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Considerations on stock structure of minke whales in western North Pacific

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ABSTRACT

Based on the stock structure of western North Atlantic humpback whales, Taylor *et al.* (2001) proposed that aggregations of whales in different feeding grounds that share a same breeding ground can be treated as different stocks. Our concern is, however, that the stock concept of Taylor *et al.* (2001) is generalized for all other baleen whales and people think that limited data, such as only from feeding grounds, are enough to define stocks. In this document, we emphasize that patterns of stock structure can differ between species and, in order to define stocks, we should gather as many information as possible form both breeding and feeding grounds of the species studied.

Definition and concept of stocks has been a matter of discussion in the International Whaling Commission/Scientific Committee (IWC/SC). During the last year's IWC/SC annual meeting, Taylor *et al.* (2001) proposed that groups (aggregations as their word) of whales inhabiting different feeding grounds, while sharing a same breeding ground, should be treated as different stocks in order to maintain both evolutionary potential and ecological function. We agree with them as long as available biological data strongly support the existence of genetically and ecologically distinct groups of whales in different feeding grounds even though they share the same breeding ground. In this case, we should be able to demonstrate pre- or post-zygotic isolation mechanism (s), as well as strong site fidelity to feeding grounds, that allow them to keep their differentiation within the same breeding ground, i.e., reproductive isolation.

Taylor *et al.* (2001) base their proposal on the stock structure of western North Atlantic humpback whales. In western North Atlantic, humpback whales utilize a single breeding and calving ground in West Indies but several different feeding grounds, such as Gulf of Maine, Gulf of St. Lawrence, and Newfoundland. Recent mitochondrial (mt) DNA analysis (Palsbøll *et al.*, 2001) indeed detected the evidence of genetic differences among the samples of humpback whales collected from feeding grounds, although the differences were slight and nuclear DNA analysis (microsatellites) did not detected such genetic differences. The genetic studies therefore suggest site fidelity of females to feeding grounds. This site fidelity of humpback whales to feeding grounds can be built up within the groups because calves of the year are known to learn their routes to feeding grounds through migration with their mother (Clapham and Mayo 1987). The site fidelity is further supported by photo identification studies that have shown that individual humpback whales returned to the same feeding grounds every year (Clapham and Mayo 1987). Their utilization of different feeding grounds then could result in segregation spatially and temporally in the breeding ground. Although it is still unclear the negative effect to the persistence of humpback whales by ignoring male dispersal on management practice, humpback whales inhabiting different feeding grounds in western North Atlantic could be treated as they came from genetically different groups (maternal line) of whales.

Our concern is, however, that the stock concept of Taylor *et al.* (2001) is generalized for all other baleen whales that are quite different from each other in life histories and behaviors (see IWC, 2000, 2001, 2002). We are also afraid that people take this proposal as that limited data, such as only from feeding grounds or migration corridors, are applicable for defining stocks. We have been studying stock structure and biology of minke whales in western North Pacific (reviewed by Pastene *et al.*, 1999), and believe that such limited data are not enough to define stocks of minke whales.

Strong bonding between mothers and calves is important for humpback whales to build up their site fidelity to feeding grounds. Humpback calves complete a round-trip migration from breeding to feeding grounds before the separation from their mothers. This is not the case for minke whales. Even though Japanese research whaling in the western North Pacific has been conducted since 1994, we have never seen the mother and calf pairs of minke whales in the study area (out of 1287 sightings) compared to eight of humpback whales (out of 122 sightings) (K. Matsuoka, pers. comm.). Same pattern of minke whales' migration behavior has been observed in Antarctic (K. Matsuoka, pers. comm.). This fact indicates that minke whales do not acquire the site fidelity to feeding grounds through migration with mothers as does humpback whales. This is further supported by other observations. Pregnancy cycle of minke whales is once per year, while that of humpback whales are once every two years. The lactation period in minke whales is only four months and the weaning occurs before their attaining feeding grounds (Dorsey *et al.*, 1990; Martin *et al.*, 1990). Hatanaka and Miyashita (1997) reported that minke whales segregate temporally and spatially by sex and maturity during their migration to feeding ground. Final destination of immature individuals and mature females are also different in the feeding ground as mature females go further north in Okhotsk Sea than immature whales. These observations thus indicate that minke whale calves cannot be learning locations of the feeding grounds from their mothers.

Genetic and ecological studies all strongly support the existence of two distinct stocks in the study area: one inhabiting Sea of Japan (J Stock) and the other North Pacific (O Stock). Genetic heterogeneity between the J and O Stocks was detected from both mtDNA and nDNA (allozymes and microsatellites) analyses. Difference in conception dates also clearly indicates reproductive isolation between the two stocks (Kato, 1992). Although the two stocks share a same feeding ground in Okhotsk Sea, the apparent heterogeneity could be accumulated through reproductive isolation by using different breeding grounds.

Existence of another stock in central North Pacific (i.e., putative W Stock) has been proposed. Only supporting data for the putative W Stock, however, is a weak heterogeneity we detected in samples from the small portion of SA9 using mtDNA analysis in some, but not all, collection years. Neither nDNA (allozymes and microsatellites) nor biological parameters, such as conception date and body length, have shown the evidence of the W stock. Considering the differences detected between the J and O Stocks, we reasonably predict that similar level of differentiation should exist between the O and putative W stocks if the putative W stock occupies substantial portion in the research area. Because our samples were collected only from their migration corridor and feeding ground, therefore, our observations could indicate either that we indeed collected samples from the O stock but samplings might have been done inadequately (e.g., sampling bias), or that we collected members of the putative W stock that occasionally enter the O stock area (i.e., we collected some of our samples from their contact zone). It is just too early to either deny or accept the existence of putative W stock in central North Pacific from the available limited data.

We agree that long-term persistence of the species depends on maintenance of the full range of the species as Taylor *et al.* (2001). Patterns of stock structure, however, can differ within as well as between species. Western North Pacific minke whales stocks from different breeding grounds utilize a same feeding ground, while North

Atlantic humpback whales stocks from different feeding grounds share a same breeding ground. Likewise, contrast to North Atlantic humpback whales, Antarctic and North Pacific humpback whales stocks tend to use different breeding and feeding grounds from each other (Pastene and Baker, 1997; Baker and Palumbi, 1997). Defining stocks should be species by species approach, and the key is to spend our all effort to gain understandings of genetics, biology, and ecology of the cetacean species in both breeding and feeding grounds.

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