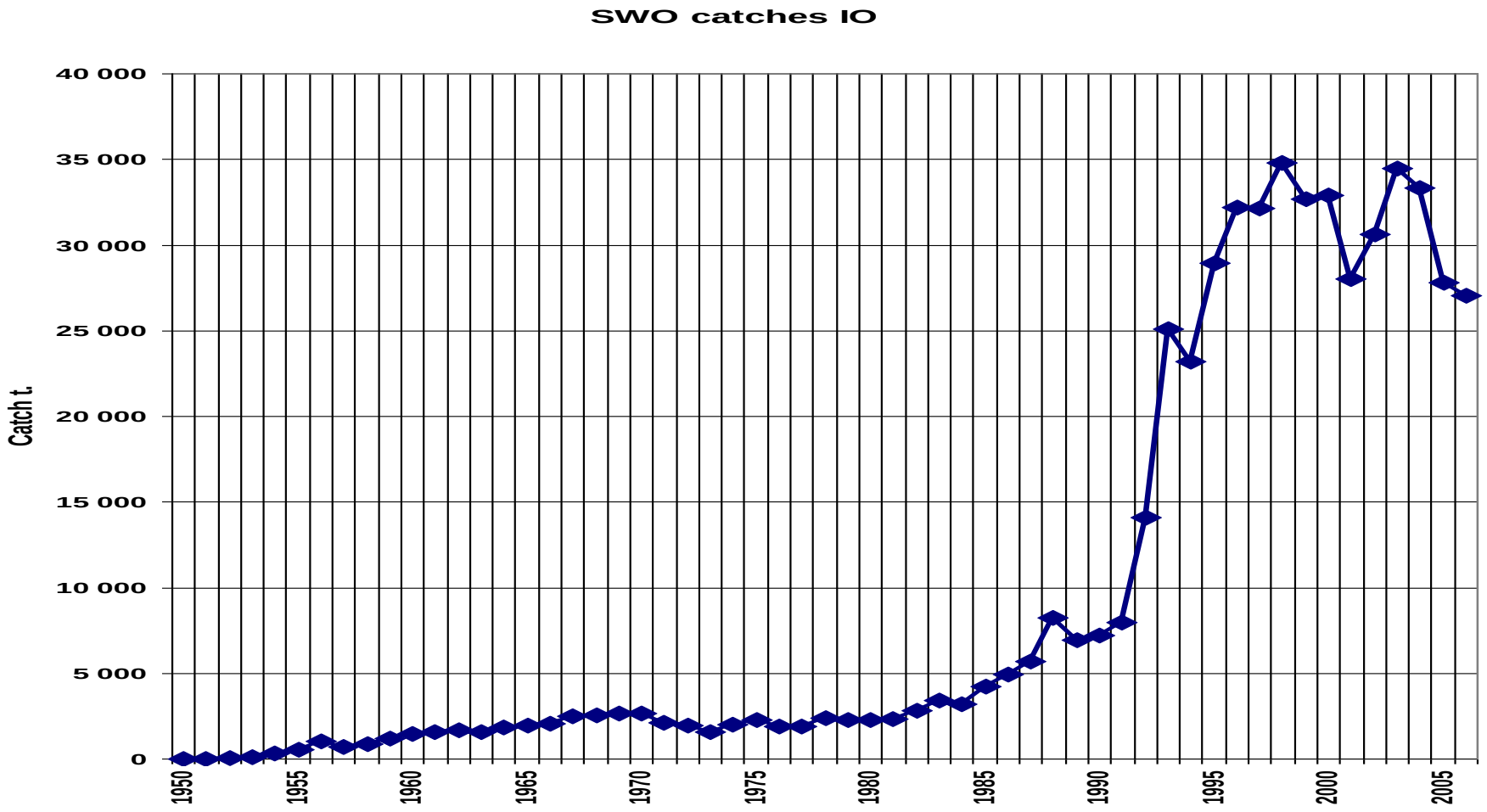
5 potential Billfishes indicators

1) **Nominal LL CPUEs** of each species, Japan & Taiwan, but in **selected core equatorial waters & areas** of each billfish species distribution (cf maps)(based on Longhurst areas?)
2) **Yearly % of fishing « targetted » efforts that have produced dominant billfish catches** in each 5°-month strata (whole IO or /area)
3) Average of the **« 3Best » highest CPUEs or catches** / fleet (and best **total catches/5°-month)** observed monthly /5°squares-month, for each billfish species
4) Maps of **total catches by species** (with pies showing the average catches /flag, for major flags)
5) Maps of **maximal monthly CPUEs** observed in each 5° during the 1952-2005 period (Japan? Taiwan?)


SWO catches IO
Catch t
40 000
35 000
30 000
25 000
20 000
15 000
10 000
5 000
0
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005

Some important facts to remember upon blue and black marlins:

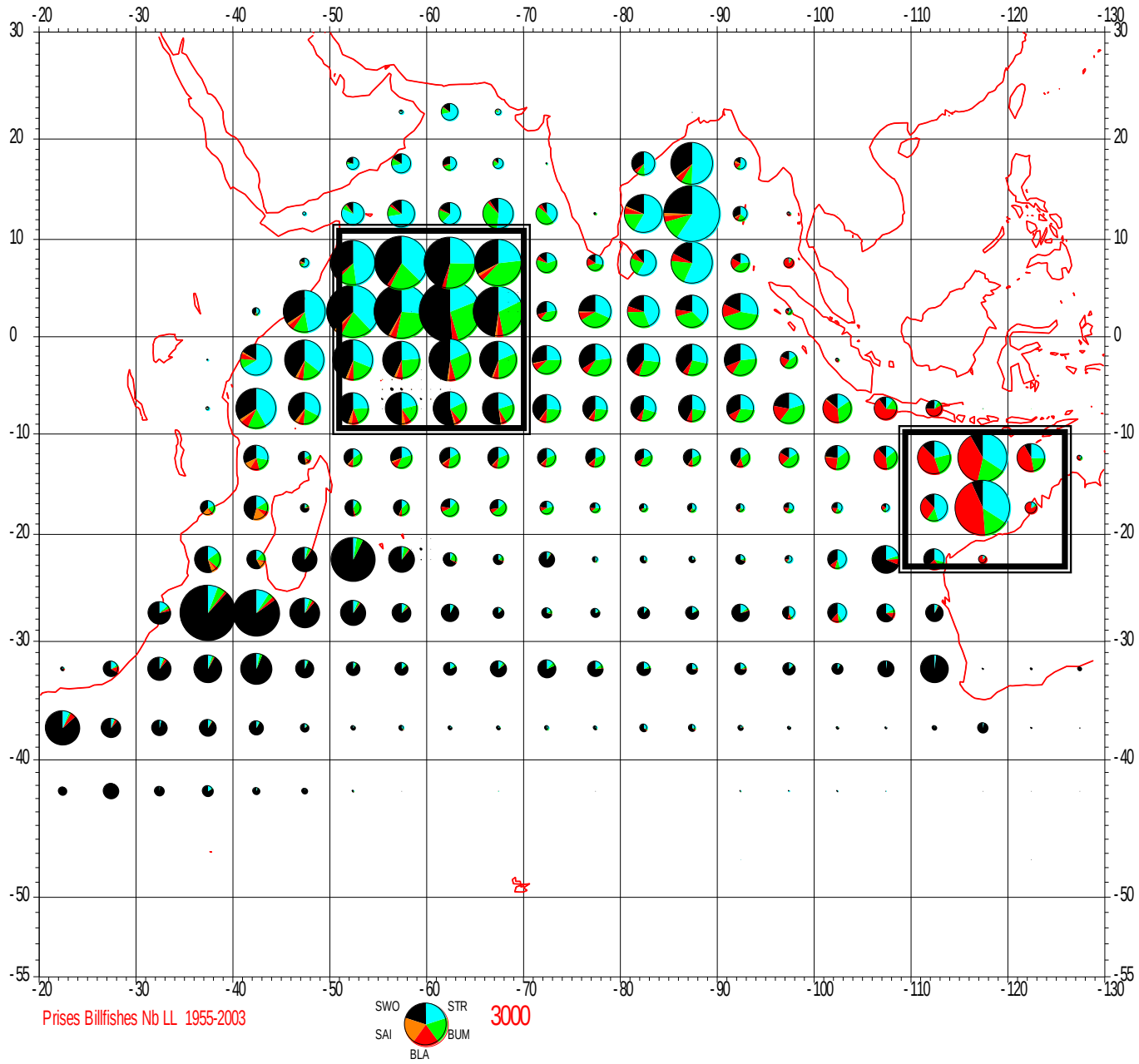
-They may reach very large sizes/weights > 1000 kg?

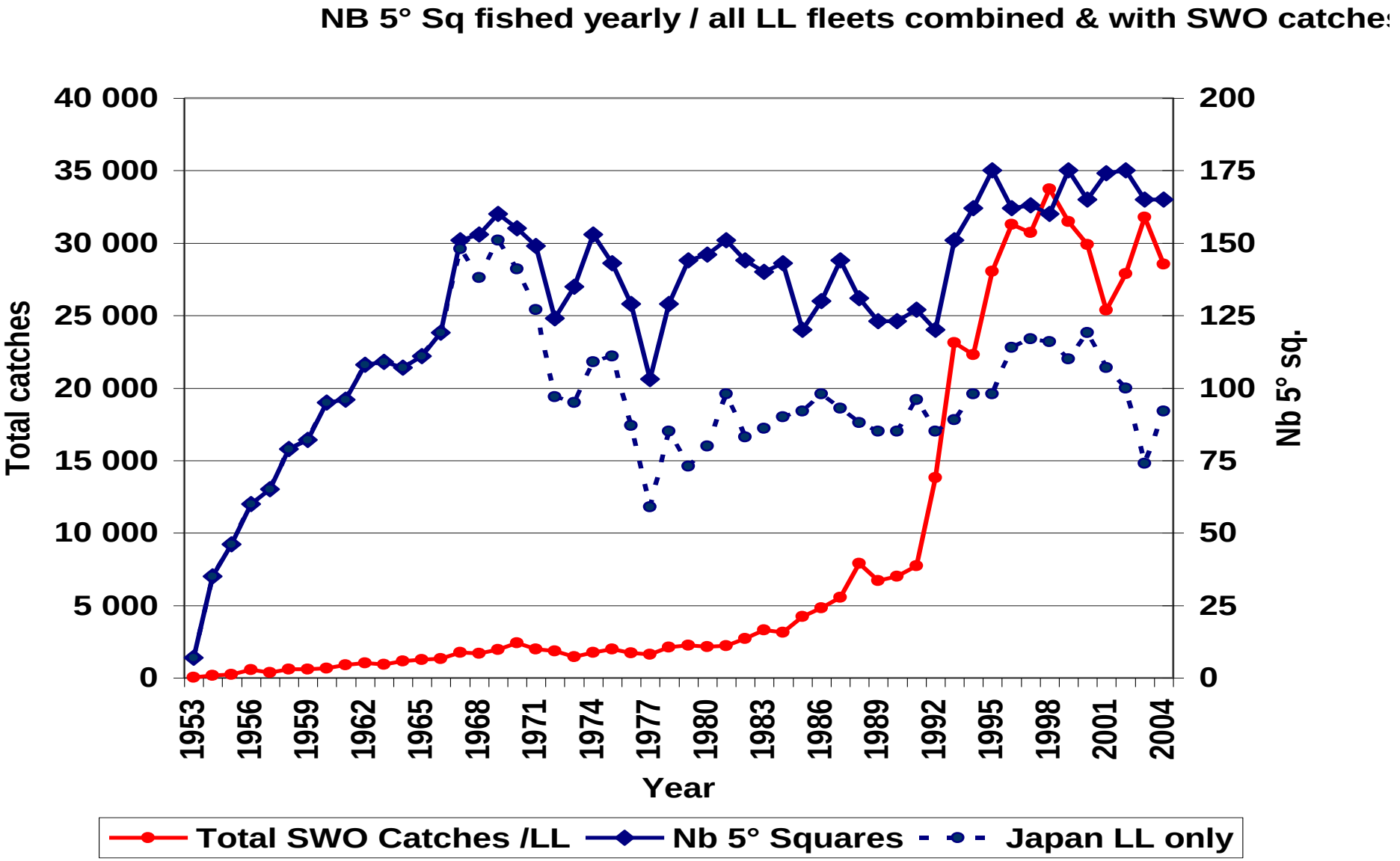
-They never form « real » schools, being sometimes simply concentrated in their favourite feeding and spawning areas: « Billfish hotspots »

- this dispersion may tend to rediuce their catchability to most fishing gears?

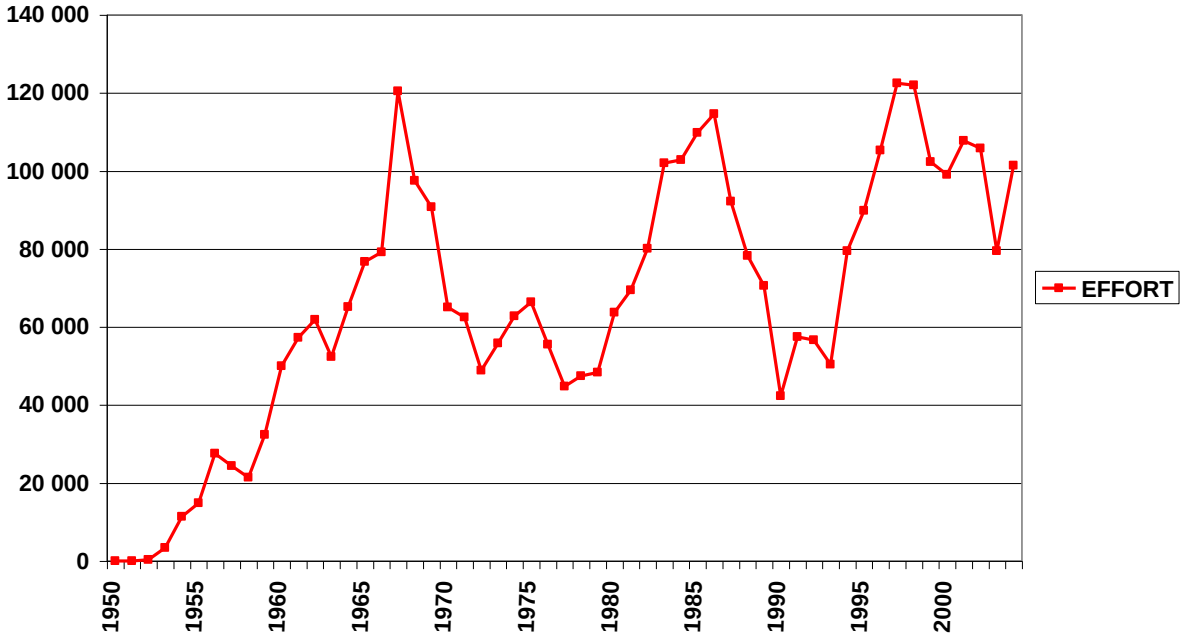
-Their very large max sizes should tend to reduce their catchability: due to technological reasons (few gears, LL or RR, can easily catch such a 1000kg BUM!, and these large billfishes tend to prefer to eat larger preys?)

-« Dome shape catchability » patterns should be the basic hypothesis in the BUM and BLM assessment models.


-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
30
20
10
0
-10
-20
-30
-40
-50
-55
Prises Billfishes Nb LL 1955-2003
SWO
STR
SAI
BUM
BLA
3000

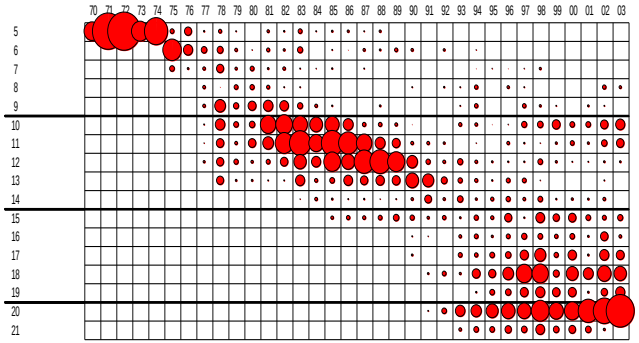

NB 5° Sq fished yearly / all LL fleets combined & with SWO catches
Total catches
40 000
35 000
30 000
25 000
20 000
15 000
10 000
5 000
0
Nb 5° sq.
200
175
150
125
100
75
50
25
0
1953
1956
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
Year
Total SWO Catches /LL
Nb 5° Squares
Japan LL only

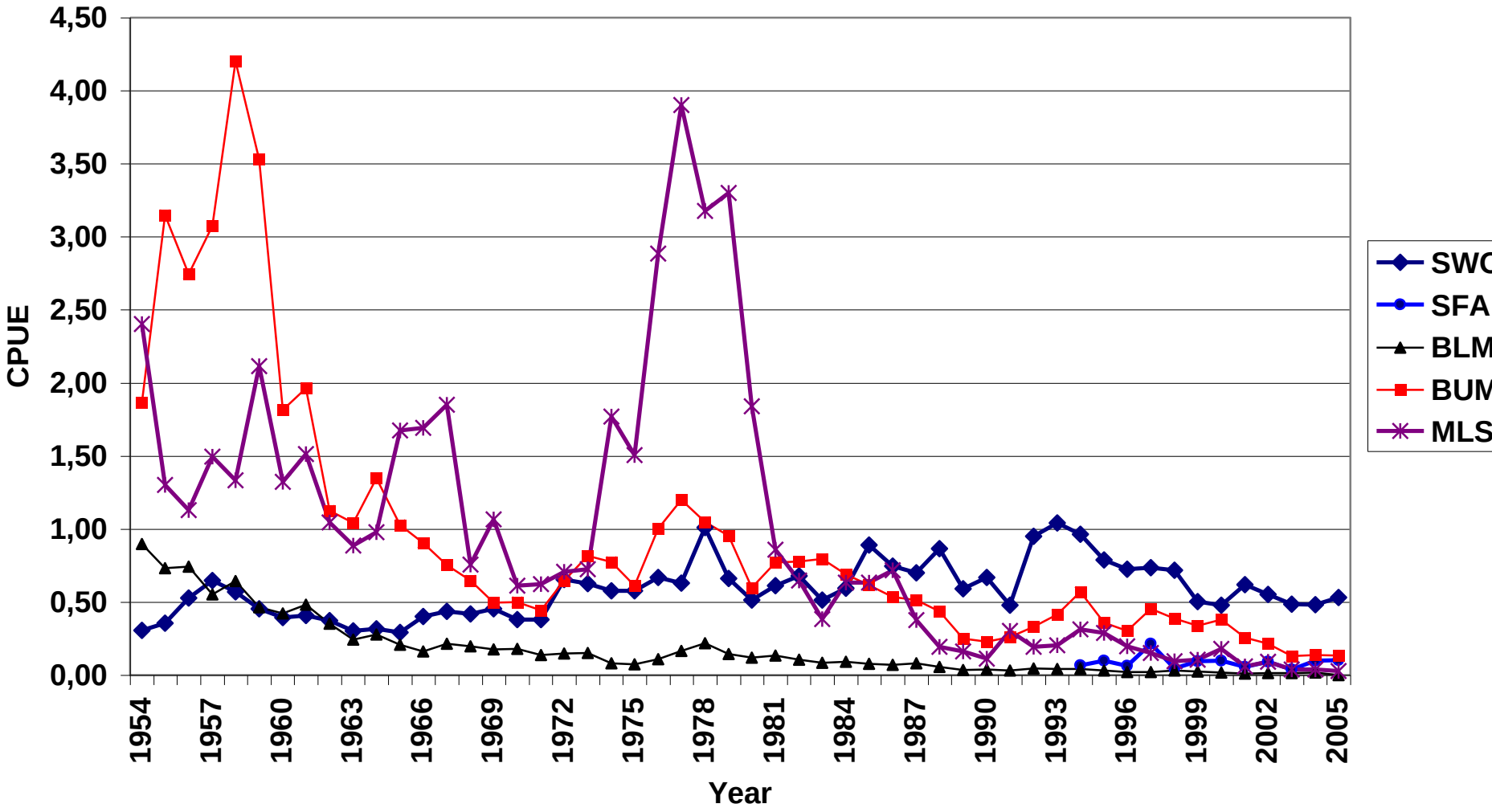
EFFORT LL Japan IO

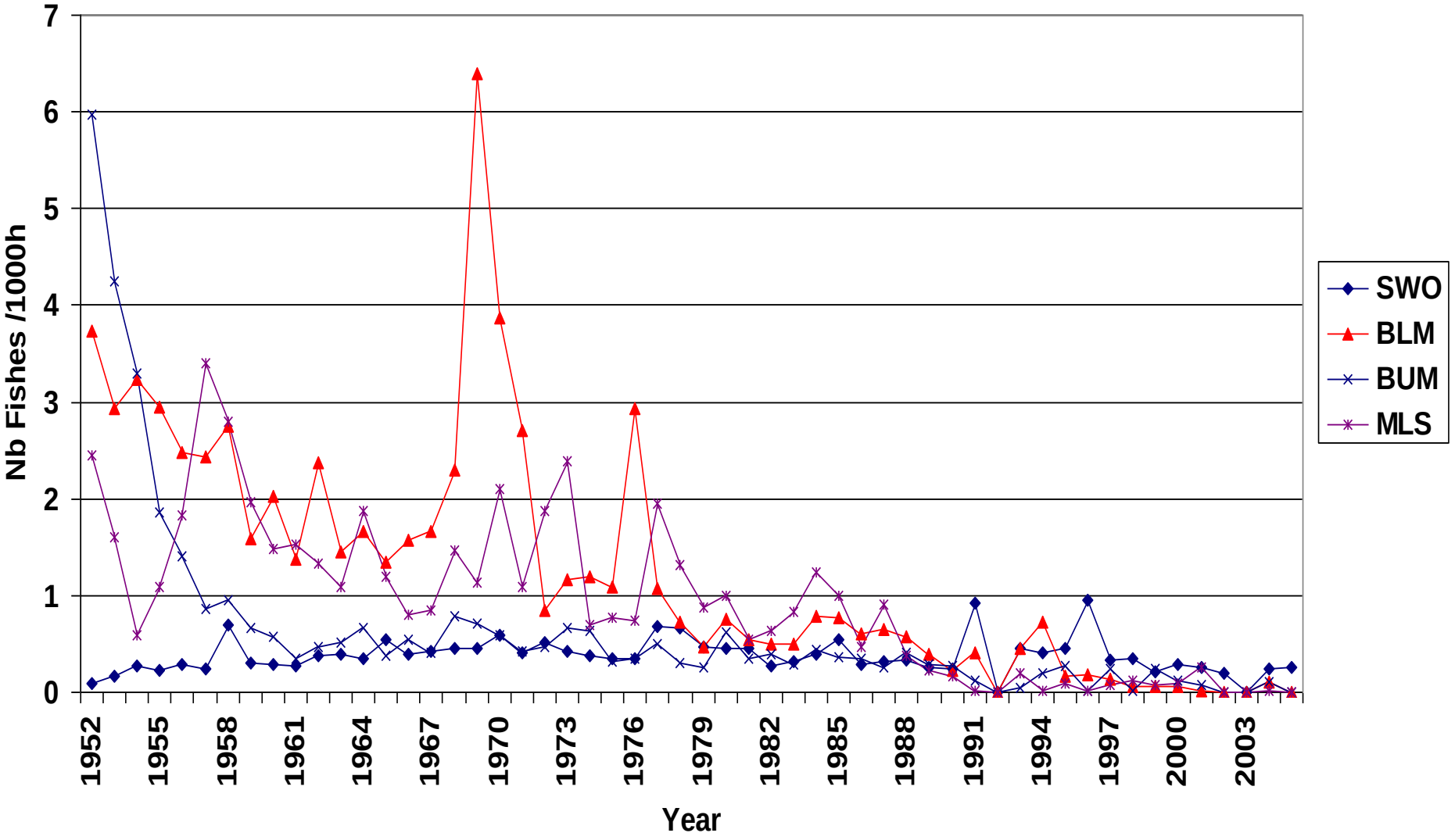


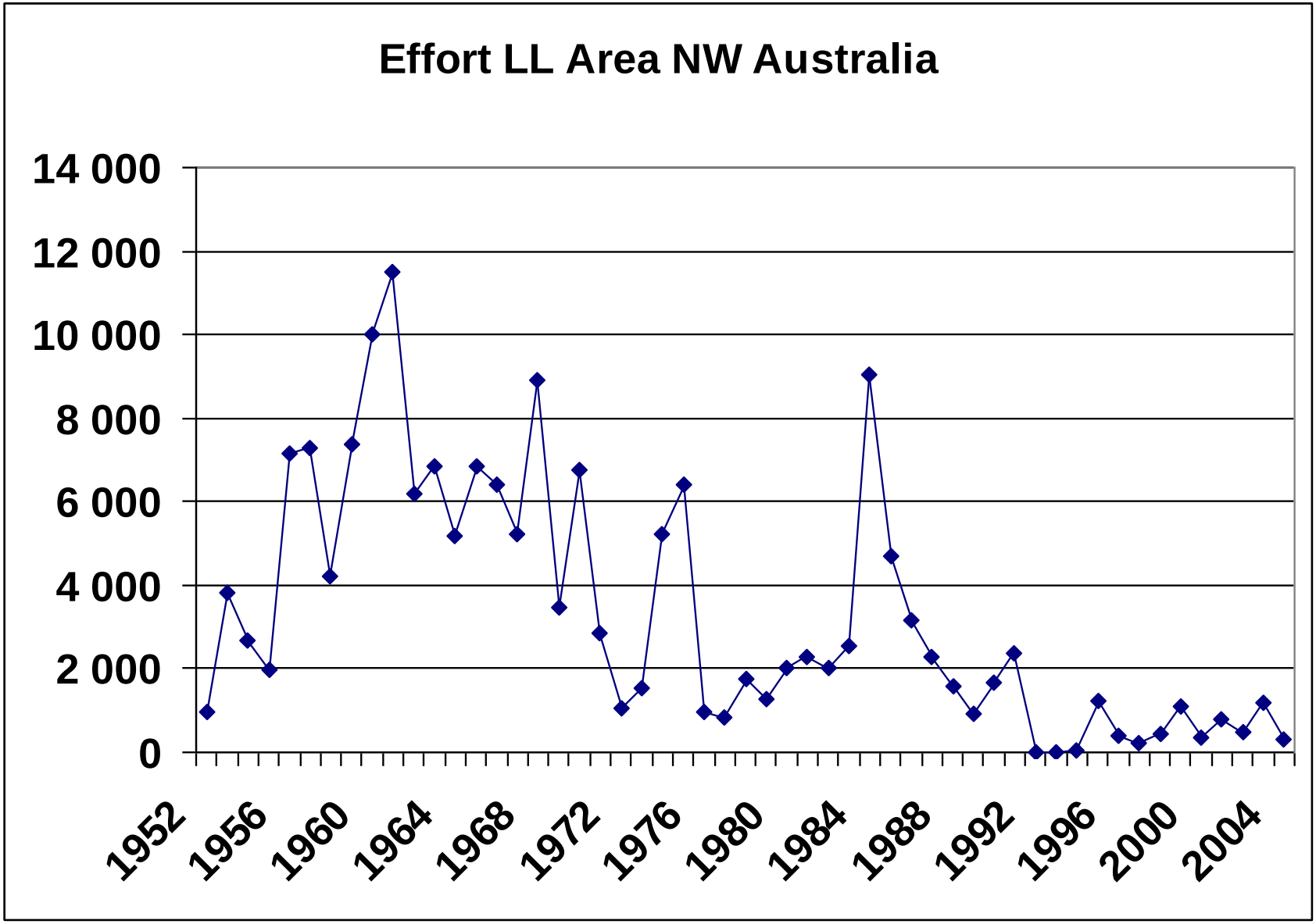
year

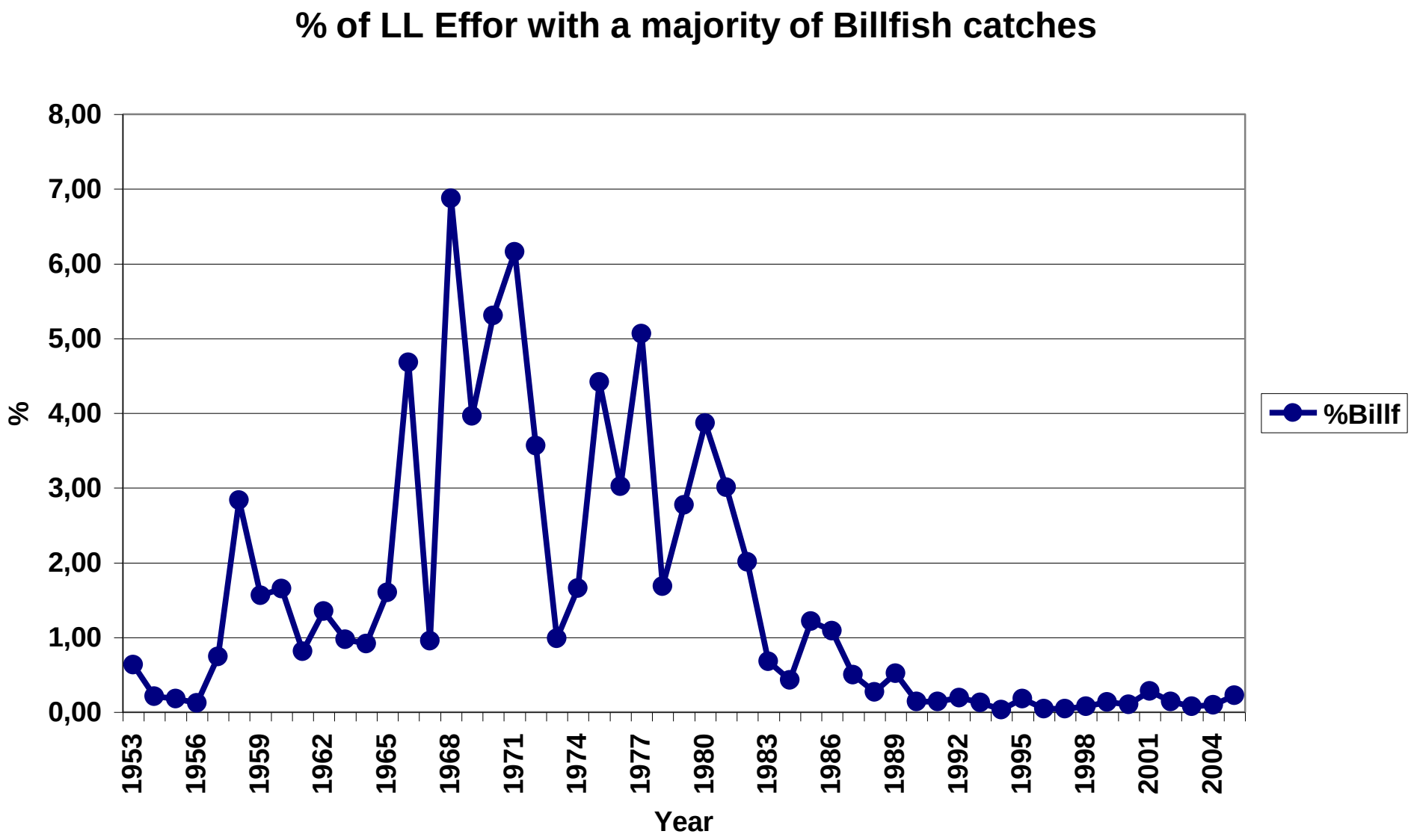
Hooks per basket



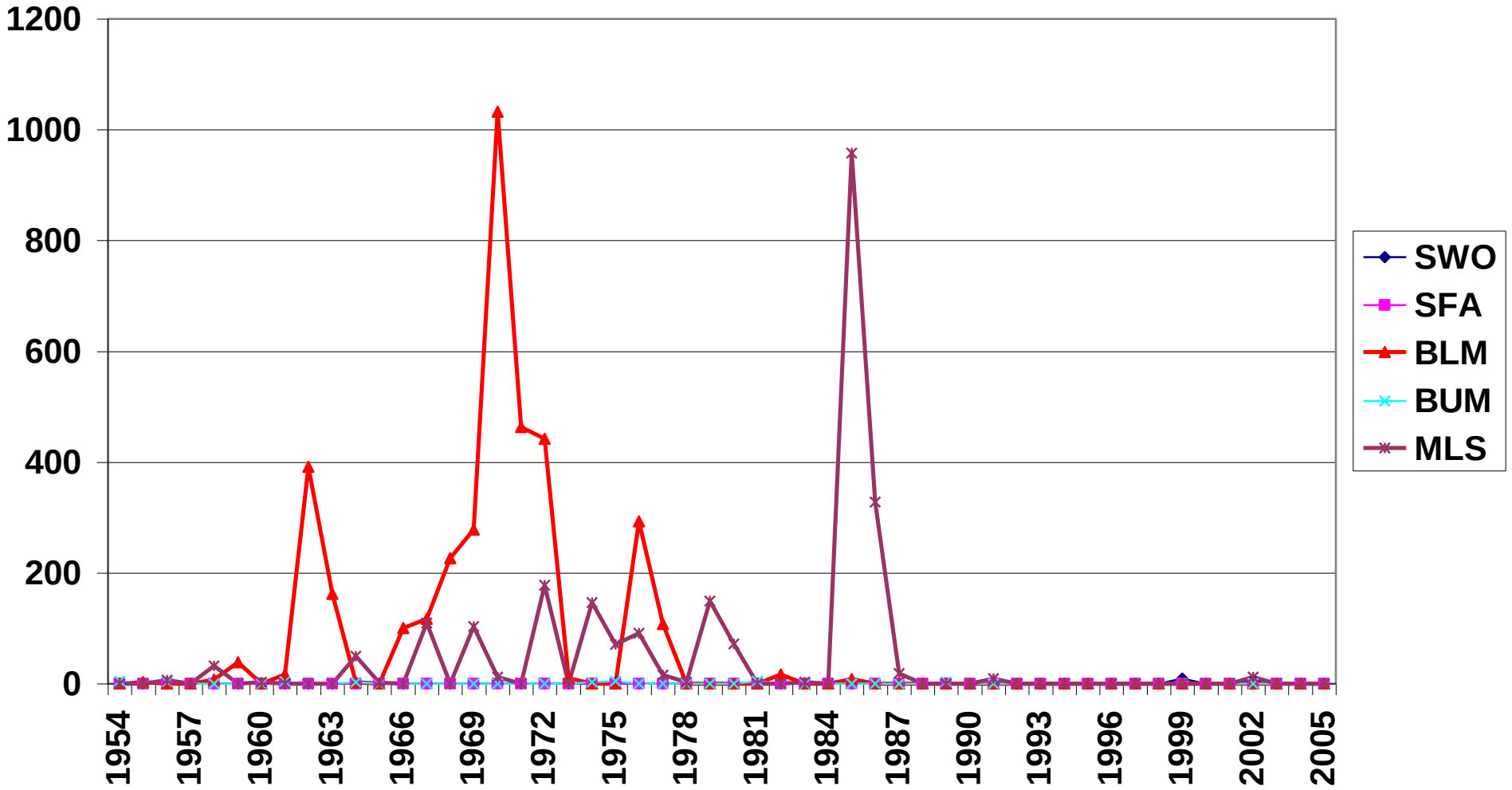

Billfish Nominal CPUE Seychelles area 10N 10S, 50 70E
CPUE
4,50
4,00
3,50
3,00
2,50
2,00
1,50
1,00
0,50
0,00
1954
1957
1960
1963
1966
1969
1972
1975
1978
1981
1984
1987
1990
1993
1996
1999
2002
2005
Year
SWO
SFA
BLM
BUM
MLS


NW Australia Billfishes CPUE LL japan
Nb Fishes /1000h
0
1
2
3
4
5
6
7
1952
1955
1958
1961
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003
Year
SWO
BLM
BUM
MLS

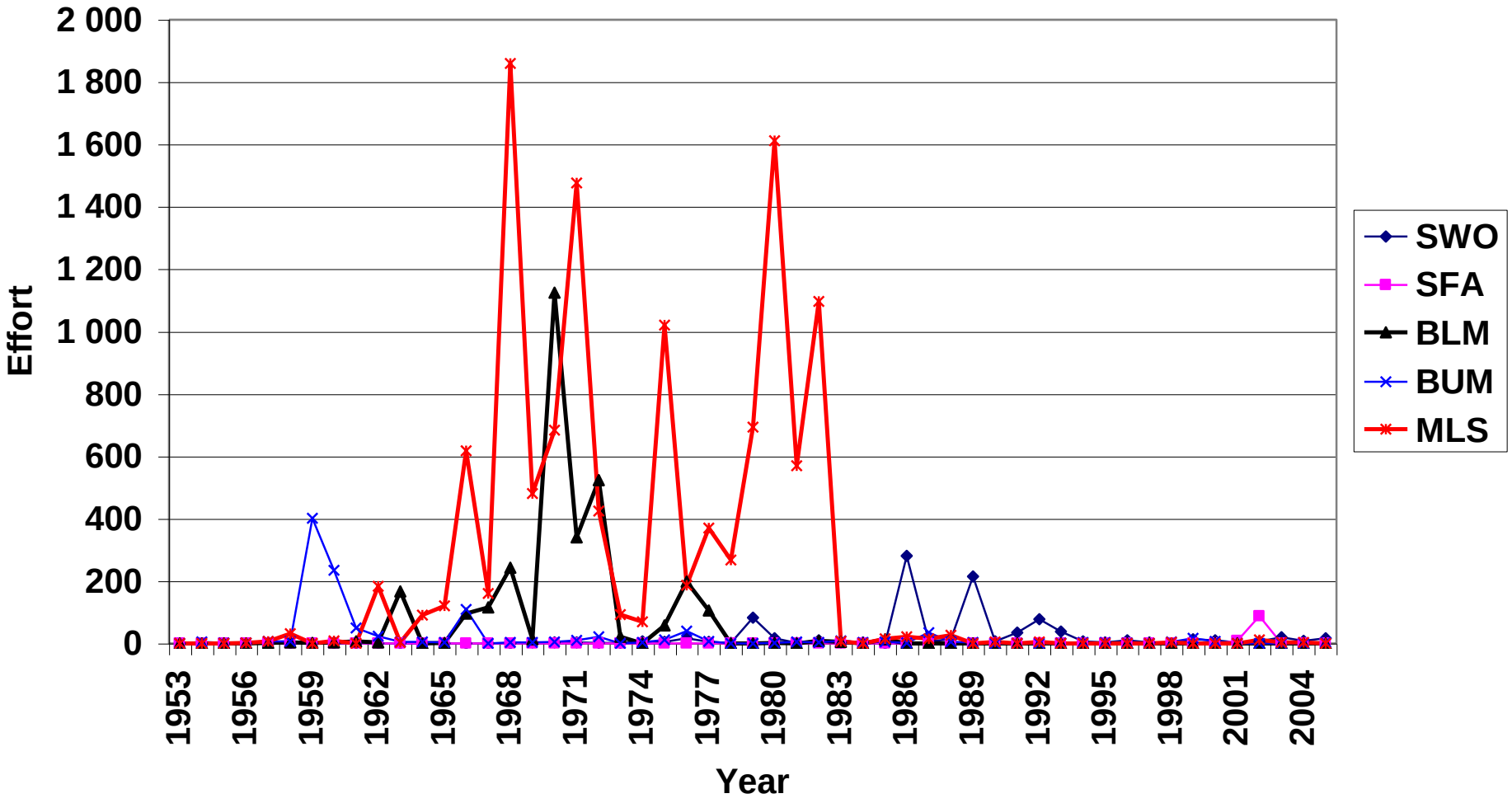

Effort LL Area NW Australia
14 000
12 000
10 000
8 000
6 000
4 000
2 000
0
1952
1956
1960
1964
1968
1972
1976
1980
1984
1988
1992
1996
2000
2004

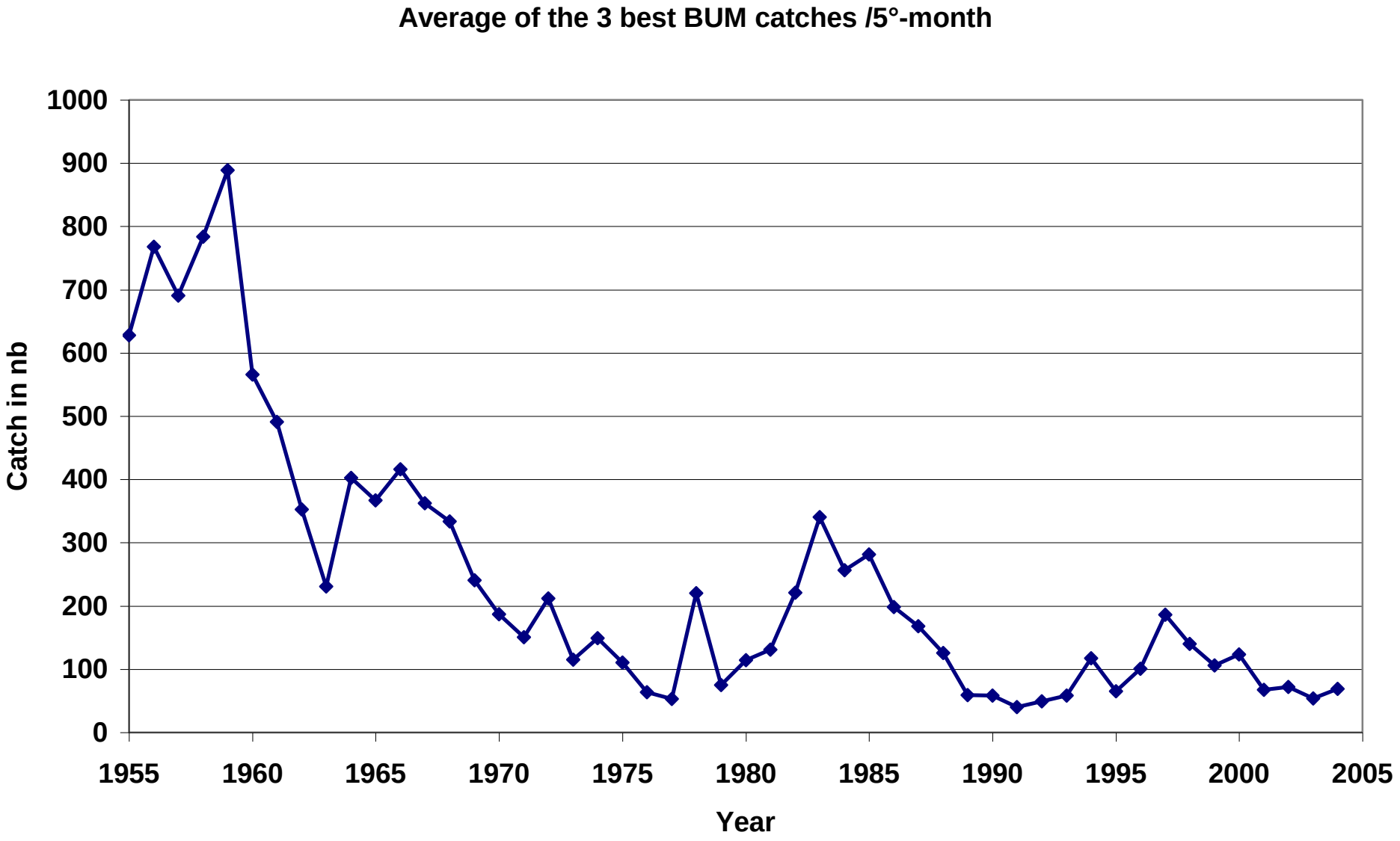

% of LL Effor with a majority of Billfish catches
8,00
7,00
6,00
5,00
4,00
3,00
2,00
1,00
0,00
%
1953
1956
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
Year
%Billf

NW Australia: LL effort in strata with dominant billf species

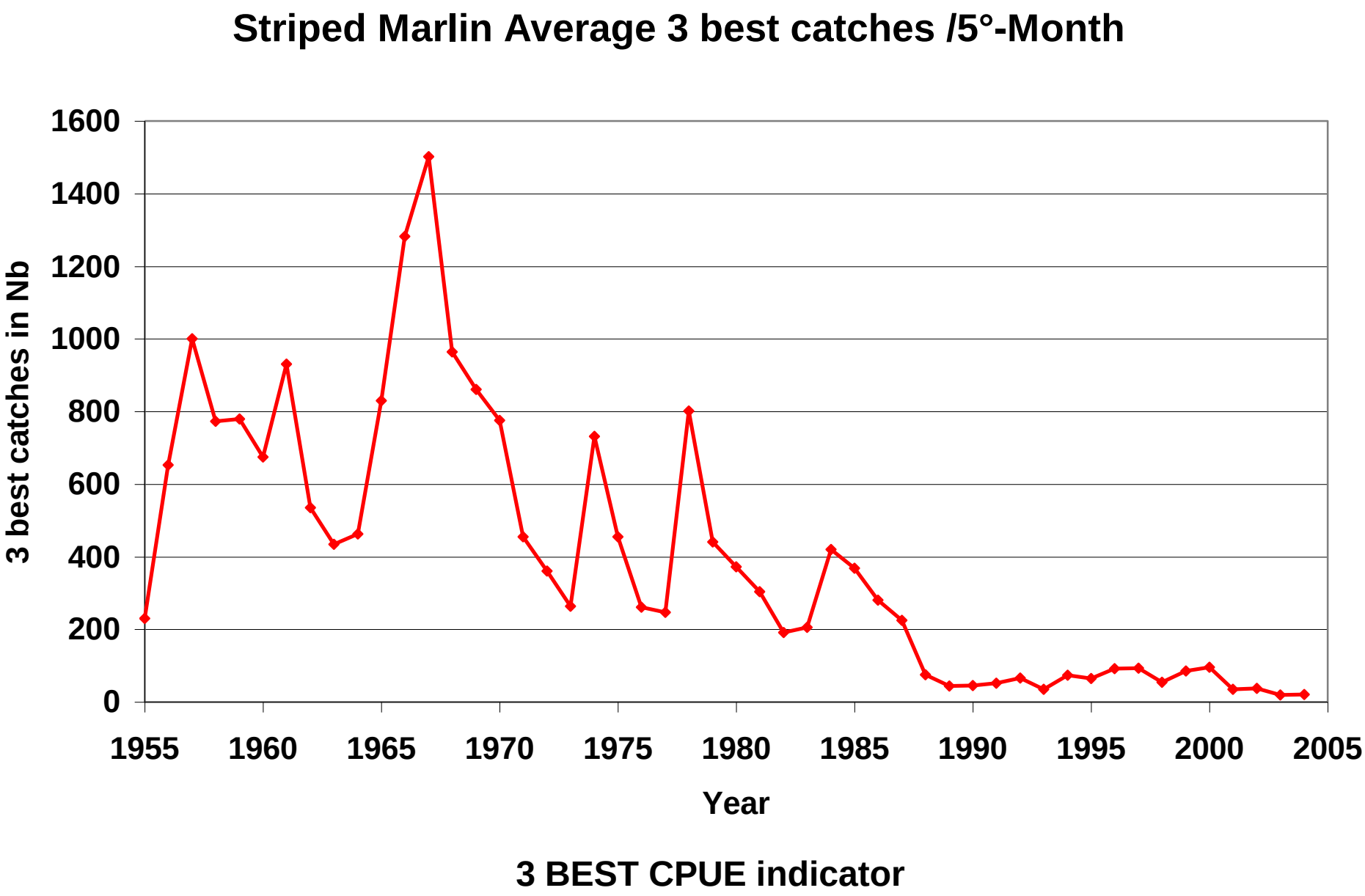


IO: Effort exerted in 5°month strata with dominant billfish species (weight)

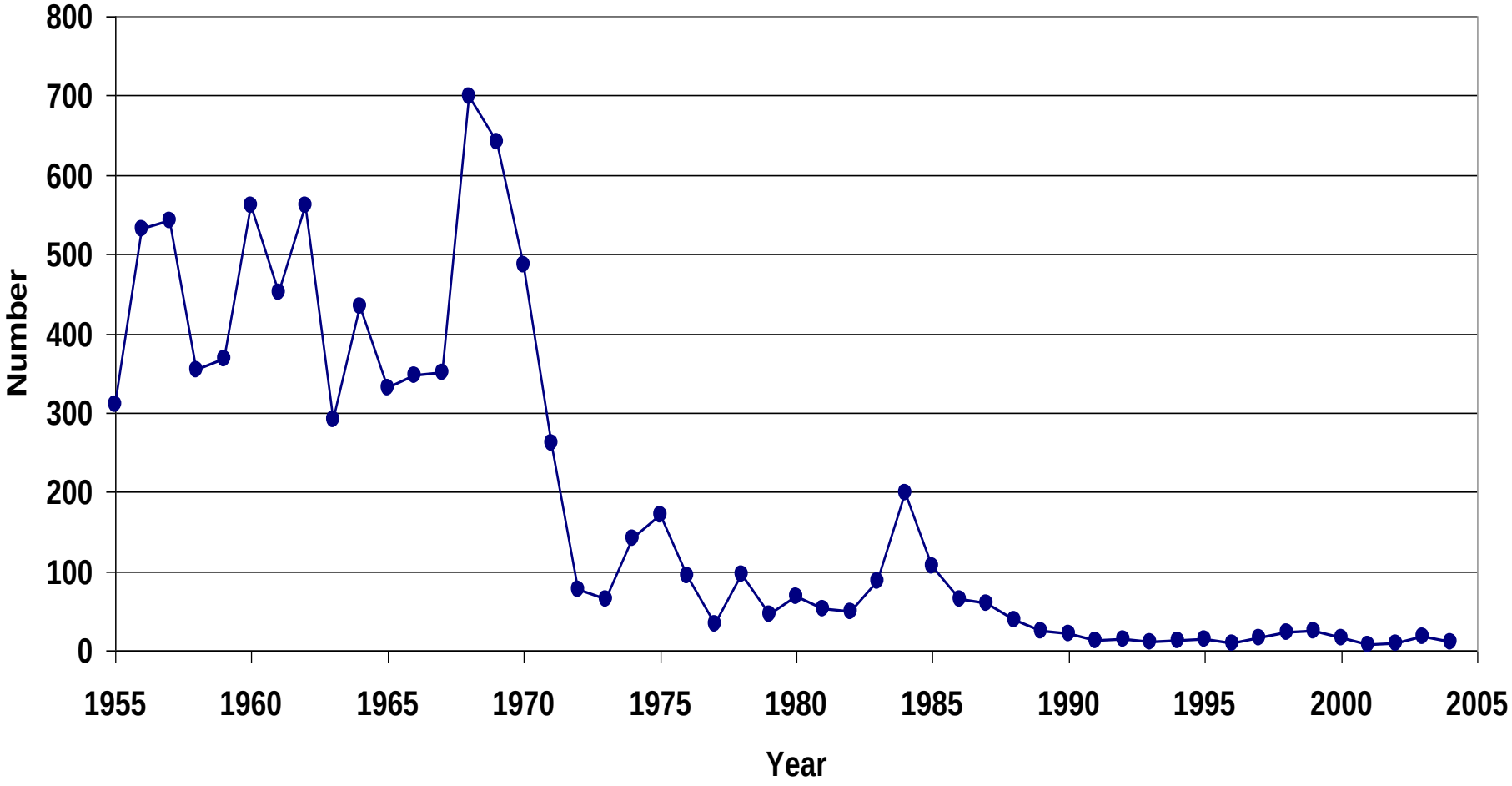




3 BEST CPUE indicator


Striped Marlin Average 3 best catches /5°-Month
3 best catches in Nb
1600
1400
1200
1000
800
600
400
200
0
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Year
3 BEST CPUE indicator

Average 3 best BLM catches /LL Japan /5°-Month



Conclusion based on indicators

1) All species of marlins (BUM,MLS & BLM) show to variable degrees major declines in their apparent abundances as they can be evaluated from LL data and shown by the 3 present indicators.
2) These declines of apparent abundance are + or les important as a function of fishing zones: slow but major declines observed in some areas (NW Australia)
3) It is impossible to firmly conclude how much these declining trends in the LL fisheries correspond to decline in stock biomasses of the marlins
4) These declines are probably due to a combination of factors: decline in billfish catchability (deep LL? Myers syndrome: excessive declines of the early CPUEs?) and declines of biomass
5) These declines have been observed at a much slower rate than for tunas, and during the 1952-1975 period during which traditionnal LL were constantly in use.
6) Active further research is needed to evaluate if these CPUE declines, that appears to be critical in various hot spots of these billfishes, should leed to management actions by the IOTC

Conclusion

- **More caution** should be given by the IOTC SC on the trends and status of these Billfishes stocks: BUM, BLM, MLS
- Even without an in depth stock assessment, their **slow apparent declines are major ones**
- Other catch/CPUE data, for instance from **sport and artisanal** fisheries, should be necessary to evaluate if the trend of these indicators may correspond or not, to trends in stock biomass
- In a **legitimate precautionary approach**, more research and potential management actions could well be envisaged/recommended by IOTC