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Morphological Variation in the Common Mackerel (*Scomber japonicus*) off Taiwan

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ABSTRACT

Variation in morphological characters was used to elucidate the stock structure of *Scomber japonicus* off Taiwan. Three samples including 139 individuals were collected from the south of the East China Sea (SECS), the waters off eastern Taiwan (ET), and the north of the South China Sea (NSCS). A total of 16 measurements were measured for each individual and size-standardized by multiple-group principal components analysis. The resulting measurements were tested with a canonical variate analysis, and clustered three samples into two groups: one included the SECS and ET samples, and the other the NSCS. Randomization tests showed that morphological difference between two groups was significant. There appear to be two morphologically distinguishable stocks of this species off Taiwan, but further verification of the stock structure may be essential.

***Key words**: Scomber japonicus, Morphological variation, Size correction, Stock structure.*

INTRODUCTION

Concrete knowledge of the stock structure of exploited species is essential for proper assessment and management of fish stocks. Several approaches have been adopted to examine the stock structure of marine organisms, including the studies of the distribution and abundance of life-history stages, marks and tags, morphological characters, allozyme, and DNA markers. From all stock discrimination techniques available, the analysis of morphological measurements is one of the most commonly used methods (Cadrin, 2000).

Morphological variation between stocks can provide a basis for stock structure, and may be more applicable for studying short-term, environmentally induced variation (Begg *et al*., 1999). For phenotypic characters, a multivariate analysis has a greater chance of detecting complex changes than univariate methods (Zelditch *et al*., 1992) and the use of the box-truss distance has resulted in more accurate classification of individuals than traditional methods (Strauss and Bookstein, 1982). However, most of the morphological variability in a set of multivariate characters is due to the specimen size (Junquera and Perez-Gandaras, 1993), and a size correction procedure such as multiple-group principal components analysis (MGPCA) (Thorpe, 1988) or the related method, Bumaby's size-adjusted discriminant analysis is required to avoid misinterpretation of the results (Cadrin, 2000).

The common mackerel (*Scomber japonicus*) is a pelagic species that is found in temperate and subtropical waters of the Atlantic, Indian and Pacific Oceans. Near East Asia, the common mackerel is mainly distributed in the Japan Sea, East China Sea, and adjacent waters of Taiwan (Tzeng, 1988; Hiyama *et al*., 2002). Four countries (Japan, Korea, China and Taiwan) exploit

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