

Preliminary Analysis on Effect of Changes in Fishing Pattern on CPUE

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Abstract Effect of changes in fishing pattern on CPUE was briefly examined. Using CE data for CPUE index, a partial data set was extracted under some condition assuming certain change in fishing pattern, and then CPUE trend (for age 4 and 4+) calculated from this extracted data set was compared with that computed from the original full data set. When data are reduced and/or changed, although overall global CPUE trend can be roughly detected, values and slope of CPUE may differ in detail. In implementing finally selected MP and setting up meta-rules, it is important to examine and to understand influence of such variability and bias of CPUE on performance of the selected MP.

要旨 漁業パターン変化による CPUE への影響を簡単に調べた。CPUE 指数のための CE データを使用し、ある漁獲パターンの変化を仮定した条件でデータを抽出し、抽出データから計算された CPUE トレンド（4 歳魚と 4+歳魚）と元のフルセットデータから計算された CPUE トレンドを比較した。データ量が減ると、全体的な CPUE トレンドは大体は捉えられるが、細かく見ると CPUE の値やトレンドにはずれが生じる。最終的に選択された MP の実施やメタルールを設定する際には、このような CPUE のバラツキやバイアスの MP パフォーマンスへの影響を調べ、理解することが重要である。

All candidate management rules which are considered for future management procedure (MP) of CCSBT rely on CPUE. In past scientific meetings for MP development, there were discussions concerning effect of changes in fishing pattern on CPUE, related to performance of MP and meta-rule. This document briefly reports results of preliminary analysis on effect of changes in fishing pattern on CPUE.

The method is quite simple described as follow. Using catch and effort data for CPUE index calculation, a partial data set was extracted under some condition assuming certain change in fishing pattern, and then CPUE trend (nominal, not normalized) calculated from this extracted data set was compared with that computed from the original full data set. As most of candidate MPs use CPUE for age 4 and age 4+, CPUE trends for these age classes were considered. The following three conditions were assumed to extract partial data sets:

- ① Reduce effort (all area and month) proportionally to current efforts distribution,
- ② Reduce effort to certain area only, and
- ③ Reduce effort to certain month only

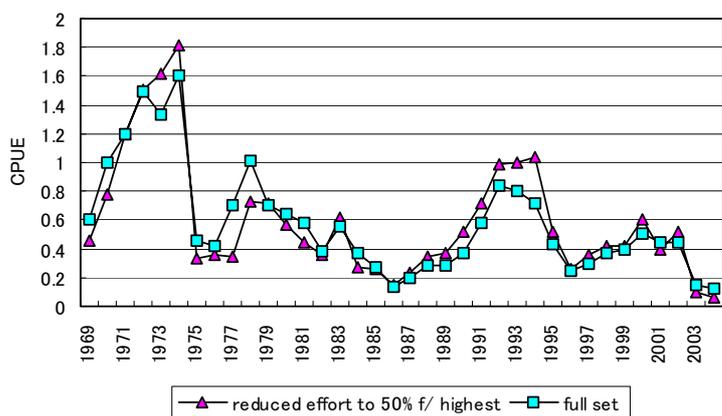
Results were summarized in bullets and shown in figures.

① Reduce effort (all area and month) proportionally to current efforts distribution

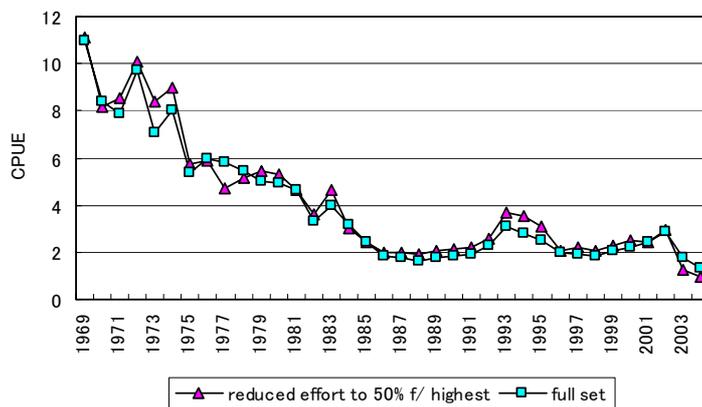
- Removal of efforts tends to exaggerate high and low CPUEs and extent of fluctuation. This tendency is more distinctive for age 4 than for age 4+.
- Global trend is roughly reserved for all cases, especially in the case of 50% reduction for age 4+.
- Clearly larger reduction of effort causes larger difference in CPUE trend, particularly for age 4 CPUE.
- When stock level is low, CPUE tends to be underestimated, especially for CPUE trend in the 2001-2004 period.

Reduce effort to 50%

age 4

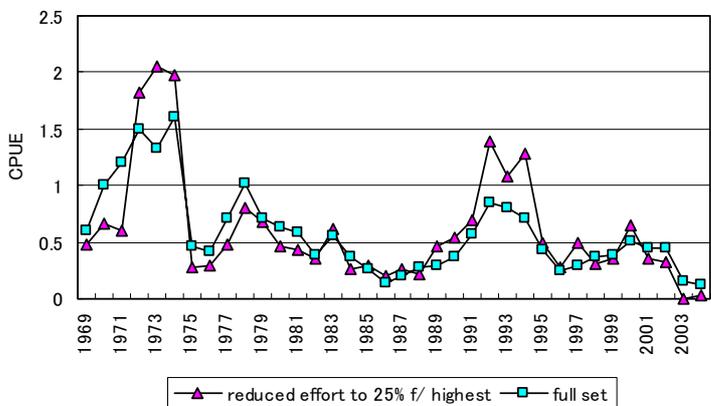


age 4+

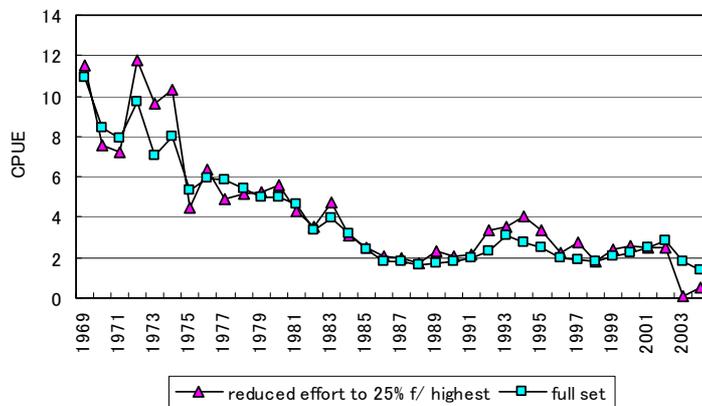


Reduce effort to 25%

age 4



age 4+

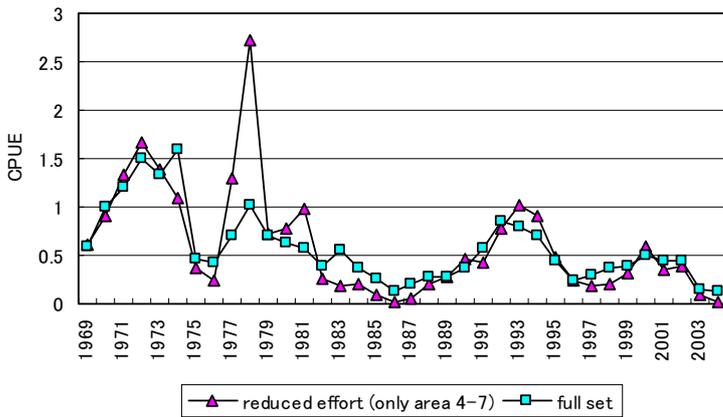


② Reduce effort to certain area only

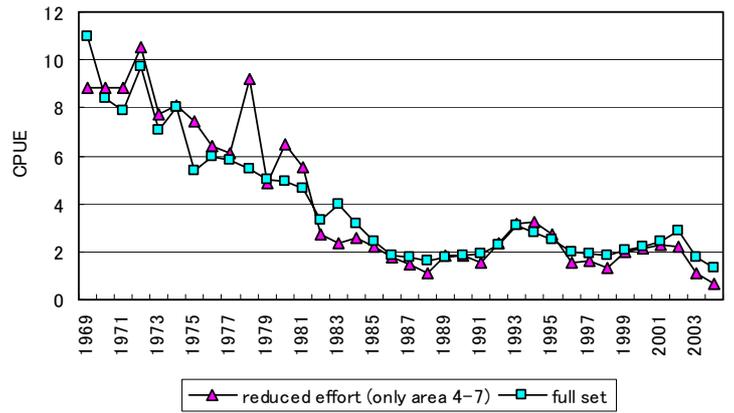
- Impacts of effort reduction is more distinctive for age 4 than for age 4+. Absolute value and slope of CPUE can be either underestimated or overestimated.
- When CPUE data available only from area 8, overall picture of CPUE trends is substantially changed both for age 4 and age 4+. In other cases, particularly in the cases of age 4+ of area 4-7 and area 9, global trend can be roughly reserved for all cases.
- Impacts are smaller from the area 9, area 4-7, area 8 in order (cf. corresponding amounts of effort are 30-60%、20-50%、5-25%, respectively)
- When specifically focusing on the 2004-2004 period, there found to be a tendency that CPUE was underestimated in the area 4-7 case, while CPUE was overestimated in the area 8 and 9 cases.

Area 4-7 only

age 4

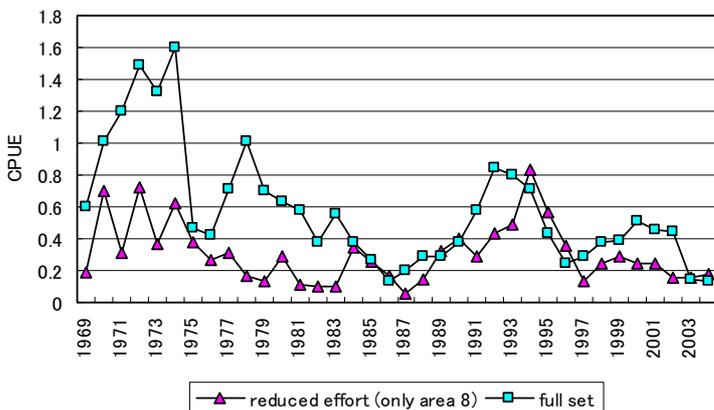


age 4+

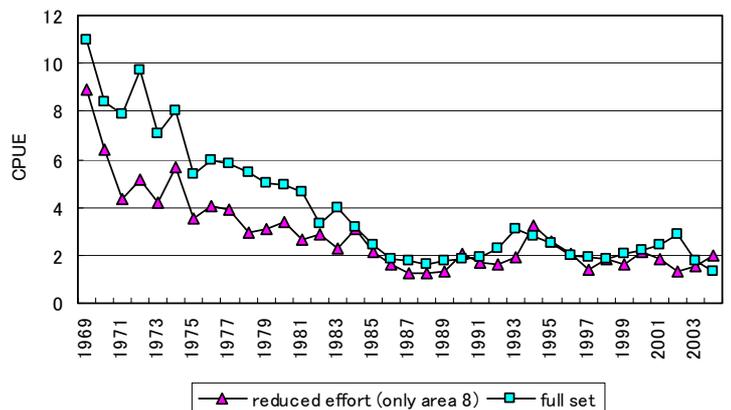


Area 8 only

age 4

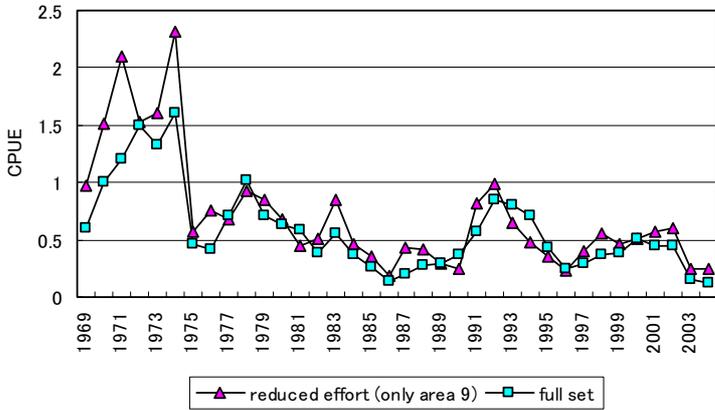


age 4+

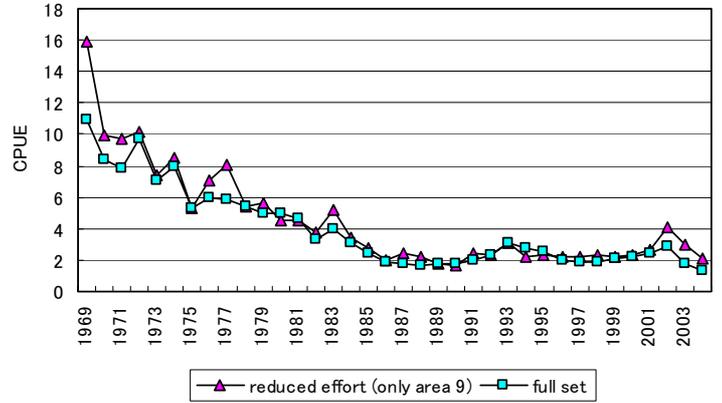


Area 9 only

age 4



age 4+

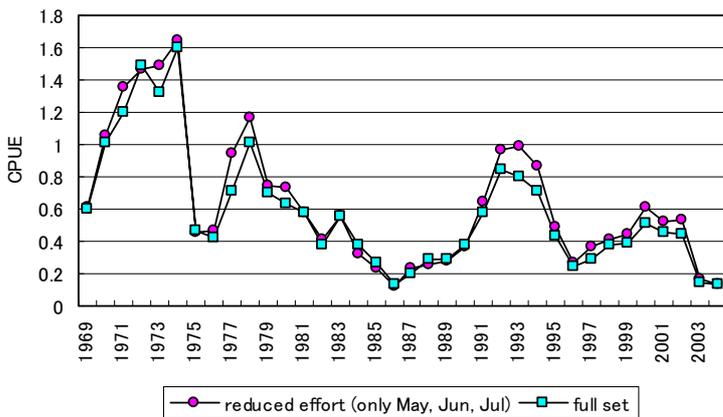


③ Reduce effort to certain month only

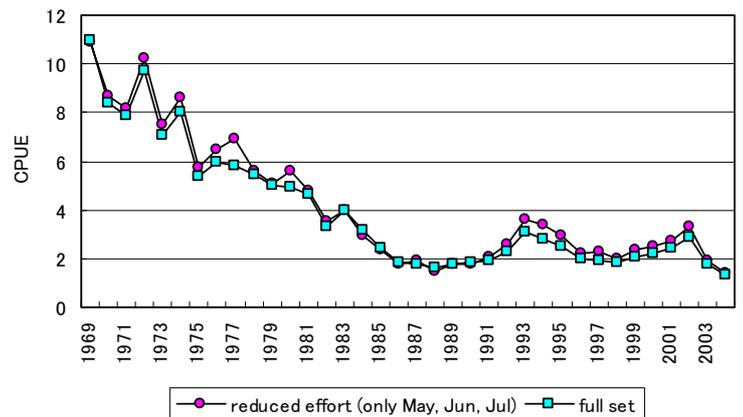
- Although there are some differences, overall trend is very similar. (cf. corresponding amount of effort is 50-80%, covering area 4-7 and 9)
- Difference observed in trend is still larger for age 4 than for age 4+.

May-July only

age 4



age 4+



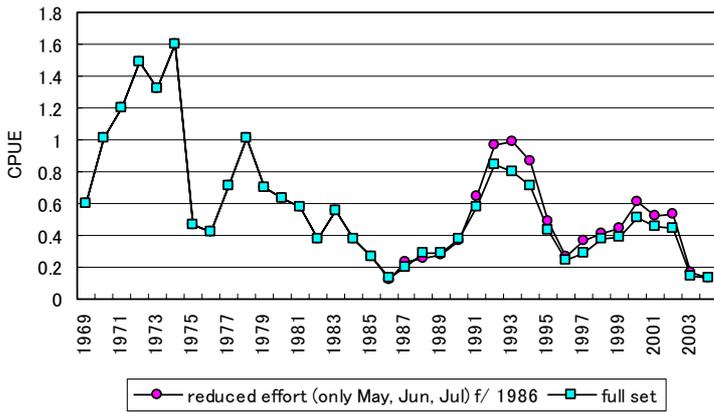
④ Data change sometime in CPUE series (issue of data consistency)

- Situation of what if availability of C/E data changes sometime in CPUE series was examined. The original full data set was used for the period 1969-1985, the reduced data sets (May-July only case and area 8 only case described above were considered) were used for the 1986-2004 period.
- Although differences due to data change remain, CPUE series can be linked normalizing values to its mean.

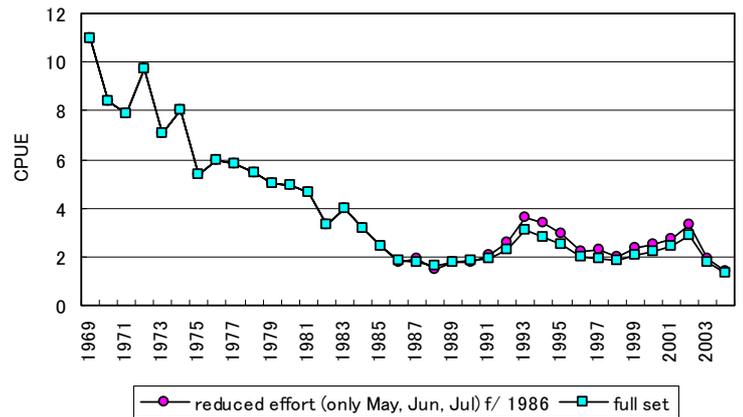
May-July only case

(not normalized)

age 4

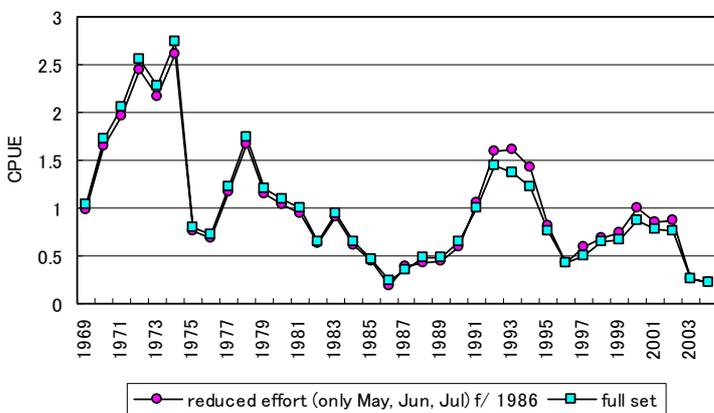


age 4+

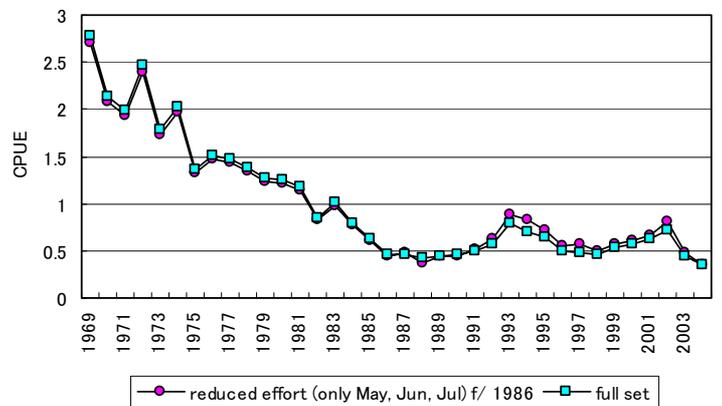


(normalized)

age 4



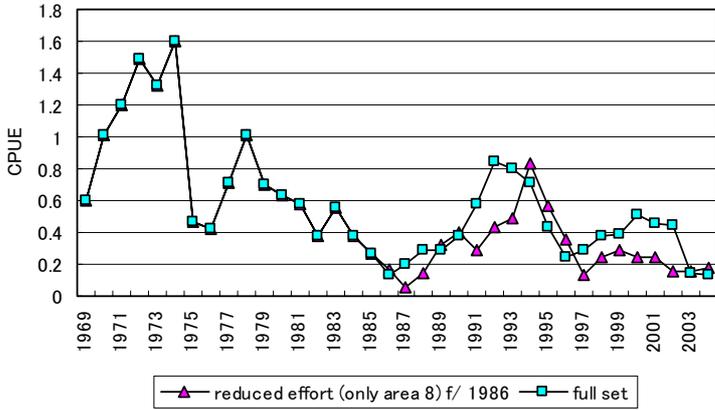
age 4+



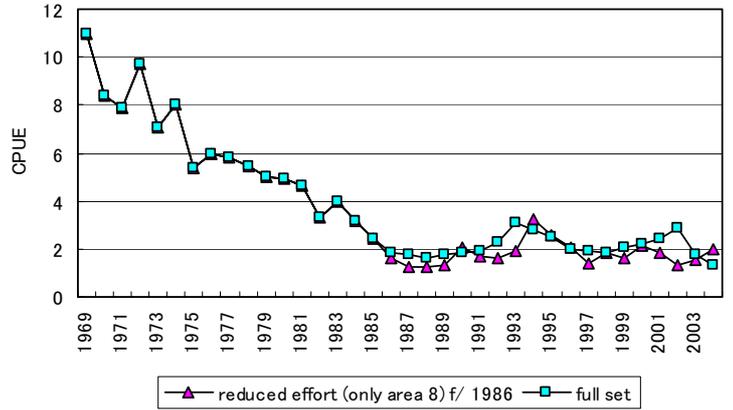
Area 8 only case

(not normalized)

age 4

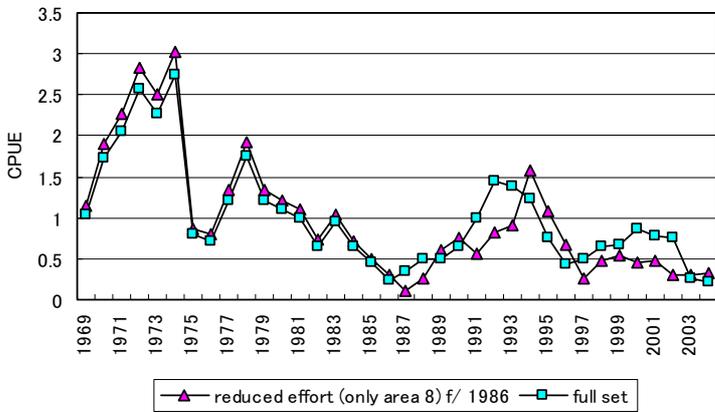


age 4+

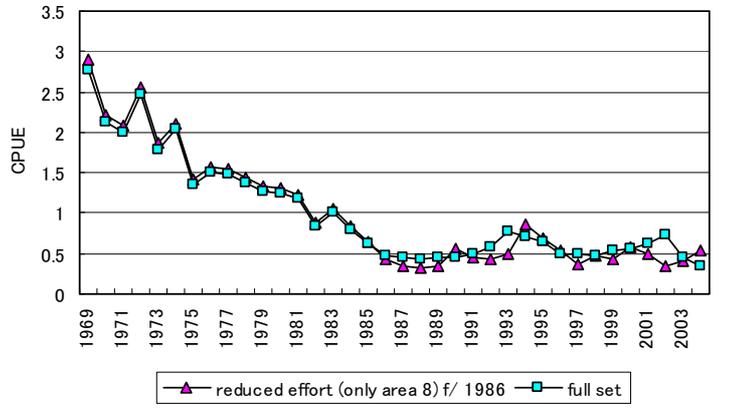


(normalized)

age 4



age 4+



Findings

- It had better that area 9 and area 4-7 (or May-July) are covered as possible.
- Dynamics of CPUE trend can be roughly detected even when using data from area 9 only. However, difference in CPUE trend may possibly become larger if further reduction of effort occurs in area 9 by some reason.
- It is yet unknown how differences examined in this document (although these differences appear to be “more or less” in graphs) influence performance of candidate MPs. For effect of variability and bias in CPUE value and trend on MP performance has not been examined at all. Especially CPUE for age 4 which most of candidate MPs rely on for recruitment information tends to be sensitive to efforts reduction and effort distribution. Caution must be needed in such a case. (For recent years when there is possibility of low recruitment, it is concerned that there are differences in CPUE trend for age 4 depending upon data extract condition)
- When data are reduced and/or changed (i.e., effort is reduced, fishing pattern changes), although overall global CPUE trend can be roughly reserved, values and slope of CPUE may differ in detail. Issue of change in CPUE due to change in fishing pattern ultimately results in issue of how candidate MPs are robust to such variability and bias of CPUE. In implementing finally selected MP and setting up meta-rules, it is important to examine carefully and to understand influence of such variability and bias of CPUE on performance of the selected MP.