IMPACT ON THE PERFORMANCE OF ANTARCTIC KRILL MID-WATER TRAWL BY THE NET BODY’S STRUCTURE

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Abstract

Antarctic krill (Euphausia superba) is one of the largest single biological resources on the earth, its large biomass and potential to support a large fishery has received increasing attentions of many countries. China began to be involved in the Antarctic krill fishery in 2009 when two large scale factory trawlers from Chinese fishing enterprisers went down to the Southern Ocean for exploratory fishing. At the beginning, large mesh size trawl net redesigned based on Chilean Jack Mackerel trawl was used, and the fishing efficiency was not satisfactory due to poor match between the net and the trawl doors, consequently the catch was much lower than those of Norway, Korea and Japan fishing fleets. In 2010, Chinese fishing vessel introduced 192.60 m×110.50 m krill trawl, a small mesh size specialized krill trawl from Korea, and fishing operation indicated that catch was also not satisfactory because of the limitation of the opening of net mouth. This was changed in 2012 when Liaoning Province Dalian Ocean Fishery Group of Corporations introduced the specialized krill trawler “Fu Rong Hai” from Japan and used the Japanese krill trawl (185.40 m×128.50 m small mesh size krill trawl) on board the fishing vessel, and the catch increased greatly. This study analyzes the performance of the Japanese krill trawl by carrying out model experiment based on the Tauti’s law. Large scale ratio $\lambda$ of the model net was chosen as 16. The average small scale ratio of the model net was 3; the ratio of towing speed between the full scale and the model net was 3. Model experiments were conducted in the towing tank of the East China Sea Fisheries Research Institute. The towing speeds of the model net ranged from 0.345 m/s to 0.685 m/s with the interval 0.085 m/s (equivalent to 2.0-4.0 kn with the interval of 0.5 kn for the full scale net). The ratio of the distance between two lower wing ends to lead line length (L/S) ranged from 0.45-0.55 with the interval of 0.05. Take down 6th-8th panel of inner net successively (each panel
accounted for 6.2%, 5.5% and 5.4% of total twine area of the trawl), then the drag and net mouth height at varied towing speed, L/S level and different twine area were recorded. The drag, mouth height and energy consumption coefficient of the prototype net were recorded at corresponding towing speeds according to model conversion rules and the hydrodynamic performance of the net was analyzed. The results indicate: (1) the drag decreased and rapidity increased when the twine area decreased; (2) the expansion (net mouth height, vertical expansion rate and sweeping area) of krill trawl was improved; (3) economical efficiency (energy consumption coefficient) and filtration (hydrodynamic performance) was optimized.

**Keywords**
Antarctic krill; mid-water trawl; model experiment; trawl performance; twine area

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