Fishery Acoustic Studies on Two Species Gathering of *Scomber australasicus* and *Trachurus japonicus* in the Waters off Northeastern Taiwan

Shean-Ya Yeh[1] and Jen-Ming Liu*[2]

[1.] Institute of Oceanography, National Taiwan University, Taipei 106, Taiwan

2. Department of Fishery Production and Management, National Kaohsiung Marine University, Kaohsiung 811, Taiwan

Abstract

Scomber australasicus and Trachurus japonicus are the two most abundant species in the waters off northeastern Taiwan and have been utilized by the large-scale purse seine fishery based in NanFanAo fishing port for a long time. For the purpose of sustainable usage of these resources, promptly and precisely providing information on the available biomass of the resources is urgently needed. Fisheries acoustic assessment method is often used to acquire abundance information of underwater organisms, yet mostly on single species gathering. The purpose of this paper is thus to provide acoustic means for assessing a two-species gathering. An algorithm for properly Grouping Anonymous TS (GATS) was proposed for assessing in situ acoustic information echoed from a two-species gathering. Results thus obtained were summarized as follows:

After a confirmation on a hammer-shaped appearance of two concentrations of in situ TS versus depth in an elementary distance sampling unit (EDSU), the available EDSUs of only containing S. australasicus and T. japonicus two-species gathering were 82.6% of the total 924 EDSUs.

The GATS searching algorithm can successfully provide best fit on its percentage composition of the two-species gathering providing that the TS-FL relationship for each species is given as well as a constant given standard deviation σTS, which is borrowed from the results of repetition ping on an anchored live fish. Four results of percentage composition (w1: w2) of S. australasicus (w1) versus T. japonicus (w2) obtained by using GATS searching algorithm were (0.414 : 0.586), (0.627 : 0.373), (0.931 : 0.069), and (0.586 : 0.414) as compared to the actual percentage composition obtained from species-size survey were (0.41 : 0.59), (0.64 : 0.36), (0.93 : 0.07), and (0.59 : 0.41), respectively. Differences between theoretical best fits versus observed results are very small.

A verification process using generated data of known parameters was also

carried out for searching the stability of GATS algorithm. The results thus obtained indicate that (1) the minimal size of acquired TS must not smaller than 3000 and (2) recognizable difference in two species' mean TS must not smaller than 0.03 dB, which is equivalent to 7 cm in size difference. It is thus suggested a proper survey setting comparable with aforementioned conditions is essential for a successful fisheries acoustic assessment.

Mean size in fork length (FL) of S. australasicus obtained by fish-size survey carried out at Nanfanao fishing port as compared to the mean size back calculated by using GATS researching algorithm are 29.7 vs 29.2; 30.9 vs 30.8; 31.7 vs 31.6; 27.0 vs 26.3, for surveys on 1995/March, 1996/April, 1997/July, 1998/November, accordingly. Those of T. japonicus are 20.4 vs 20.0; 20.9 vs 21.7; 24.9 vs 24.2; 18.5 vs 18.1, accordingly. Again, the discrepancies between the two are insignificant.

For spatial distributions of estimated mean FL and biomass, larger mean FL of S. australasicus concentrated near the edge of slope of the continental shelf with slight biomass but the abundant biomass with smaller size were concentrated at the northwest part of continental shelf and below the slope in May. Mean FLs distribution was divided into two groups two month later. One group of larger size S. australasicus stayed at the northwest area of high latitude, the other of larger size stayed along the slop to bottom of continental shelf. Though one group of mean FLs distribution of larger size was concentrated below the slope, there was an abundant S. australasicus of small size stayed at the northwest area of high latitude.

Mean FLs spatial distribution of T. japonicus was much smaller than S. australasicus. The mean FL of T. japonicus was smaller than 24 cm in May. The large size fish appeared to concentrate along the edge of shelf after two month. Spatial biomass distribution of T. japonicus was much homogenous than S. australasicus in May but as the same condition in July, i.e., concentrated below the slope. An obvious result suggested that whatever S. australasicus or T. japonicus of small size stayed at the continental shelf in May but larger size fishes were divided into two groups staying at northwest area of high latitude and slope, respectively.

Standing crops, in an area of 14.4 thousand square of nautical mile, of S. australasicus and T. japonicus, were estimated as 1.40x105 tons and 1.30x105 tons, respectively, for the period of 1995-1996. The catch level or removal of these two species from the area in 1995-1996 was about 3.2x104 tons annually by the large-scale purse seine fisheries of Taiwan, which is about 11.8% of their total standing crops.

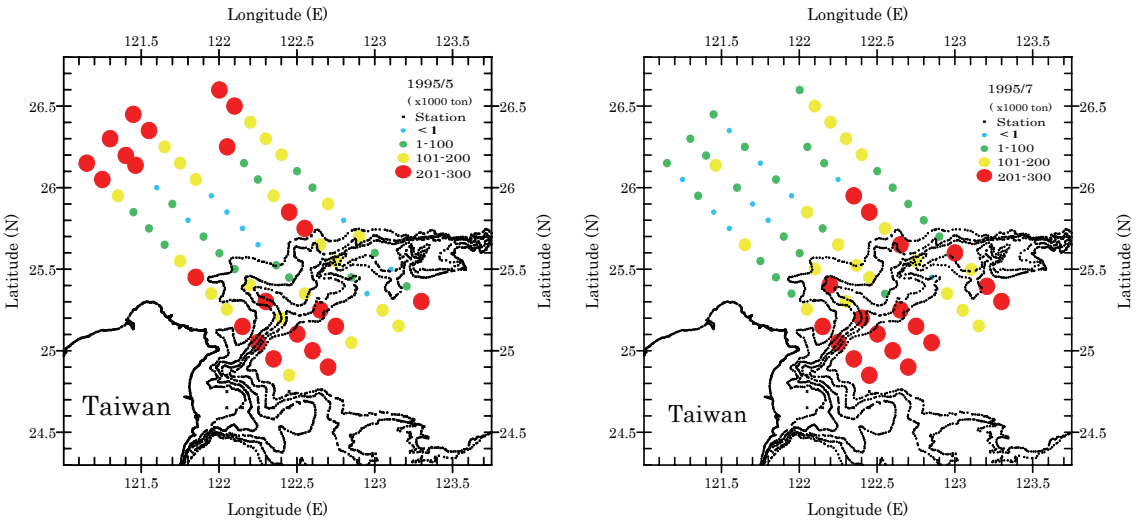

Fig. 1. Charts showing biomass pattern variation of *S. australasicus* in the waters off northeast Taiwan.

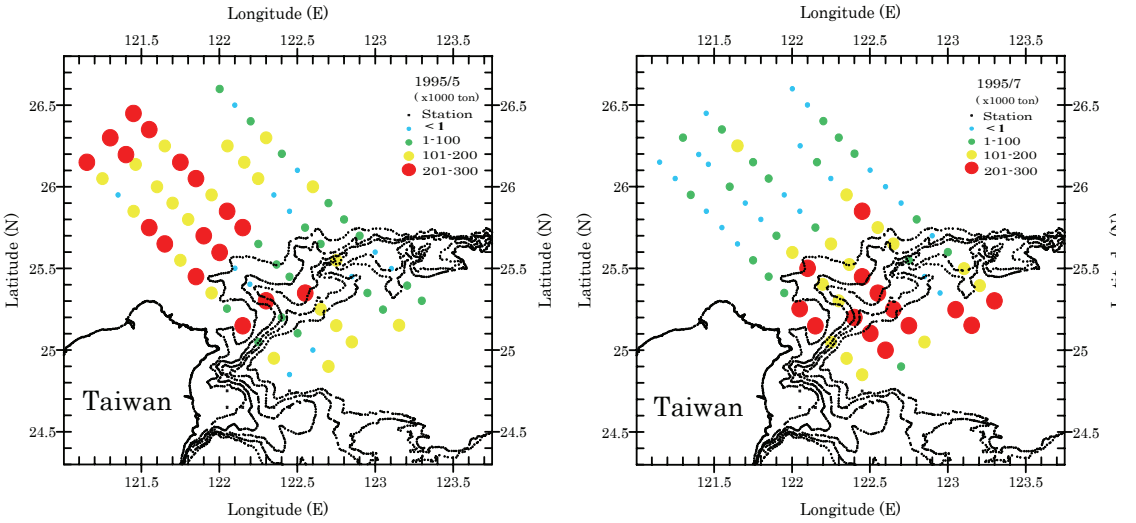

Fig. 2. Charts showing biomass pattern variation of *T. japonicus* in the waters off northeast Taiwan.

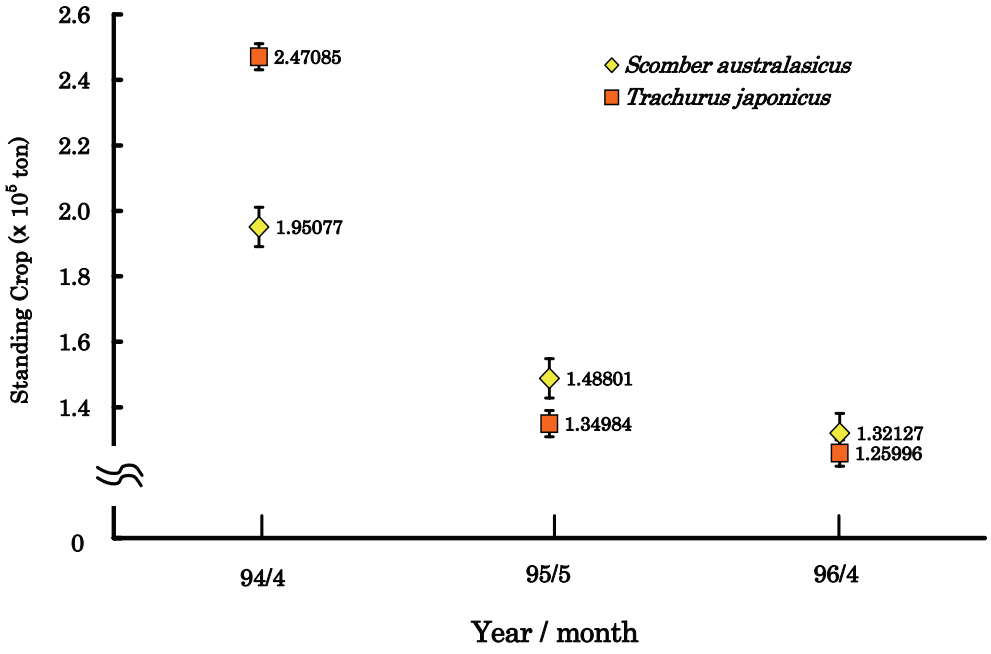

Fig. 3. Standing crop, in an area of 14.4 thousand square nautical mile, of *S. australasicus* and *T. japonicus* obtained from acoustic survey dating from 1994 to 1996. Vertical bar shows standard deviation.