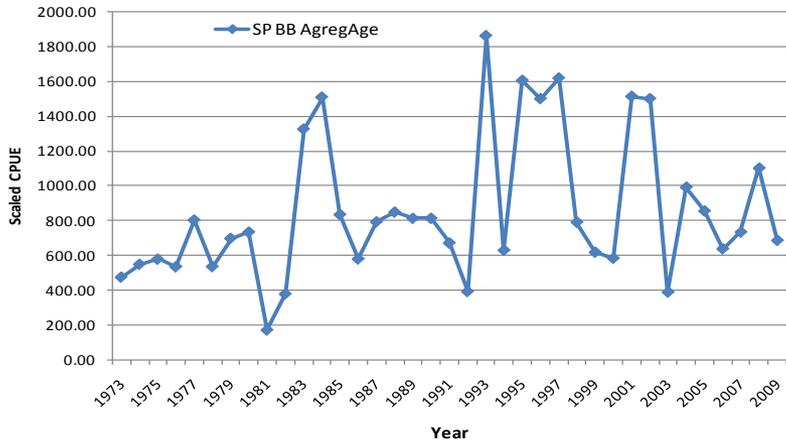


Spawners

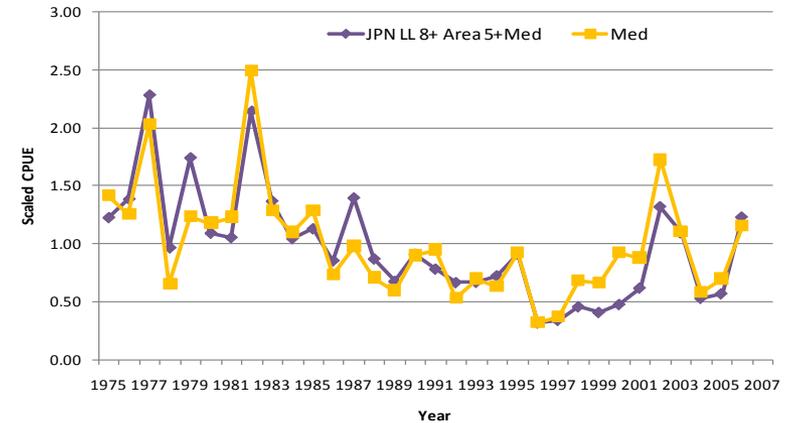
East Atlantic CPUE



East Atlantic CPUE



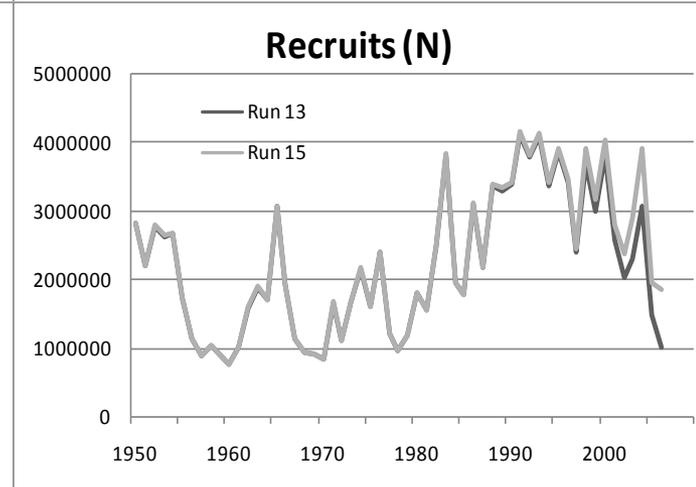
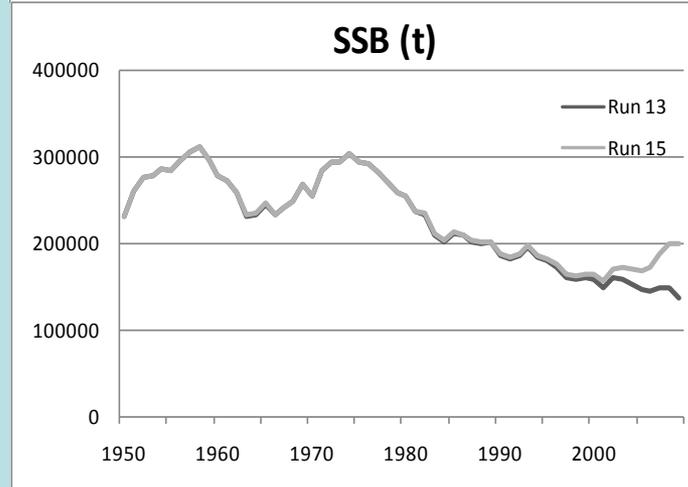
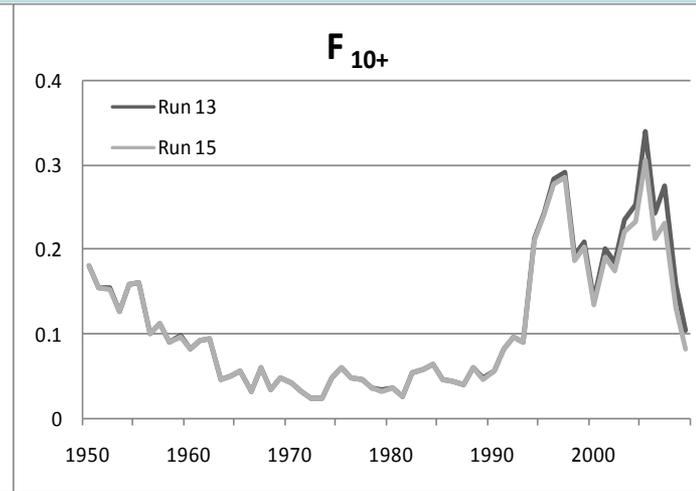
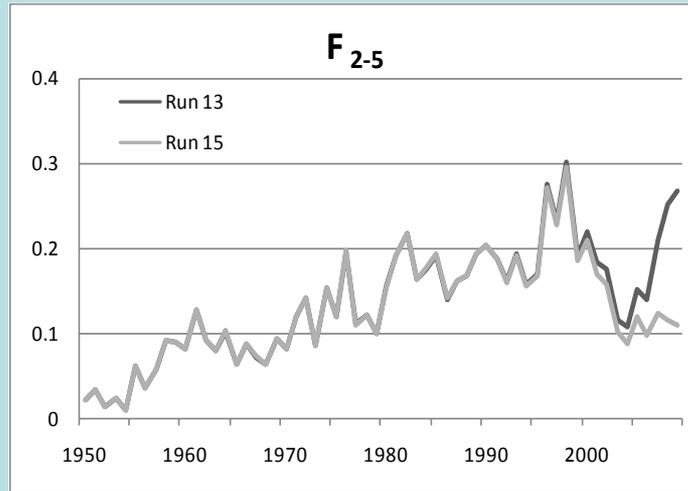
East Atlantic CPUE



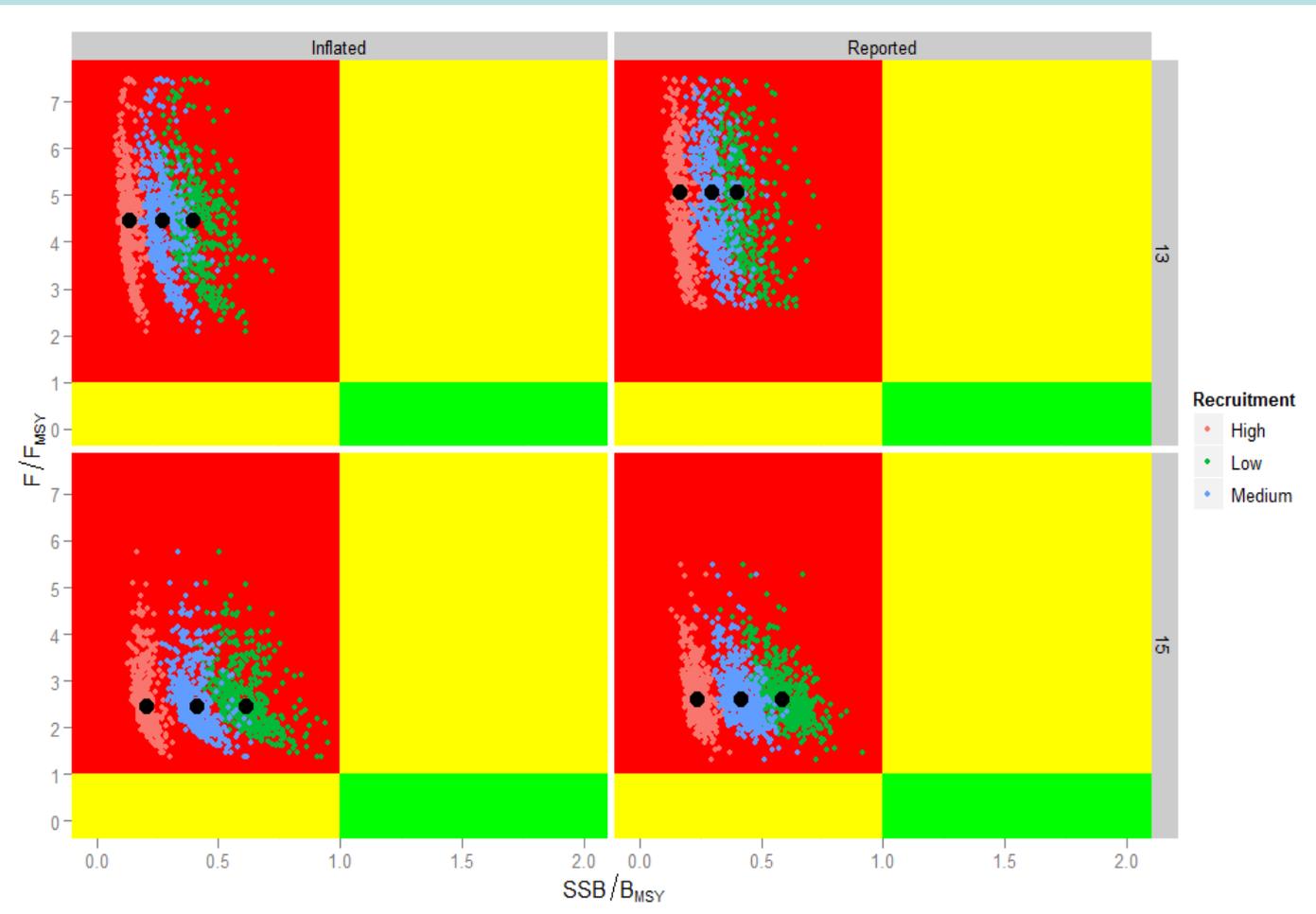
STATUS OF STOCK

VPA results from Runs 13 & 15

- Recent SSB increases in some runs and continues to decline in others
- F_{10+} has declined in recent years
- F_{2-5} uncertain and higher variability



STATUS OF STOCK



$$F_{2009} / F_{0.1} = 2.9$$

$$B_{2009} / B_{F0.1} = 0.35$$

PROJECTED OUTLOOK

24 scenarios:

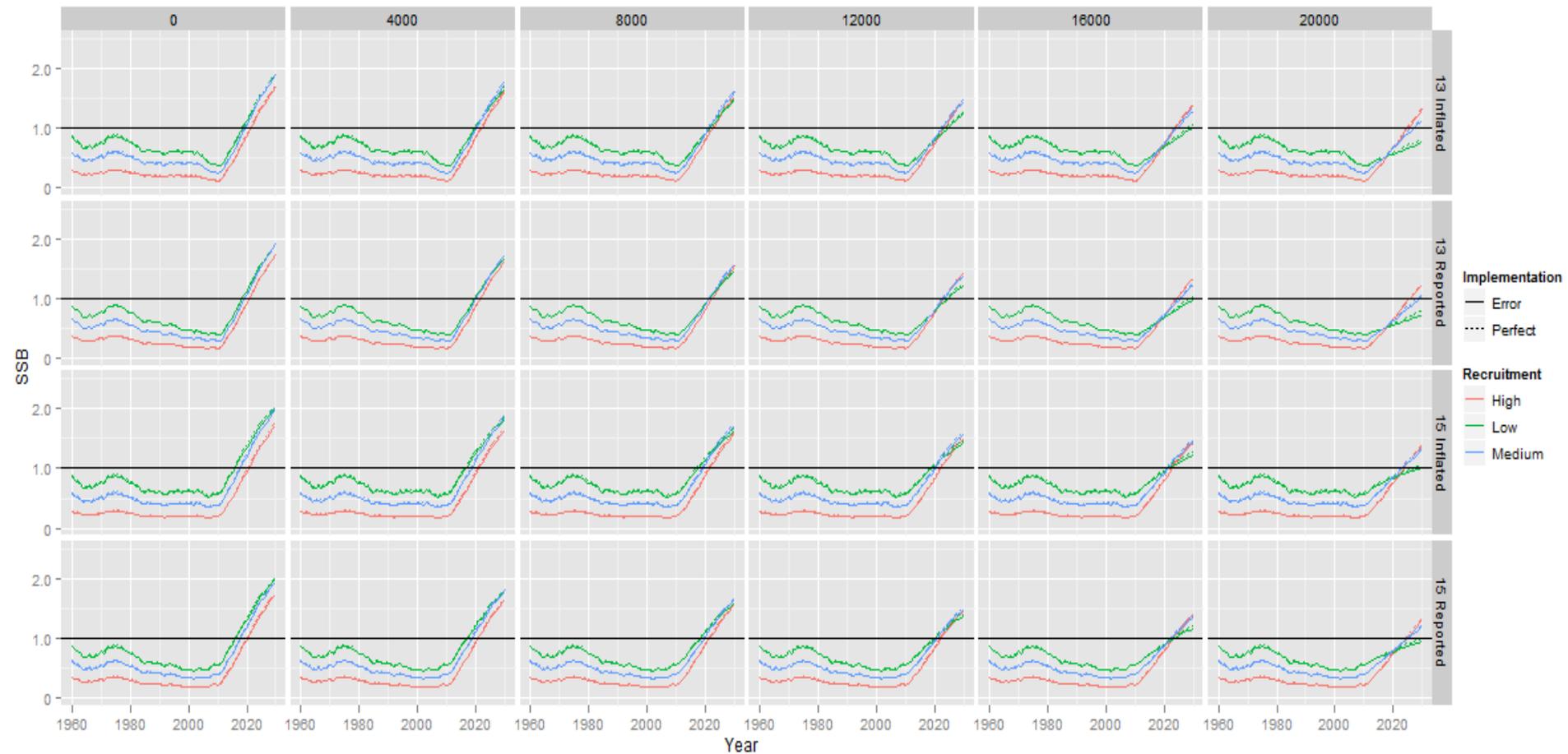
- 2 runs (run 13 and 15)
- 2 historical catches (reported, inflated)
- 3 levels of recruitment (low, medium, high)
- 2 levels of management implementation (perfect, imperfect)

Scenario	VPA Run	Catch	Recruitment	Implementation
1	13	Reported	Low	Perfect
2	13	Reported	Medium	Perfect
3	13	Reported	High	Perfect
4	13	Reported	Low	Imperfect
5	13	Reported	Medium	Imperfect
6	13	Reported	High	Imperfect
7	13	Inflated	Low	Perfect
8	13	Inflated	Medium	Perfect
9	13	Inflated	High	Perfect
10	13	Inflated	Low	Imperfect
11	13	Inflated	Medium	Imperfect
12	13	Inflated	High	Imperfect
13	15	Reported	Low	Perfect
14	15	Reported	Medium	Perfect
15	15	Reported	High	Perfect
16	15	Reported	Low	Imperfect
17	15	Reported	Medium	Imperfect
18	15	Reported	High	Imperfect
19	15	Inflated	Low	Perfect
20	15	Inflated	Medium	Perfect
21	15	Inflated	High	Perfect
22	15	Inflated	Low	Imperfect
23	15	Inflated	Medium	Imperfect
24	15	Inflated	High	Imperfect

PROJECTED OUTLOOK

Projected trends in $B/B_{F0.1}$ (60% probability) for each of the 24 scenarios

TAC



PROJECTED OUTLOOK

Combining all scenarios

TAC	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
0 mt	0%	0%	0%	2%	6%	14%	25%	38%	52%	69%	89%	98%	99%
2000 mt	0%	0%	0%	1%	5%	12%	21%	33%	46%	62%	83%	97%	99%
4000 mt	0%	0%	0%	1%	4%	9%	18%	28%	40%	55%	75%	93%	99%
6000 mt	0%	0%	0%	1%	3%	7%	14%	23%	34%	47%	66%	86%	97%
8000 mt	0%	0%	0%	0%	2%	6%	11%	19%	29%	40%	56%	77%	92%
10000 mt	0%	0%	0%	0%	2%	4%	9%	15%	23%	33%	46%	65%	84%
12000 mt	0%	0%	0%	0%	1%	3%	6%	11%	18%	26%	37%	53%	73%
13500 mt	0%	0%	0%	0%	1%	2%	5%	9%	14%	21%	30%	45%	63%
14000 mt	0%	0%	0%	0%	1%	2%	4%	8%	13%	20%	28%	42%	59%
16000 mt	0%	0%	0%	0%	0%	1%	3%	6%	9%	14%	20%	31%	46%
18000 mt	0%	0%	0%	0%	0%	1%	2%	4%	6%	10%	15%	22%	34%
20000 mt	0%	0%	0%	0%	0%	0%	1%	2%	4%	6%	10%	15%	24%

Rebuild to $SSB_{F0.1}$ level with 60% probability by:

2019 with a TAC = 0 t

2022 with current TAC (13,500 t)

2023 or later with TAC >14,000 t

EFFECT OF CURRENT REGULATIONS

- **Rec. [06.05 - 08.05 - 09.06] has clearly resulted in reductions in catch and F**
- **Enforcement of minimum size regulations under Rec.06.05 led to much lower reported catch of younger fish since 2007**
- **Fishery is currently adapting to new management measures: Need more time to fully evaluate the implications of the measures on the stock.**

MANAGEMENT ADVICE

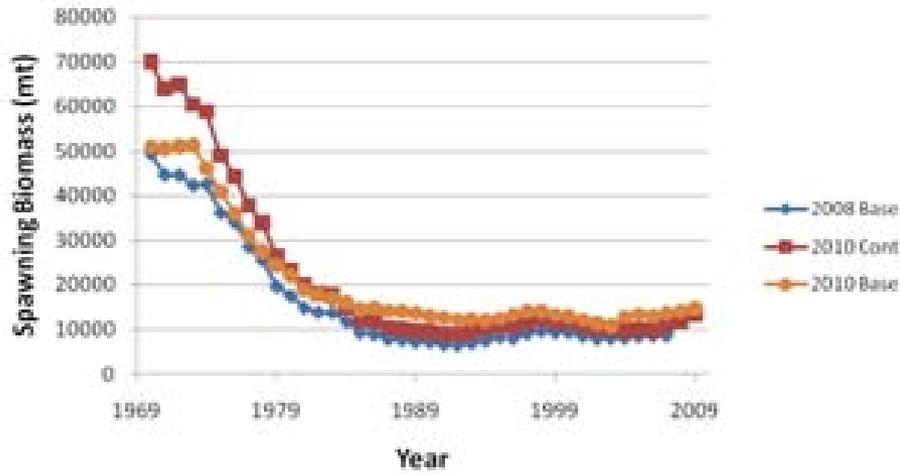
- **Maintaining catches at the current TAC (13,500 t) under current management scheme, for 2011-2013, will likely allow the stock to increase and is consistent with the goal of achieving F_{MSY} and B_{MSY} through 2022 with at least 60% of probability**
- **The commission might consider more precautionary approach considering the unquantified uncertainties.**



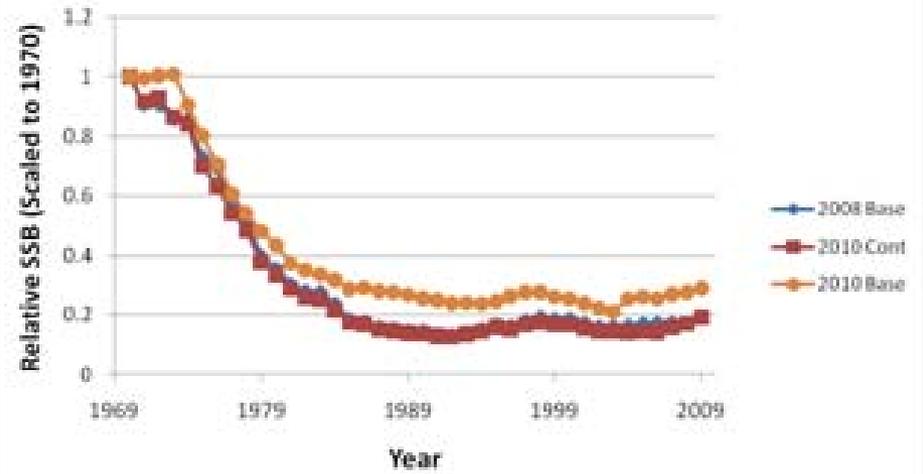
Research & Statistics

- **Need fishery independent information (large-scale tagging and indices of abundance)**
- **Investigate BFT population structure (via otoliths) and reproductive biology**
- **Continue data mining**

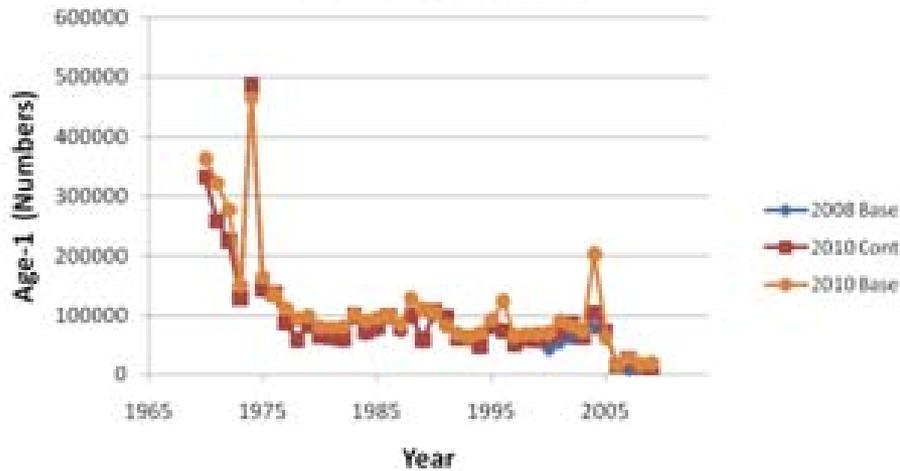
BFT W Spawning Biomass



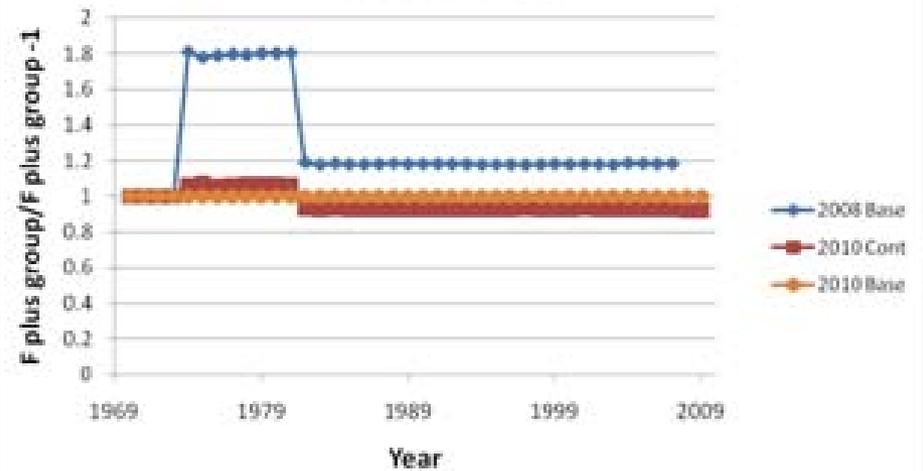
BFT W Spawning Biomass



BFT W Recruitment



BFT W F Ratio



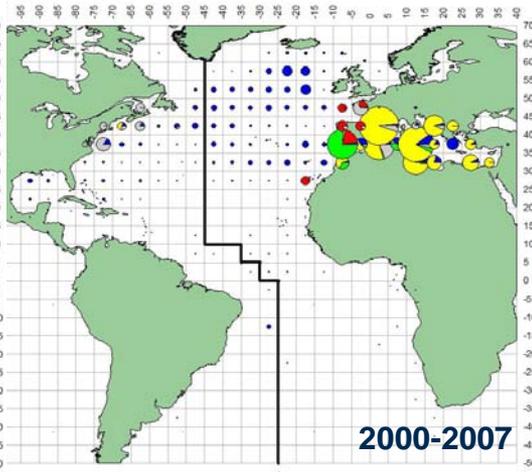
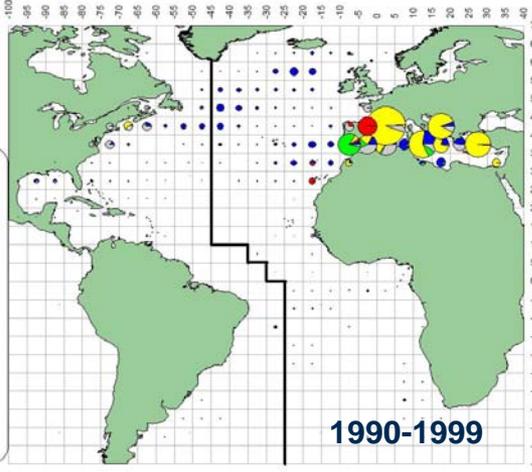
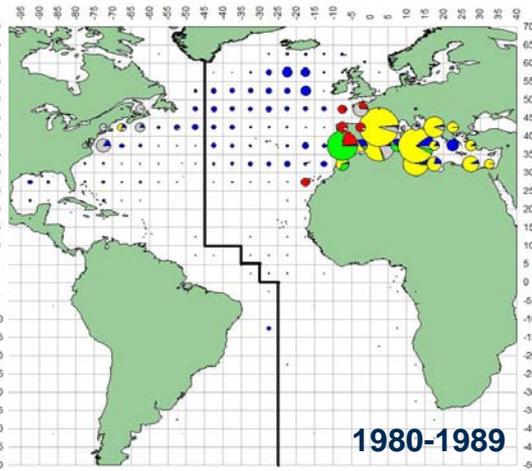
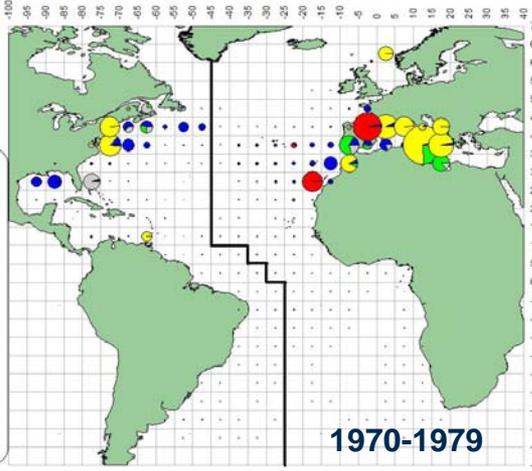
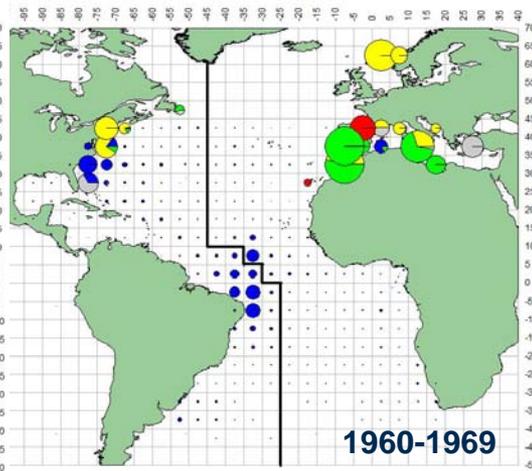
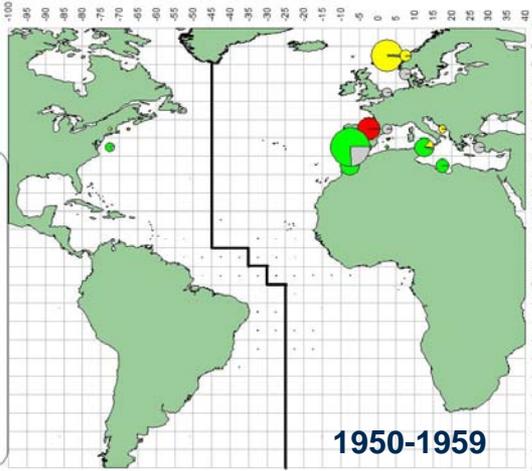
KOBE II Matrix: Chance that F will exceed the level that will produce MSY for a given year and TAC

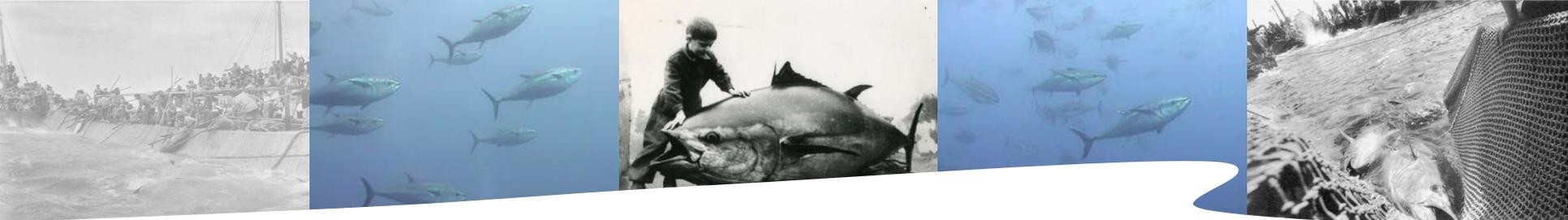
Low recruitment scenario (two-line)

TAC	2011	2012	2013	2014	2015	2016	2017	2018	2019
0 mt	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
250 mt	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
500 mt	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
750 mt	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
1000 mt	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
1250 mt	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
1500 mt	99.6%	99.6%	99.6%	99.4%	99.4%	99.4%	99.4%	99.4%	99.4%
1750 mt	98.8%	98.8%	98.8%	98.6%	98.6%	98.8%	98.8%	98.8%	98.8%
2000 mt	96.4%	96.4%	96.4%	96.6%	96.0%	95.8%	96.0%	96.6%	96.6%
2250 mt	90.2%	91.8%	91.6%	91.4%	91.2%	90.4%	90.4%	91.4%	91.6%
2500 mt	78.8%	82.4%	81.2%	80.2%	79.0%	77.0%	78.0%	81.6%	79.8%
2750 mt	63.6%	67.0%	65.2%	66.0%	65.0%	62.2%	61.0%	63.4%	61.6%
3000 mt	47.8%	51.4%	49.0%	48.4%	46.6%	43.6%	41.4%	43.0%	41.8%
3250 mt	34.4%	37.2%	33.8%	32.8%	29.4%	25.4%	23.8%	26.2%	23.6%
3500 mt	21.4%	25.4%	18.2%	17.4%	15.2%	13.6%	12.2%	13.0%	12.2%

High recruitment scenario (Beverton-Holt)

TAC	2011	2012	2013	2014	2015	2016	2017	2018	2019
0 mt	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
250 mt	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
500 mt	99.8%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
750 mt	96.6%	98.4%	98.6%	98.8%	98.8%	99.2%	99.2%	99.4%	99.6%
1000 mt	75.6%	85.2%	88.8%	91.6%	93.0%	93.4%	95.4%	97.0%	98.6%
1250 mt	40.4%	53.6%	60.0%	67.2%	71.4%	74.6%	80.6%	87.2%	89.8%
1500 mt	13.8%	25.6%	30.6%	38.4%	44.0%	47.6%	53.2%	63.6%	67.6%
1750 mt	4.6%	8.2%	10.4%	14.2%	18.0%	22.2%	26.6%	38.6%	41.0%
2000 mt	1.4%	3.2%	4.2%	4.6%	7.0%	9.0%	12.4%	17.4%	19.6%
2250 mt	0.6%	1.0%	1.2%	2.2%	2.6%	3.2%	5.0%	7.4%	9.4%
2500 mt	0.2%	0.2%	0.2%	0.6%	1.2%	1.4%	1.4%	3.4%	3.8%
2750 mt	0.0%	0.2%	0.2%	0.2%	0.2%	0.2%	0.8%	1.4%	1.4%
3000 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	0.2%	0.2%
3250 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
3500 mt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%





Fishing Capacity & Catch estimate

The 2008 & 2009 estimates are based on a larger amount of information

Gear	Boat Size	2008			2009			2006	Estimated yield with
		Nb. Vessels	catch rates	Estimated yield	Nb. vessels	catch rates	Estimated yield	catch rates	2006 catch rates & 2009 vessels
PS	<=15	3	1	3	-	-	-	40	-
	>15 - <20	5	5	26	-	-	-	40	-
	>=20 - <40	156	54	8408	152	45	6843	150	22800
	>=40	51	66	3383	62	61	3766	300	18600
LL	<=15	185	2	308	135	2	263	10	1350
	>15 - <20	59	6	370	56	5	252	10	560
	>=20 - <40	37	14	508	37	10	371	20	740
	>=40	6	24	144	36	53	1901	50	1800
BB	<=15	4	0	0	4	0	2	15	60
	>15 - <20	3	10	31	3	1	2	15	45
	>=20 - <40	60	20	1214	59	12	695	40	2360
HL	-	92	5	474	91	3	261	4	364
TW	-	76	6	443	46	6	288	15	690
TP	-	26	130	3380	25	130	3250	245	6125
OT	-	23	36	834	23	18	413	4	92
Total		786	380	19526	729	345	18308	958	55586

- Best catch estimates consistent with the large decrease in the reported catch for 2008 and 2009 (24,054t and 20,228 t, i.e. ~10,000t lower than the 2003-2007 reported catch)
- The maximum catch estimates may be seen as the utilized capacity under [Rec. 08-05], but still large overcapacity in 2009: Need to pursue the capacity reduction plan

Western Atlantic Bluefin tuna

Current (2009) Catch (including discards):	1,935 t	
Assuming Low Potential Recruitment		
Maximum sustainable Yield (MSY):	2,585 t	(2,409 - 2,766)
Relative Spawning Stock Biomass:		
B_{2009}/B_{msy}	1.1	(0.89-1.35)
Relative Fishing Mortality:		
F_{2009}/F_{msy}	0.73	(0.59-0.91)
Assuming High Potential Recruitment		
Maximum sustainable Yield (MSY):	6,329 t	(5,769 - 7,074)
Relative Spawning Stock Biomass:		
B_{2009}/B_{msy}	0.15	(0.10 - 0.22)
Relative Fishing Mortality:		
F_{2009}/F_{msy}	1.88	(1.49 - 2.35)

Eastern Atlantic Bluefin tuna

Current (2009) Yield:	Reported: 19,701 t	SCRS Estimate: 18,308 t
Short Term Sustainable Yield:	13,500 t or less	
Long Term Yield:	about 50,000 t	
Relative Spawning Stock Biomass:		
Medium recruitment (1950-2006)	0.35	
Low recruitment (1970s)	0.51	
High recruitment (1990s)	0.19	
Relative Fishing Mortality:	2.9	