Effects of supplemental *undaria* powder, herb and wasabi in the diets on growth, body composition, blood chemistry and non-specific immune response of juvenile flounder, *Paralichthys olivaceus*

Sang-Un Park[a], Mun Gyeong Kwon[a], Yoon-Ho Lee[a], Kyoung-Duck Kim[a], Il-Shik Shin[b] and Sang-Min Lee[b,*]

[a]*National Fisheries Research and Development Institute, Busan 619-900, Korea*

[b]*Faculty of Marine Bioscience and Technology, Kangnung National University, Gangneung 210-702, Korea*

This study was conducted to investigate the effects of several additives(macroalgae, wasabi, and herb) in formulated diets on the growth, body composition, blood chemistry and non-specific immune response of juvenile flounder. Three replicates of juveniles (average weight 8.4 g) in flow-through aquarium system were fed one of six isonitrogenous (45%) and isolipidic (8%) diets containing 5 and 10% *Undaria* powder, 2% wasabi leaf, 2% wasabi stem, and 0.5% herb (Obosan) for 8 weeks. Survival was not affected by the different dietary additives ($P>0.05$). The highest weight gain and feed efficiency offish fed the diet containing 0.5% herb were significantly higher than those of fish fed the diets containing 10% *Undaria* powder ($P<0.05$). No significant differences were found in contents of moisture, crude protein, lipid and ash of whole body ($P>0.05$). Fish fed the diet containing 10% *Undaria* powder showed the highest moisture and the lowest crude lipid contents in the liver. Although hematological parameters (red blood cell, hematocrit and hemoglobin) and serum constituents (glucose, total cholesterol and glutamic-oxaloacetic transaminase) contents of fish varied between treatments, no specific trend was observed throughout feeding periods. Lysozyme activity in the serum and nitroblue tetrazolium reduction of macrophage in the head kidney from fish fed the diets containing herb was significantly higher than

those of fish fed the control diet. The results of this study suggest that herb as an additive in this formulated diet may improve growth and non-specific immune response of juvenile flounder.

* Corresponding author: smlee@kangnung.ac.kr