

Variation in the Karyotype, Cytochrome *b* Gene, and 5S rDNA of Four *Thunnus* (Perciformes, Scombridae) Tunas

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Yan-Horn Lee, Tsair-Bor Yen, Chiu-Fen Chen, and Mei-Chen Tseng (2018) *Thunnus* tunas in Scombridae are divided into the temperate subgenus *Thunnus* (bluefin group) and tropical subgenus *Neothunnus* (yellowfin group) species based on anatomic traits and distributions. The main purpose of this study was to examine the systematic status of *T. obesus* based on karyotype, cytochrome (Cyt) *b* gene, and 5S ribosomal DNA sequences. All *T. obesus*, *T. albacares*, *T. alalunga*, and *T. orientalis* specimens were caught in southeastern coastal waters off the main island of Taiwan. The karyotypical formula of *T. obesus* was 2 m + 2 st + 44 t, that of *T. albacares* was 2 m + 2 sm + 2 st + 42 t, that of *T. alalunga* was 2 m + 2 sm + 2 st + 42 t, and that of *T. orientalis* was 2 m + 2 sm + 44 t (m: metacentric; sm: submetacentric; st: subtelocentric; t: telocentric chromosome). According to a molecular genetics analysis for these species using Cyt *b* gene sequences (1141 bp), interspecific genetic distances ranged from 0.004 (*T. orientalis* vs. *T. alalunga*) to 0.038 (*T. alalunga* vs. *T. obesus*). The genealogy tree exhibited these 4 species as being categorized into 4 monophyletic groups with high bootstrapping values; *T. alalunga* and *T. orientalis* are sister species. This result suggests that the species currently allocated in *Thunnus* and *Neothunnus* might need new taxonomic characters to redefine the monophyly of the two subgenera. The sequence lengths of all cloned 5S genes from the 4 species ranged from 327-342 bp. Interspecific genetic distances ranged from 0.016 (*T. orientalis* vs. *T. alalunga*) to 0.111 (*T. orientalis* vs. *T. albacares*). The phylogenetic tree based on 5S rDNA shows *T. obesus* divided into 2 groups: one similar to *T. albacares* and the other close to *T. orientalis*. These results imply that *Thunnus* tunas have a common synapomorphic character with Scombridae fish (2n = 48) and high numbers of telocentric chromosomes (42-44). *Thunnus orientalis* and *T. alalunga* are sister based on molecular data. *Thunnus obesus* may have been derived from a more-complicated speciation processes.

Key words: *Thunnus albacares*, *T. alalunga*, *T. obesus*, *T. orientalis*, synapomorphic character.

BACKGROUND

Thunnus (Perciformes, Scombridae) tunas are highly migratory fishes that are mainly distributed in tropical and temperate oceans.

Tunas are significant economic species, but are recently facing population collapse (Hutchings 2000; Fromentin and Powers 2005; MacKenzie et al. 2008). Regional tuna fishery organizations have taken management actions and set quotas

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