

ISSUES TO BE CONSIDERED FOR FURTHER DEVELOPMENT OF MP

K.Hiramatsu, H.Kurota, H.Shono, N.Takahashi, S.Tsuji
(alphabetical order)

National Research Institute of Far Seas Fisheries

Abstract Some issues to be considered for further development of MP are raised. These are: 1) some of 43 scenarios currently proposed can be eliminated by using principal component analysis; 2) it should be avoided to focus heavily on results of MP tests for scenarios with low plausibility in developing MP; 3) uncontrolled catch, bias of CPUE, and a drastic drop of recruitment due to regime shift are possible other scenarios concerned; 4) plausibility of scenarios should be determined based on conditioning with updated data including 2001-2003 data; 5) relaxing too severe robustness criteria needs to be considered; 6) to check MP performance with 50 years deterministic projection for MP passed through the first selection is proposed; 7) to direct what MP is desired to develop, management objectives agreed by the Commission are absolutely needed.

要旨 これからの MP 開発の留意点をまとめた。1) 現在提案されている 43 個のシナリオは主成分分析によって少なくできる; 2) 妥当性の低いシナリオを過度に注視すべきではない; 3) 規制外漁獲、CPUE のバイアス、レジームシフトによる劇的な加入量の減少のシナリオは考慮する; 4) シナリオの妥当性は 2001-2003 年のデータを加えて得た結果で判断すべきである; 5) 過度に厳しいロバストネス基準は緩めることを考える必要がある; 6) 第一段階で選ばれた MP については、決定論的な 50 年のシミュレーション結果もチェックする; 7) どのような MP を開発するか方向づけるために、本委員会からの管理目標の提示が絶対必要である。

Through processes of test trials for various candidate MP, we noticed some issues to be raised concerning OM scenarios and its plausibility, time horizon of MP trials, and management objectives. The purpose of this short paper is to table those issues to be considered for further development of MP.

Need all OM Scenarios?

There are 43 OM scenarios currently proposed in all for reference and robustness tests of MP. These scenarios were agreed at the MPWS2 to examine a wide range of uncertainties in the second stage of MP trials. There seems to be room left to consider these scenarios before deciding a final set. It may be awkward to deal with 43 OM scenarios at the same time in MP evaluation. If some scenarios can be eliminated, then it will be easier to deal with the remainders. One possible approach to determine scenarios to be deleted is to eliminate

scenarios in which MP performances are similar to one in other scenarios.

In course of testing various candidate MPs, we found that MP performances in some scenarios are similar to one another. In order to see whether this approach is applicable, similarity of the MP performance between scenarios were quantitatively examined by principal component analysis (PCA). PCA is an effective method to simplify and summarize complicated phenomena by synthesizing many variables. Ten agreed performance statistics (except for 20-year average of surface catch) were defined as variables, and each scenario was regarded as a sample in PCA we conducted. PCA was done for each MP separately and for hierarchy 1 only. Results are graphically shown in Fig. 1-4, which correspond to MP “HK1-dfl”, “NTlg1”, “STlv1.1”, and “HK5-hyb”, respectively. First and second principal components (PCs) mostly reflect data. Cumulative contribution ratios of the first and second PCs ranged between 78.6% and 84.0%.

Figures show that reference cases widely scattered within the second, third, and fourth quadrants of 2-dimensional PC space (Fig. 1-4). Most robustness cases fall within the space which is covered by the reference scenarios, indicating that MP performances of robustness tests can be represented by the reference cases. There are a few exception, however. Most of “omega” and “Mo5” scenarios fall within the first quadrant which the reference cases do not cover. It suggests that “omega” and “Mo5” scenarios differ substantially from the references. Figures also indicate that MP performances for “Q0” and “Q1” scenarios of the references are very similar. Thus, our analyses by PCA of scenarios in terms of MP performance suggest that the reference cases with “Q0” and robustness cases with “omega” and “Mo5” are our choices, and the remainders can be represented by those scenarios.

PCA can be separately conducted for only one MP at a time. Thus, results are dependent on MP, although our results of conducting PCA on various MP do not show large differences in scatter patterns of scenarios in the PC space (Fig. 1-4).

Scenarios with Low Plausibility

For example, a series of “H30” OM scenarios seems to be unrealistic. For MSYs for these scenarios are all less than 12000 tons. It was agreed that current catch of 15386 tons approximately corresponded to sustainable yield because stock status appeared to be stable for the recent 10 years. It may be appropriate that plausibility of these scenarios is considered low. It should be avoided to focus heavily on results of MP tests for scenarios with low plausibility in developing MP.

Weighting Scenarios

How to assign weights between OM scenarios has not been resolved yet. Although it should not be stated that better model fit means being closer to truth, weight assignment based on likelihood from conditioning results is one possibility to apply. A MCMC approach (hierarchy 4) can also integrate across reference scenarios.

Need Other Scenarios?

A wide range of uncertainties has already been covered by proposed scenarios. There still remains other uncertainties to be considered. Among those uncertainties, uncontrolled catch, reliability of CPUE (especially bias), and a drastic drop of recruitment possibly due to regime shift may be important in MP trials. It should be discussed whether MP tests need to be conducted under scenarios that consider those uncertainties.

Fisheries closely relates to trends in economics, and thus its future is unpredictable in some sense. Uncertainties associated with such changes in human activities may be an involvement of new country that starts SBT fisheries, or collapse of some fisheries. It also needs to be discussed possibilities of which these events would happen in the future and whether scenarios that describe such events should be proposed for MP testing.

Plausibility based on Update Data in 2004

Currently a series of OM conditionings was done using data up to 2000. In 2004 when final decision of MP is made, however, data from 2001 to 2003 will be added. Plausibility of scenarios should be determined based on conditioning with these additional data.

Robustness Criteria

There may be a situation in which although some OM scenarios represent rare events (i. e., plausibility is low), there is a risk to be concerned and those scenarios must be considered to examine how candidate MPs perform. A scenario of a drastic drop of recruitment explained above is one example. In many cases, MPs would show poor performances for such scenarios, and could fail to pass tests if strict robustness criteria are applied. Some of the current robustness criteria proposed, especially one relating to stock recovery, seem to be too severe. Robustness criteria including relaxing the current ones proposed need to be discussed further to leave room for evaluating a large variety candidate MPs. It should be avoided to reject all MPs which perform poorly for worst but low plausible scenarios by applying severe robustness criteria. Concern is a balance between a range of uncertainties

(to what extent low plausible scenarios of worst cases are considered) and required severity of robustness criteria.

Time Horizon for MP Trials of 20 Years vs 50 Years

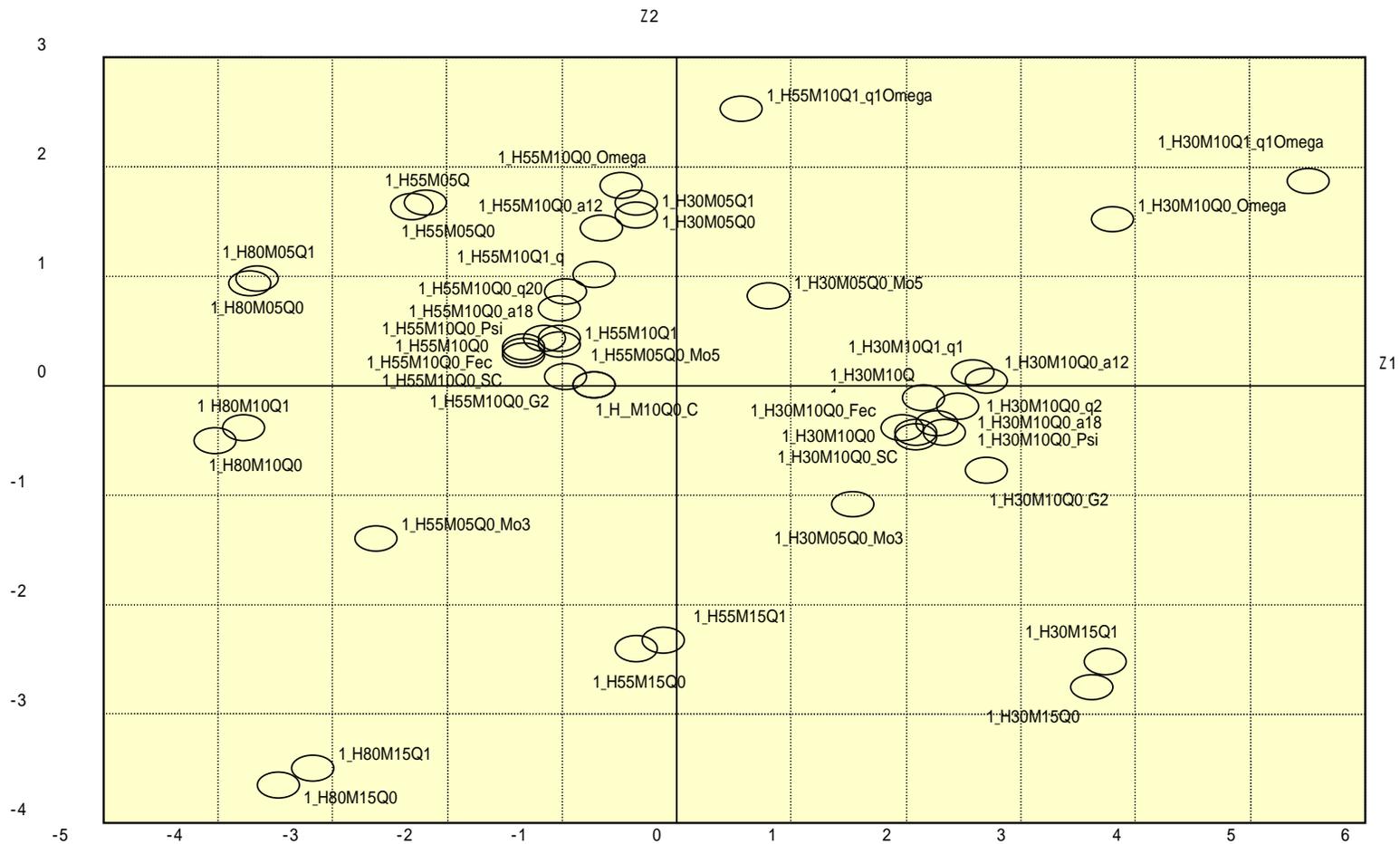
Fig. 5 shows one example showing perfectly reasonable performance during 20 years projection but showing drastic depletion afterwards. Twenty years is long time from fishery management prospect, but it also should be noted that period is shorter than even one generation of SBT. In order to prevent unexpected surprise, we propose to check with 50 years deterministic projection for MP passed through the first selection.

Management Objectives

Conservation of stock, stability of fishery, and optimizing (maximizing) catch are identified at the MPWS1 as possible management objectives. The Commission of CCSBT has not determined management objective(s) for developing MP and priority between objectives. Even when using one MP, either MP of risk-averse or risk-prone can be developed only by adjusting parameters for the MP (structurally the same). To direct what MP is desired to develop, management objectives agreed by the Commission are absolutely needed.

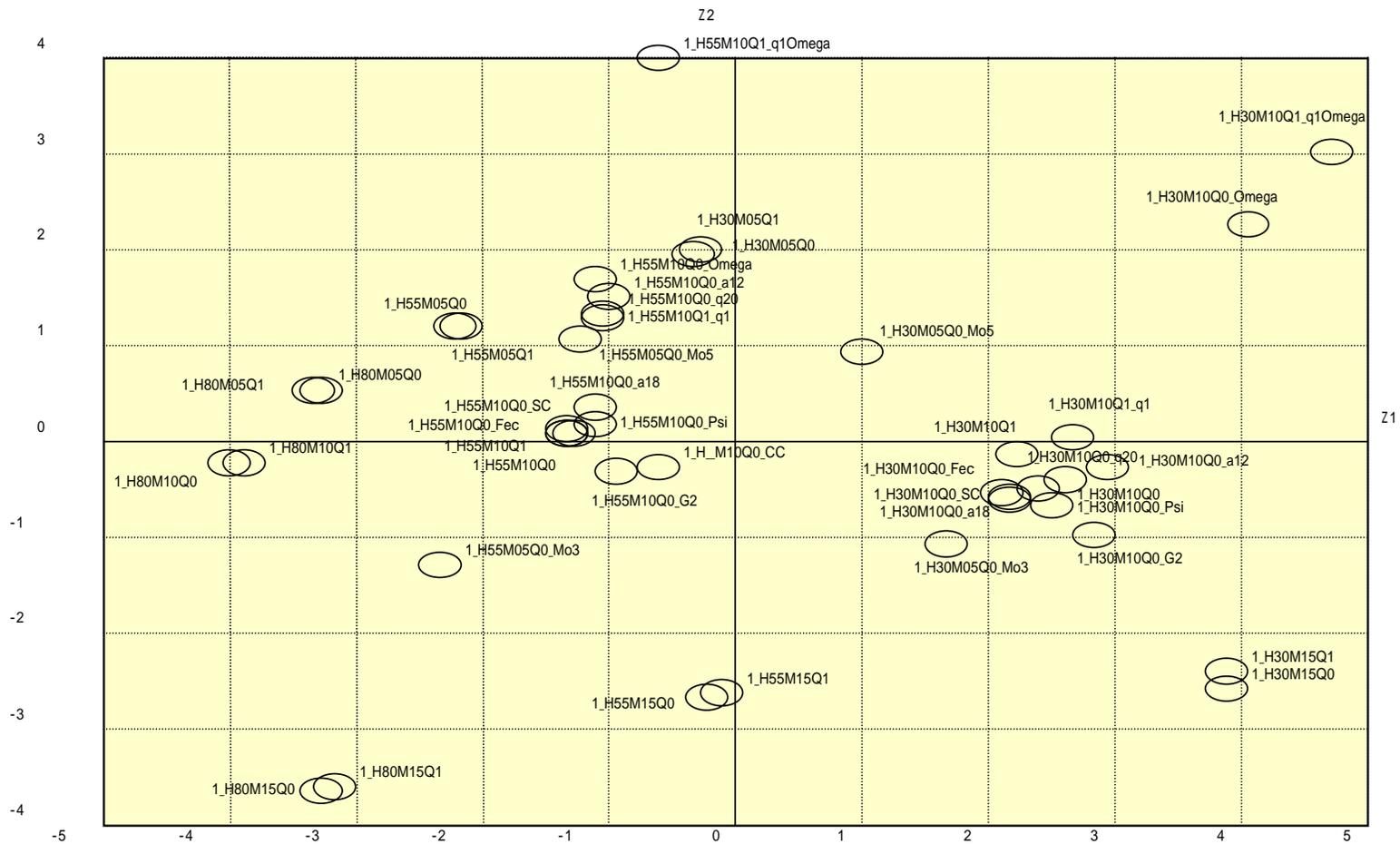
Presentation of Results of MP Trials

It is often difficult to evaluate candidate MPs by examining proposed performance statistics only because these statistics can hardly detect all aspects of MP performance. We would like to strongly encourage national scientists to show TAC and stock biomass trajectories in presentations of test results as it was agreed in the 2003 3rd SAG meeting.



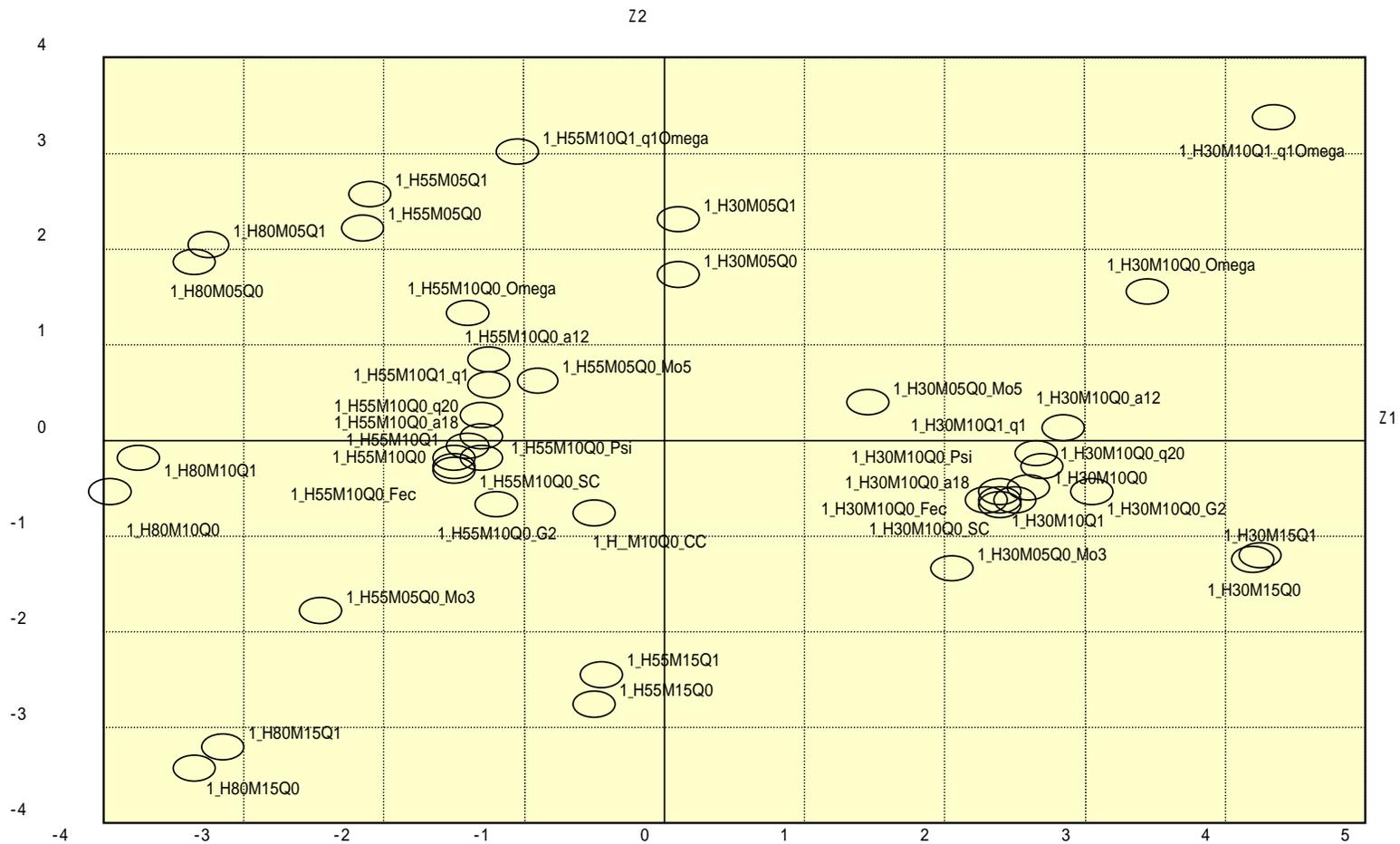
Z1とZ2のスコア散布図

Fig. 1. Result of PCA for MP “HK1-dfl.” Z1 and z2 are first and second principal axes, respectively.



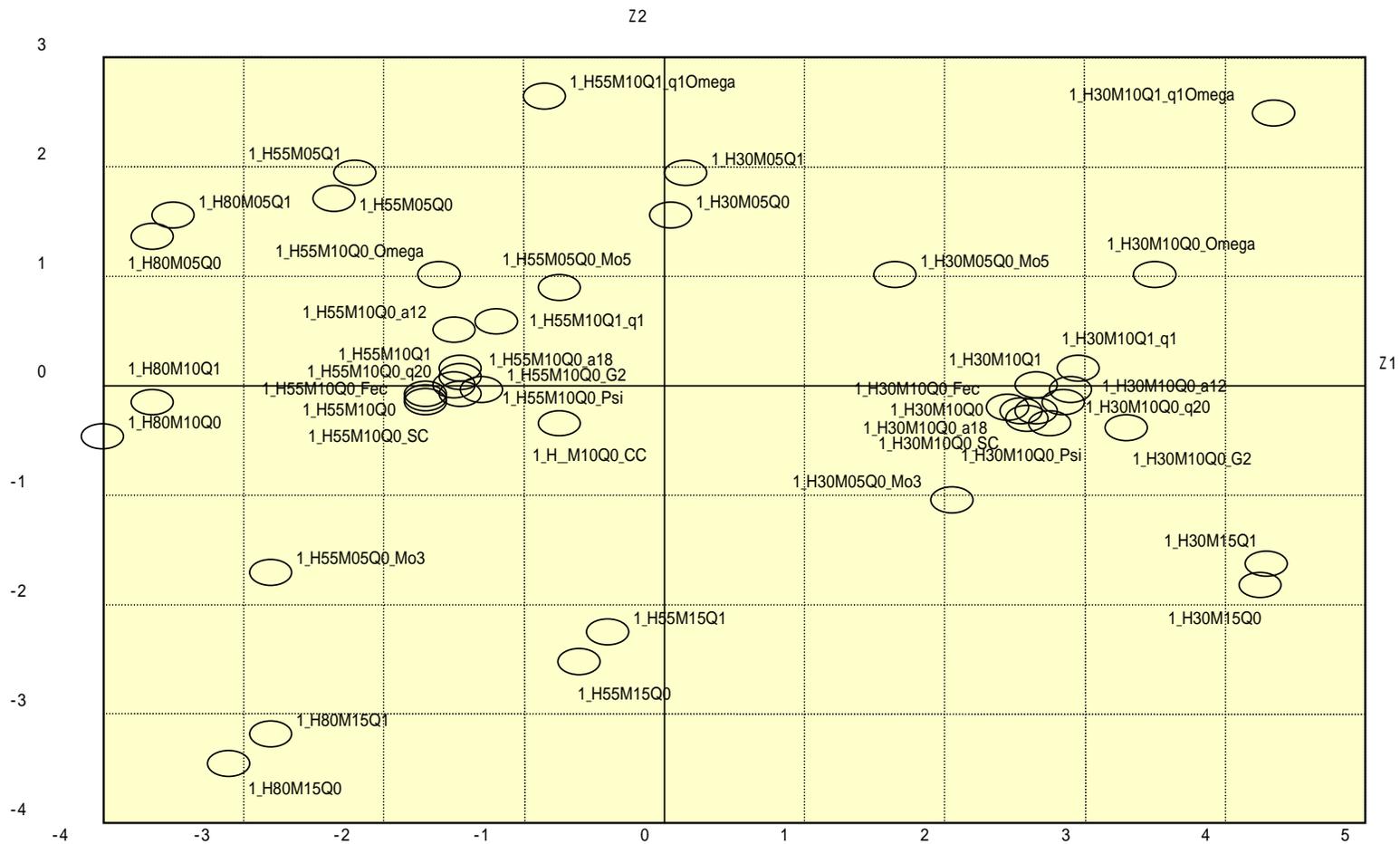
Z1とZ2のスコア散布図

Fig. 2. Result of PCA for MP "NTlg1." Z1 and z2 are first and second principal axes, respectively.



Z1とZ2のスコア散布図

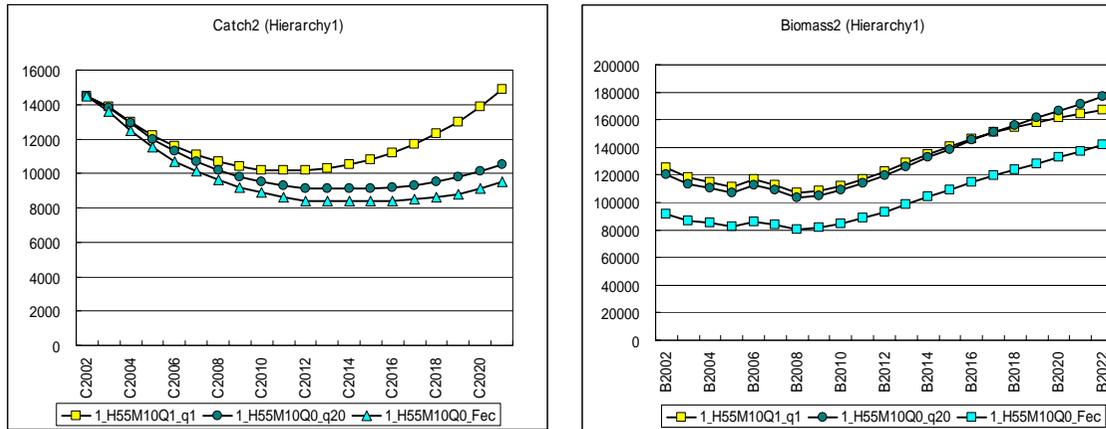
Fig. 3. Result of PCA for MP “STlv1.1.” Z1 and z2 are first and second principal axes, respectively.



Z1とZ2のスコア散布図

Fig. 4. Result of PCA for MP “HK5-hyb.” Z1 and z2 are first and second principal axes, respectively.

(a) 20 years



(b) 50 years

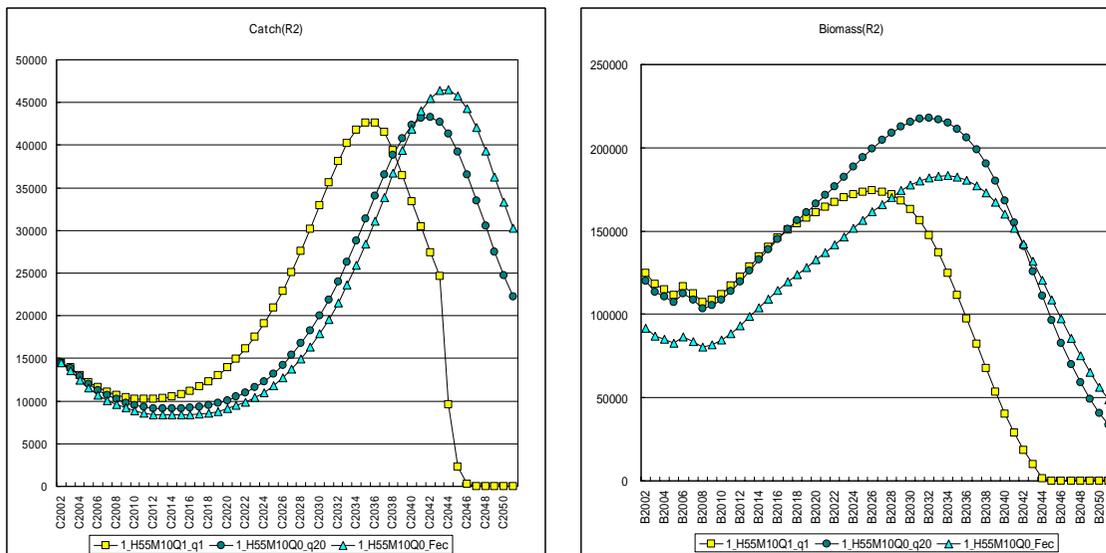


Fig. 5. Examples of catch and stock biomass dynamics for 20 and 50 years of hierarchy 1 MP trials.