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# Feeding Habits of Yellow Goose Fish *Lophius litulon* and John Dory *Zeus faber* in the South Sea of Korea

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## Abstract

The feeding habits of yellow goosefish *Lophius litulon* and John Dory *Zeus faber* were studied by analyzing the stomach contents of specimens collected in the South Sea of Korea. In total, 132 hauls were taken during six experimental trawl survey (*Tamgu 1*) cruises conducted on a seasonal basis (March 2005-October 2007). The main prey items of the two species were similar. Fishes and crustaceans were the most important prey, with neither species showing ontogenetic changes in preferred species. Specifically, *Pennahia argentata* was the preferred prey item of *L. litulon*, whereas *Trichiurus lepturus* and *Engraulis japonicus* were preferred by *Z. faber*. Larger *Z. faber* (>24 cm) preferred bigger prey such as *T. lepturus* and *Larimichthys polyactis*, while smaller *Z. faber* preferred *E. japonicus* and *Acropoma japonicum*.

**Key words:** *Lophius litulon*, *Zeus faber*, Stomach contents, South Sea of Korea

## Introduction

The yellow goosefish *Lophius litulon* (family Lophiidae), is commonly found in the southern and western seas of Korea. The John Dory *Zeus faber* (family Zeidae), is widely distributed, ranging from the North Atlantic to New Zealand. Within the South Sea of Korea, the species is common found around Jeju-do (National Fisheries Research and Develoment Institute, 2010).

Most fishes undergo an ontogenetic shift in diet with growth and are affected by light intensity during the early larval stages (Yoon et al., 2010). The timing of the shift depends on the attack success rate, handling times, relative profitability, and the rate of encounter for each fish species (Juanes et al., 2001). *L. litulon* and *Z. faber* are typical carnivorous fish that exhibit differing feeding strategies in the South Sea ecosystem (Cha et al., 1997; Huh et al., 2006a). *L. litulon* is an ambush predator that lives on the seafloor, whereas *Z. faber* is an active predator that feeds mainly on schooling bony fishes. The two fish species inhabit the same ecosystem as top predators and compete for food. An understanding of the feeding strategies of two species is necessary to develop a fisheries management and ecosystem conservation plan. Thus, the purpose of this study was to compare the food preferences, ontogenetic changes in diet, and prey selectivity of *L. litulon* and *Z. faber*.

## Materials and Methods

In total, 132 hauls were taken during the day over during six experimental trawling survey (*Tamgu 1*) cruises conducted in the spring and fall over 3 years (March 2005-October 2007) in the South Sea of Korea (Fig. 1). For each haul, the total length (TL) (± 0.1 cm) and wet body weight (± 0.1 g) of captured *L. litulon* and *Z. faber* were recorded, after which their stomachs were dissected and immediately fixed with 10% neutral formaldehyde solution. In the laboratory, the stomach contents of up to 10 individuals of each species per haul were examined under a dissecting microscope and identified to the lowest possible taxon. The total wet weight of prey was measured in each

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stomach. The percent weight of each prey category relative to the total weight was calculated as follows: %W = [(weight of prey × total weight of prey in a given stomach) × 100].

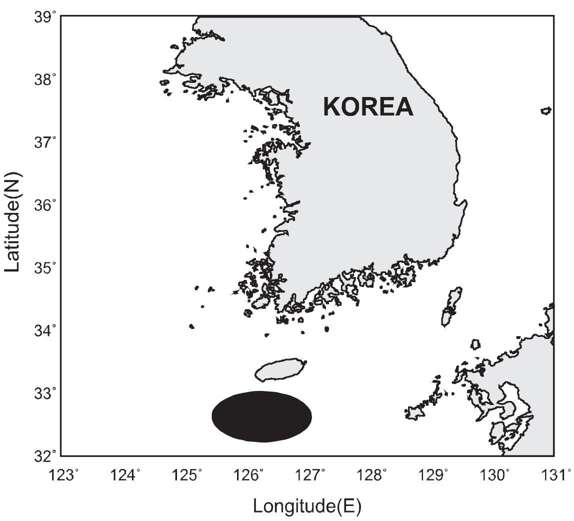


**Fig. 1.** Location of trawl survey (Black oval) in the South Sea of Korea from 2005 to 2007.

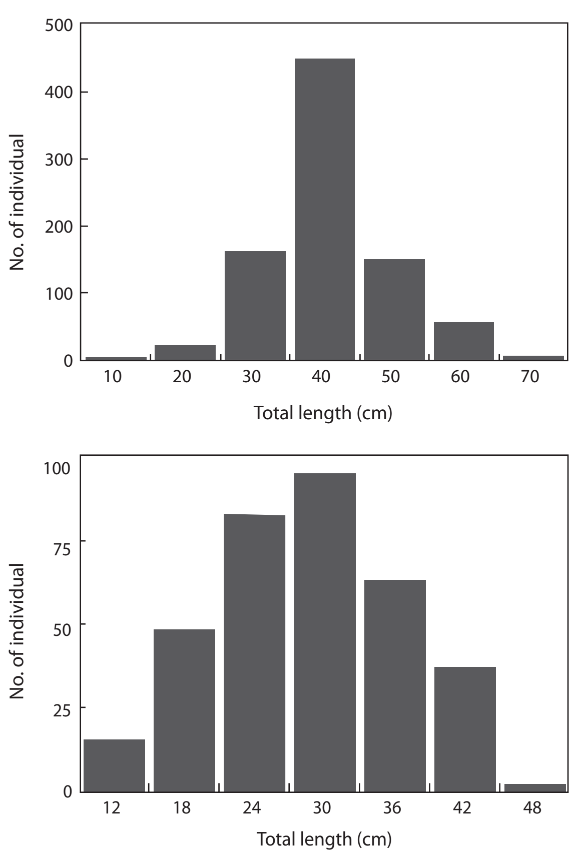


**Fig. 2.** Size distributions of *Lophius litulon* (Top) and *Zeus faber* (Bottom) in the South Sea of Korea.

Fishes, cephalopods, and polychaetes were counted as single prey items per stomach, as determining their exact numbers was not possible. Unidentified crustaceans, decapods (*e.g.*, crabs and shrimps), unidentified mollusks, cephalopods, and unidentified fish were regarded separately. Fragments of larger crustaceans, such as decapods, were often found digested into small pieces, and taxa origins were not identifiable, although in some cases, fragments (*e.g.*, rostra) could be identified as certain taxonomic groups. Some jaws and suckers of cephalopods could also be identified as specific taxonomic groups. Several fish bone parts were identifiable. The presence of scales was not taken as proof that fish had been eaten because ingestion of scales has been known to occur in the net during capture. Amorphous portions of prey that could not be identified were regarded as "others."

Three indices were used to describe the fish diet and to make comparisons between the two fishes: the frequency of occurrence (%Fi), the relative abundance (%N), and the index of relative importance (IRI). These indices were calculated for each stomach as follows: (%Fi) = [(number of stomachs containing a given prey item × number of not empty stomach specimens) × 100], (%N) = [(number of prey items of a given prey in all nonempty stomachs in a sample/total number of food items in all stomachs) × 100], and IRI = [(%N + %W) × %F].

Predator preference was expressed by an IRI using prey-specific abundance (Pinkas et al., 1971) to assess the importance of various food items converted as percentage of the total index, %IRI = (IRI/∑ IRI) × 100. Favored food items were defined by comparing the percent abundance of a prey item in the stomach vs. in nature: Electivity index, E = (Ri - Pi)/(Ri + Pi), where Ri = the relative abundance of that prey *i* in the stomach, and Pi = the relative abundance of that prey *i* in nature. The degrees of preference for food items were rated from -1 (completely avoided) to +1 (strongly favored).

Diversity (H′) in the diet of different size classes and years was established using the Shannon index (Shannon and Weaver, 1949) based on the IRI. The statistical significance of the differences between the diet compositions for each species and comparisons between the species diets were calculated.

## Results

In total, we examined the diets of 852 *L. litulon* and 355 *Z. faber*. The TL of *L. litulon* ranged from 8.8 to 62.8 cm, while that of *Z. faber* ranged from 6.5 to 41.7 cm (Fig. 2).

### Feeding intensity and diet composition of *L. litulon* and *Z. faber*

In total, 64.3% and 49.9% of *L. litulon* and *Z. faber* stomachs, respectively, were empty. The stomachs of *L. litulon* contained 59 different prey species, mainly belonging to two groups, fishes and crustaceans. Combined, these two prey categories represented 94.35% of the relative abundance, 125.36% of the total occurrence, and 94.73% of the total prey weight (Tables 1 and 2).

The dominant fish prey of *L. litulon* was *Larimichthys polyactis*, which accounted for the largest portion of the entire fish diet by weight (19.91%); *L. polyactis* comprised 18.96% of the diet by number and occurred in 5.84% of all prey stomachs analyzed. *Engraulis japonicus* was the second most popular prey item, comprising 2.88% of the diet by weight, 2.84% of the diet by number, and 5.11% of the diet by occurrence. *Acropoma japonicum*, *Collichthys* sp., and *Liparis agassizii* were also principal prey items, comprising 0.82%, 8.98%, and 8.44%, respectively, of the diet by weight. Another 30 fish species comprised a minor part of the diet. The dominant crustacean in the diet of *L. litulon* was *Palaemon gravieri*, which accounted for almost all crustaceans by weight (2.20%); *P. gravieri* comprised 1.90% of the diet by number and was found in 1.82% of the samples. Minor groups of crustacean species included *Crangon* sp., *Alpheus* sp., and *Cancer* sp.

The diet of *Z. faber* consisted of 26 prey species, mainly belonging to two groups: fish and crustaceans. Together, these two prey categories represented 99.45% of the total prey weight and 90.83% of the diet by number, while occurring in 95.52% of all stomachs analyzed. *A. japonicum* was the dominant prey of *Z. faber*, accounting for almost the entire diet by weight (13.80%), comprising 14.08% of the diet by number, and occurring in 13.41% of all examined prey. The other dominant crustacean in the diet of *Z. faber* was *P. gravieri*, which comprised 0.15% of prey weight, 1.48% of the diet by number, and 1.69% by occurrence. *Z. faber* foraged on numerous other prey items including *Trichiurus lepturus*, *E. japonicus*, *Pholis* sp., and *L. polyactis*.

## Ontogenetic changes in the diets of *L. litulon* and *Z. faber*

The dietary composition (percentage of prey weight) for the two species per size group is given in Figs. 3 and 4. The smallest *L. litulon* (8.8 cm TL) consumed fish exclusively, whereas the percentage of crustacean prey increased with predator size. All size groups of *L. litulon* preferred *L. polyactis* and *E. japonicus*. The relatively smaller fish preyed upon *L. agassizii*, while the middle size group (40-50 cm TL) preferred *Pennahia argentata, A. japonicum*, and *T. lepturus* and the large predator group preferred *Collichthys niveatus*.

For *Z. faber* individuals smaller than 6 cm TL, the prey mainly consisted of small crustaceans such as copepods. The small size group (6-24 cm TL) preferred small fish such as *E. japonicus* and *A. japonicum*, while individuals greater than 24 cm TL preferred larger fish such as *T. lepturus* and *L. polyactis*. The mean size of the prey increased with increasing predator size.

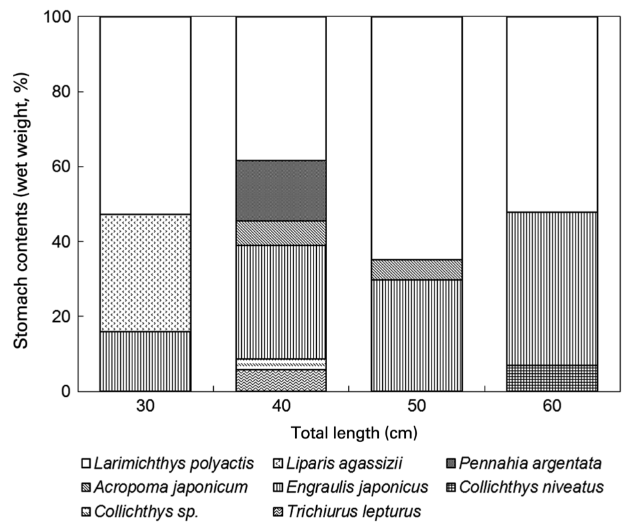


**Fig. 3.** Ontogenetic change in feeding habits of *Lophius litulon* (only fish)

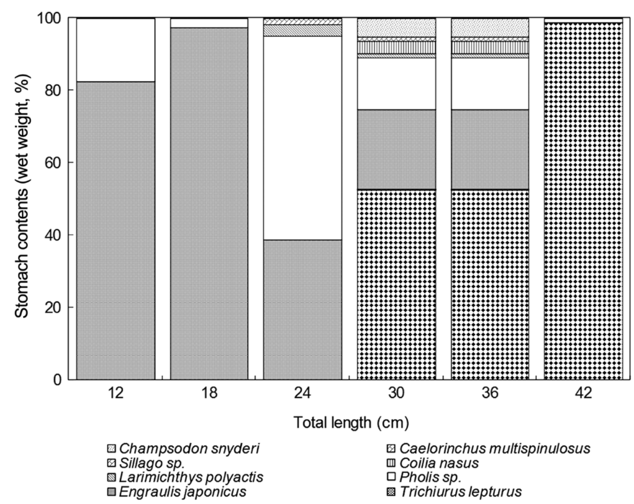


**Fig. 4.** Ontogenetic change in feeding habits of *Zeus faber* (only fish).

## Relationship between prey items and resident fish in the study area

We detected a relationship between the two fishes (*L. litulon* and *Z. faber*) and the main prey items occurring in the study area. Specifically, *L. litulon* feeds primarily on *L. polyactis*, *A. japonicum*, *E. japonicus*, *T. lepturus*, *C. niveatus*, and *P. argentata*, all of which are abundant in the study area. Considering selectivity, *L. litulon* actively forages *L. polyactis*, *A. japonicum*, and *P. argentata*. Calculations of the E (electivity) value for each of these prey by number showed positive values: 0.08, 0.47, and 0.75, respectively. However, *A. japonicam*, *E. japonicas*, and *T. lepturus* all exhibited negative E values, at -0.69, -0.34, and -0.89, respectively. Moreover, the E values calculated based on weight data for *A. japonicum* and

**Table 1.** Composition of the stomach contents of *Lophius litulon* by frequency of occurrence, number, wet weight, and index of relative importance (IRI)

| Prey organism | Occurrence (%) | No. (%) | Weight (%) | IRI | IRI (%) |
|---|---|---|---|---|---|
| Pisces | | | | | |
| *Acropoma japonicum* | 3.65 | 2.84 | 0.82 | 863.23 | 0.17 |
| *Amblychaeturichthys hexanema* | 0.73 | 0.47 | 0.5 | 95.35 | 0.02 |
| *Apogon lineatus* | 1.09 | 0.71 | 0.19 | 60.23 | 0.01 |
| *Benthosema pterotum* | 1.82 | 2.13 | 0.07 | 76.9 | 0.02 |
| *Chaeturichthys stigmatias* | 0.36 | 0.24 | 0.01 | 1.94 | + |
| *Champsodon snyderi* | 0.36 | 0.24 | 0.02 | 2.58 | + |
| *Collichthys niveatus* | 0.73 | 0.24 | 0.01 | 3.44 | + |
| *Collichthys* sp. | 0.36 | 8.29 | 8.98 | 849.94 | 0.17 |
| *Doederleinia berycoides* | 0.36 | 0.24 | 0.03 | 3.68 | + |
| *Engraulis japonicus* | 5.11 | 2.84 | 2.88 | 3,827.08 | 0.76 |
| *Gadus macrocephalus* | 0.36 | 0.47 | 0.18 | 18.55 | + |
| *Glossanodon semifasciatus* | 0.36 | 1.66 | 0.04 | 10.79 | + |
| Gobidae sp. | 1.46 | 0.47 | 0.02 | 14.3 | + |
| *Hoplobrotula armata* | 0.36 | 0.24 | 1.02 | 93.61 | 0.02 |
| *Hoplobrotula* sp. | 0.36 | 0.95 | 0.06 | 9.53 | + |
| *Hypodytes rubripinnis* | 0.36 | 0.24 | 0.88 | 81.11 | 0.02 |
| *Johnius grypotus* | 1.82 | 0.47 | 0.55 | 261.97 | 0.05 |
| *Larimichthys polyactis* | 5.84 | 18.96 | 19.91 | 30,205.42 | 5.96 |
| *Lepidotrigla* sp. | 0.36 | 0.24 | + | 1.17 | + |
| *Liparis agassizii* | 0.36 | 0.95 | 8.44 | 770.52 | 0.15 |
| *Liparis* sp. | 1.46 | 0.24 | 0.02 | 11.29 | + |
| *Liparis tanakae* | 1.46 | 1.66 | 0.01 | 32.11 | 0.01 |
| *Lophius litulon* | 0.36 | 0.24 | 0.14 | 13.75 | + |
| *Lophius* sp. | 0.36 | 2.13 | 4.61 | 427.74 | 0.08 |
| *Ophisurus* sp. | 2.19 | 1.18 | 1.13 | 644.48 | 0.13 |
| Ophichthidae sp. | 0.36 | 0.24 | 0.04 | 4.71 | + |
| *Pennahia argentata* | 1.09 | 0.71 | 1.69 | 470.5 | 0.09 |
| *Pleuronichthys cornutus* | 0.36 | 0.24 | 0.04 | 4.53 | + |
| *Psenopsis anomala* | 0.36 | 0.47 | 1.07 | 99.1 | 0.02 |
| *Scomber japonicus* | 0.36 | 0.24 | 1.11 | 101.43 | 0.02 |
| *Setipinna tenuifilis* | 0.36 | 0.24 | 0.19 | 17.94 | + |
| *Synagrops philippinensis* | 0.36 | 0.24 | 0.02 | 2.72 | + |
| *Trachurus japonicus* | 1.46 | 0.24 | 0.06 | 27.39 | 0.01 |
| *Trichiurus lepturus* | 1.46 | 0.24 | 1.06 | 388.6 | 0.08 |
| Uranoscopidae spp. | 0.36 | 0.24 | 0.76 | 70.2 | 0.01 |
| Unidentified fish | 62.77 | 19.43 | 28.72 | 462,602.94 | 91.35 |
| Crustacea | | | | | |
| Euphausiacea | 0.36 | 0.24 | + | 1.00 | + |
| Brachyura | 1.09 | 0.71 | 1.45 | 135.49 | 0.02 |
| *Charybdis bimaculata* | 0.36 | 0.24 | + | 1.41 | + |
| *Cancer* sp. | 0.36 | 0.24 | 1.34 | 122.7 | 0.02 |
| Unidentified Brachyura | 0.36 | 0.24 | 0.11 | 11.38 | + |
| Macrura | | | | | |
| *Acetes japonicus* | 1.46 | 0.24 | 0.02 | 9.59 | + |
| *Alpheus* sp. | 0.36 | 0.24 | 0.02 | 2.38 | + |
| *Crangon hakodatei* | 5.11 | 2.37 | 0.47 | 733.77 | 0.14 |
| *Crangon* sp. | 0.36 | 0.47 | 0.01 | 2.77 | + |
| *Metapenaeopsis* sp. | 0.36 | 0.24 | 0.01 | 2.08 | + |
| *Palaemon macrodactylus* | 0.73 | 10.19 | 3.21 | 669.74 | 0.13 |
| *Palaemon* sp. | 1.82 | 1.18 | 0.58 | 287.33 | 0.06 |
| *Palaemon gravieri* | 1.82 | 1.9 | 2.2 | 1036.54 | 0.2 |
| *Palaemon macrodactylus* | 0.36 | 0.24 | 1.18 | 108.44 | 0.02 |
| *Pandalus* sp. | 5.11 | 3.08 | 0.13 | 223.15 | 0.04 |
| *Solenocera* sp. | 0.36 | 0.24 | 0.01 | 2.03 | + |
| Unidentified Macrura | 1.82 | 0.95 | 0.07 | 52.62 | 0.01 |
| Unidentified Crustacea | 1.82 | 0.47 | 0.09 | 50.44 | 0.01 |
| Mollusca | | | | | |
| Cephalopoda | | | | | |
| *Loligo* sp. | 0.73 | 0.24 | 0.33 | 62.09 | 0.01 |
| *Sepiola* sp. | 1.10 | 0.95 | 1.10 | 176.87 | 0.04 |
| *Todarodes pacificus* | 0.37 | 0.24 | 0.42 | 38.98 | 0.01 |
| Unidentified Cephalopoda | 0.73 | 0.24 | 0.01 | 3.92 | + |
| Etc. | | | | | |
| Chaetognatha | 0.36 | 1.42 | + | 6.01 | + |
| Echinoidea | 0.36 | 0.24 | 0.21 | 20.15 | + |
| Anthozoa | 0.36 | 0.24 | 0.25 | 23.55 | + |
| Unidentified | 1.46 | 2.84 | 2.95 | 560.03 | 0.11 |
| Total | 129.93 | 100.00 | 100.00 | 506,379.73 | 100.00 |

+ : under 0.01

**Table 2.** Composition of the stomach contents of *Zeus faber* by frequency of occurrence, number, wet weight, and index of relative importance (IRI)

| Prey organism | Occurrence (%) | No. (%) | Weight (%) | IRI | IRI (%) |
|---|---|---|---|---|---|
| Pisces | | | | | |
| *Acropoma japonicum* | 13.41 | 14.08 | 13.8 | 598.8 | 33.9 |
| *Benthosema pterotum* | 1.12 | 0.47 | 0.11 | 1.03 | 0.06 |
| *Caelorinchus multispinulosus* | 1.12 | 0.47 | 0.5 | 1.74 | 0.1 |
| *Champsodon snyderi* | 1.12 | 0.47 | 0.15 | 1.1 | 0.06 |
| *Coilia nasus* | 1.12 | 0.47 | 1.67 | 3.84 | 0.22 |
| *Engraulis japonicus* | 10.06 | 7.98 | 14.16 | 356.56 | 20.19 |
| *Larimichthys polyactis* | 1.12 | 0.47 | 2.14 | 4.67 | 0.26 |
| *Pholis* sp. | 2.24 | 5.16 | 0.64 | 20.78 | 1.18 |
| *Sillago* sp. | 1.12 | 0.47 | 1.41 | 3.37 | 0.19 |
| *Trichiurus lepturus* | 7.82 | 5.16 | 33.28 | 481.51 | 27.26 |
| Unidentified fish | 36.74 | 33.14 | 30.86 | 680.29 | 12.03 |
| Crustacea | | | | | |
| Amphipod | | | | | |
| Caprellidae | 0.56 | 0.30 | + | 0.17 | 0.01 |
| Gammaridae | 1.12 | 1.48 | + | 1.67 | 0.07 |
| Euphausiacea | 0.56 | 2.07 | + | 1.16 | 0.05 |
| Macrura | | | | | |
| *Leptochela sydniensis* | 1.12 | 5.33 | 0.03 | 6.02 | 0.27 |
| *Palaemon gravieri* | 1.69 | 1.48 | 0.15 | 2.74 | 0.12 |
| *Pandalus prensor* | 0.56 | 0.89 | 0.02 | 0.51 | 0.02 |
| *Pandalus* sp. | 0.56 | 0.3 | 0.03 | 0.18 | 0.01 |
| *Plesionika izumiae* | 0.56 | 0.3 | 0.01 | 0.17 | 0.01 |
| *Plesionika ortmanni* | 0.56 | 0.59 | 0.06 | 0.37 | 0.02 |
| *Plesionika* sp. | 1.12 | 0.59 | 0.02 | 0.69 | 0.03 |
| Unidentified Macrura | 7.30 | 7.10 | 0.35 | 48.27 | 2.14 |
| Unidentified Crustacea | 2.81 | 2.07 | 0.06 | 5.99 | 0.27 |
| Mollusca | | | | | |
| Cephalopoda | | | | | |
| *Todarodes pacificus* | 0.56 | 0.30 | 0.01 | 0.17 | 0.01 |
| unidentified Cephalopoda | 5.06 | 2.96 | 0.19 | 12.74 | 0.56 |
| Bivalve | 0.56 | 0.30 | 0.00 | 0.17 | 0.01 |
| Unidentified Mollusca | 3.93 | 5.33 | 0.17 | 21.62 | 0.96 |
| Unidentified | 0.56 | 0.30 | 0.18 | 0.27 | 0.01 |
| Total | 106.19 | 100.00 | 100.00 | 2,256.58 | 100.00 |

+ : under 0.01

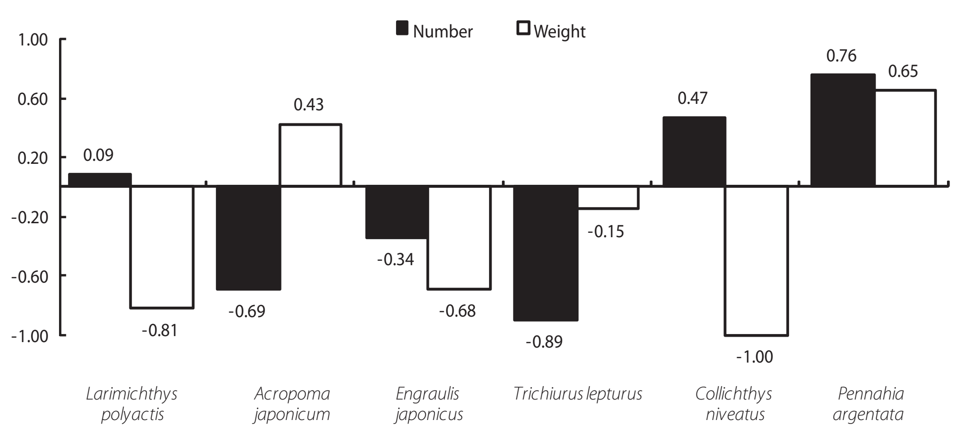


**Fig. 5.** Electivity indices for the Lophius litulon relative to the each main prey items (only fish).

*P. argentata* were 0.43 and 0.65, respectively. Thus, *P. argentata* is strongly favored as a prey item by *L. litulon* (see Fig. 5).

*Z. faber* feed primarily upon *T. lepturus*, *Benthosema pterotum*, *E. japonicus*, *A. japonicum*, *Champsodon snyderi*, and *Caelorinchus multispinulosus*. The E values for *T. lepturus* and *E. japonicus* were 0.11 and 0.16, respectively, while those for all other prey species were negative. The E values calculated by weight for *T. lepturus*, *E. japonicus*, *A. japonicum*, and *C. multispinulosus* were 0.52, 0.57, 0.52, and 0.65, respectively, while those of *B. pterotum* and *C. snyderi* were negative. These results suggest that *Z. faber* strongly favors *T. lepturus* and *E. japonicus* as prey items (see Fig. 6).

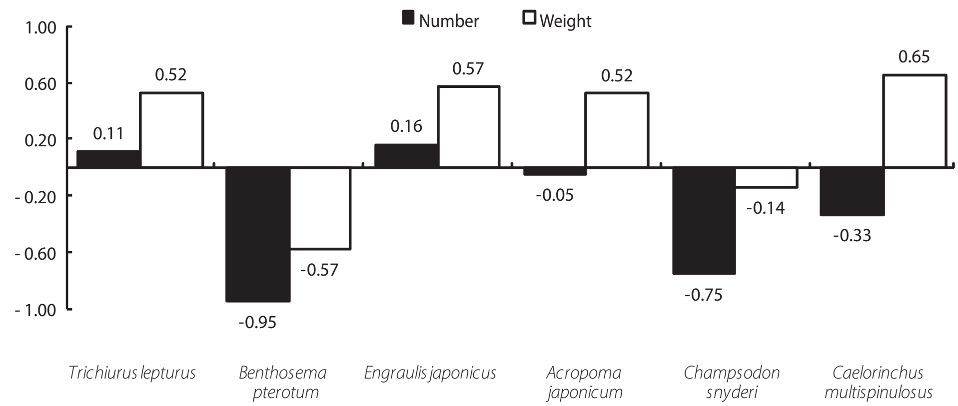


**Fig. 6.** Electivity indices for the Zeus faber relative to the each main prey items (only fish).

## Discussion

The genus *Lophius* includes opportunistic predators that ambush prey by attracting them using the angling apparatus (illicium) within their mouths. When captured, this genus exhibits a high proportion of empty stomachs (Maurer and Bowman, 1975; Crozier, 1985). The IRI value of unidentified fish was 91% in *L. litulon*, which is accordance with the species' opportunistic feeding behavior and strong digestive capacity. Of 59 prey species identified, crustaceans and fish were the most important prey for *L. litulon*. Baeck and Huh (2003) reported that juvenile *L. litulon* (1-2 cm TL) mainly feed on mysids and sagestids, whereas individuals larger than 3 cm TL mostly consume fish and crustaceans and adult-sized *L. litulon* mainly ingest fish (Cha et al., 1997). Cha et al. (1997) reported that the major species in the stomach contents of *L. litulon* was *Larimichthys polyactis*, which is in agreement with our data. The high percentage of *L. polyactis* is related to the distribution pattern and the recently increased biomass of this species. *L. polyactis* is widely distributed over Asia's continental shelf in the East China and Yellow seas (United Nations Development Programme/Global Environment Faculty, 2007; National Fisheries Research and Develoment Institute, 2010). The spawning grounds of *L. polyactis* typically occur in coastal environments, such as the Zhoushan Archipelago, where seawater mixes with freshwater discharged from large rivers (Lin et al., 2008). After 2004, the fish count for this species increased around the study area because changes in the hydrologic system for the region provided increased spawning and nursery habitats (MIFFAF, 2009).

The total number of prey species for *Z. faber* was 28, which is less than that of *L. litulon*. Huh et al. (2006a) reported that *Z. faber* mainly prey on fish species in the coastal waters off of Gori. The stomach contents of *Z. faber* captured around coastal areas contained demersal fish whose foraging patterns mimicked those of *T. lepturus* and *Conger myriaster* (Huh, 1999). However, we found that *Z. faber* had consumed pelagic fish species that inhabit midpelagic and sub-pelagic layers. For example, *Benthosema pterotum* and *T. lepturus* are middle or sub-pelagic species. However, *E. japonicus* is also a pelagic species in this study area. One possible reason for the high percentage of pelagic fish within the stomachs of *Z. faber* is that sampling was conducted during the daytime. Also, the feeding characteristics of *Z. faber* may have been such that pelagic species were more often encountered. Indeed, Silva (1999) reported that *Z. faber* exhibits pelagic foraging behaviors in the Portuguese coastal area. Moreover, Stergiou and Fourtouni (1991) suggested that *Z. faber* evolved a unique mouth structure to escape cannibalism. They also reported that *Z. faber* preferred elongated fish to those with rounded bodies.

Three groups of piscivore fishes have been recognized. One group, which includes *Sebastes inermis* and *Acanthopagrus schlegelii*, feeds on crustaceans (Huh and Kwak, 1998a, 1998b), while another group, which includes *T. lepturus* and *Zoarces gilli*, feeds on fish and crustacea (Huh, 1999; Huh and Beack, 2000); the third group feeds on fish such as *Sphyraena pinguis* and *Scomberomorus niphonius* (Baeck and Huh, 2004; Huh et al., 2006b). Most piscivorous fishes feed on crustacea during early life stages. For example, *T. lepturus* less than 50 cm in TL forage mostly on euphausia and shrimp (Huh, 1999). *Conger myriaster* greater than 30 cm in TL prey on fish approximately 70% of the time, while the remaining 30% of the diet consists of shrimp (*C. myriaster* up to 16 cm TL) (Huh and Kwak, 1998c). In this study, the smallest-sized fish (*L. litulon*, 8.8 cm; *Z. faber*, 6.5 cm) preyed primarily on fish. This difference in ontogenetic change appears to be related to mouth size. The relationship between the size of a predator and the size of its prey has important implications for prey choice, and shifts in diet are primarily accounted for by ontogenetic changes in mouth dimensions (Juanes et al., 2001). Because *L. litulon* has a larger mouth than *Z. faber*, it is able to feed on prey items that are larger than its body size. Indeed, Yamada et al. (2007) reported that the body lengths of some prey items of yellow goosefish are longer than those of the predator (85-125%).

The two species investigated in this study live in similar geographical areas but exhibit distinctive fish foraging behaviors. These species differ in their swimming abilities and inhabit different layers of the same water column. *L. litulon* demonstrated strong selectivity for demersal fish in the study area, whereas *L. faber* preferred small pelagic fish. These differences in feeding patterns prevent competition for prey between the two species.

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