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Feeding ecology and strategy of Japanese seabass, *Lateolabrax japonicus* (Actinopterygii, Acropomatiformes, Lateolabracidae), in the southern waters off Korean peninsula

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Abstract

This study examined the feeding ecology of *Lateolabrax japonicus* (Cuvier, 1828) in Korean coastal waters, focusing on variations in diet composition across the reproductive seasons and size classes of the fish. The stomach contents of 310 individuals were analyzed, and prey biomass was quantified and standardized to assess multivariate dietary pattern analyses. The primary prey of *L. japonicus* were teleost fishes, exhibiting a relative importance index of 92.8%. In the Teleostei prey group, *Engraulis japonicus* was the most dominant. Across all reproductive seasons and size classes, the diets were strongly dominated by teleost fishes, confirming the species' position as a specialized piscivorous predator. The contribution of Teleostei increased from 85.2% during the non-spawning season to 96.2% during the spawning season, whereas that of Caridea shrimps declined markedly. Ontogenetic shifts were evident, with small individuals (<40 cm) relying more on Caridea shrimps and larger individuals exhibiting near-exclusive piscivory, reflecting size-dependent foraging consistent with energetic optimization. DistLM revealed that size class, reproductive season, total length and month significantly influenced dietary variation ($P < 0.05$), whereas no significant differences were detected between sexes. Overall, these findings demonstrate that *L. japonicus* maintains a relatively stable trophic niche, with minor temporal variation driven primarily by changes in the relative contribution of crustacean prey, highlighting its ecological role as a top-level piscivore and providing valuable insights for ecosystem-based management of coastal fish populations.

Keywords

seabass, *Lateolabrax japonicus*, feeding strategy, feeding ecology, trophic level

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Introduction

Research on the feeding ecology of commercially valuable fish species holds significant implication in fisheries resource management (García and Contreras 2011), because they perform crucial ecological functions through predator–prey relationships regulating trophic interactions as higher trophic level predators in marine food webs (Mihalitsis et al. 2021; Traugott et al. 2021). However, understanding food web structures in marine ecosystems is challenging compared to terrestrial ecosystems, owing to longer pathways for energy transfer from primary producers to the top predators and greater complexity within and/or between trophic levels (Park and Gan 2014). Consequently, studies on the feeding ecology of predatory fishes can provide information on prey organisms, the biota within habitats, and energy flows throughout food chains (Cortés 1999).

Japanese seabass, *Lateolabrax japonicus* (Cuvier, 1828), is a typical carnivorous predator in marine ecosystems, primarily feeding on fish and crustaceans (Huh et al. 2009; Jeong et al. 2015; Mori et al. 2015; Chen and He 2025). It regulates the populations of lower trophic level species, thereby maintaining the balance of the food web (Huh et al. 2009; Estes et al. 2011). However, a decline in the abundance of top predators, such as the Japanese seabass, can trigger top-down control mechanisms, inducing population fluctuations in lower trophic level species, consequently leading to structural changes in marine ecosystems (Myers et al. 2007; Heithaus et al. 2008). Such changes ultimately threaten ecosystem stability, making continuous monitoring and resource management of *L. japonicus* populations essential (Shin and Shannon 2010). This contributes not only to maintaining the function and structure of marine ecosystems beyond simple resource conservation but also provides scientific grounds for establishing sustainable fisheries management strategies (Link 2002; Thrush and Dayton 2010).

According to the findings of Huh et al. (2009), *L. japonicus* were reported to primarily consume small fish. As *L. japonicus* exhibited piscivorous and opportunistic feeding behavior, they predominantly consume fish prey items that are abundant in their surroundings. For piscivorous species exhibiting opportunistic feeding habits, their diet is characterized by flexibility and variation across different habitats (Fuji et al. 2016). This necessitates undertaking comparative studies across diverse marine regions including Korean and Japanese waters. However, the earlier Korean studies were conducted in relatively narrow geographical areas including in waters around Dolsando Island, Yeosu (Huh et al. 2009) and in small tidal creeks (Jeong et al. 2015). While this study expanded the geographical scope to encompass a broader area, extending from the southern coast of Korea. This expansion can provide a more comprehensive understanding of the dietary habitats of the seabass species being studied. In particular, *L. japonicus* have been observed to exhibit seasonal migratory characteristics, moving between habitats in response to environmental influences, such as water temperature (Hayashi 1969). Given that the range of migration spans both coastal and offshore areas, it is anticipated that differences in the prey organisms consumed will be observed. Migratory fish take advantage of the high productivity of habitats and through such movements and trophic interactions, ecological energy is transferred from productive coastal zones to less productive offshore areas (Linda 1993). In addition, analyses of stomach contents provide valuable indirect information about the structure of prey communities within habitats, offering insight into how environmental conditions or prey availability may influence feeding patterns (Park et al. 2024).

The objective of this study was to analyze the stomach contents of *L. japonicus*, which occupy a higher trophic level within the ecosystem, and to understand the dietary patterns of *L. japonicus* inhabiting the southern coast of Korea. The findings of this study contribute to a more detailed understanding of the trophic role of *L. japonicus* in coastal food webs, provide baseline information for assessing spatiotemporal changes in prey communities, and offer valuable ecological insights that can support fisheries management and ecosystem-based conservation efforts in Korean coastal waters.

Materials and methods

Lateolabrax japonicus samples were collected monthly from January to December 2020 in the southwestern waters of Korea using various fishing gears incorporating longline, gillnet and handline (Fig. 1). Because specimens were obtained from routine commercial fishing operations with the assistance of local fishermen, no additional animal handling or experimental procedures were conducted, and formal institutional animal ethics approval was not required.

Immediately following capture, the individuals were packed on ice and transported to the laboratory, where their total length (TL, ±1.0 mm) and body weight (BW, ± 1.0 g) were measured after thawing. In the laboratory, the stomachs of all specimens were removed, and the contents were preserved in 5% buffered formalin solution for at least 24 h. For each specimen, stomachs were cut open and the contents were identified to the lowest possible taxonomic level under a dissecting microscope; if digestion made identification difficult, prey items were classified to the family or order level. The number of individuals for each prey category was counted, and their size and wet weight were determined to the nearest 0.1 cm and 0.001 g, respectively.

The dietary composition was expressed as a frequency of occurrence (%*F*), a numerical percentage (%*N*), and a gravimetric percentage (%*W*) based on the following equations:

$$\%F = 100 \times A_i \times N^{-1}$$

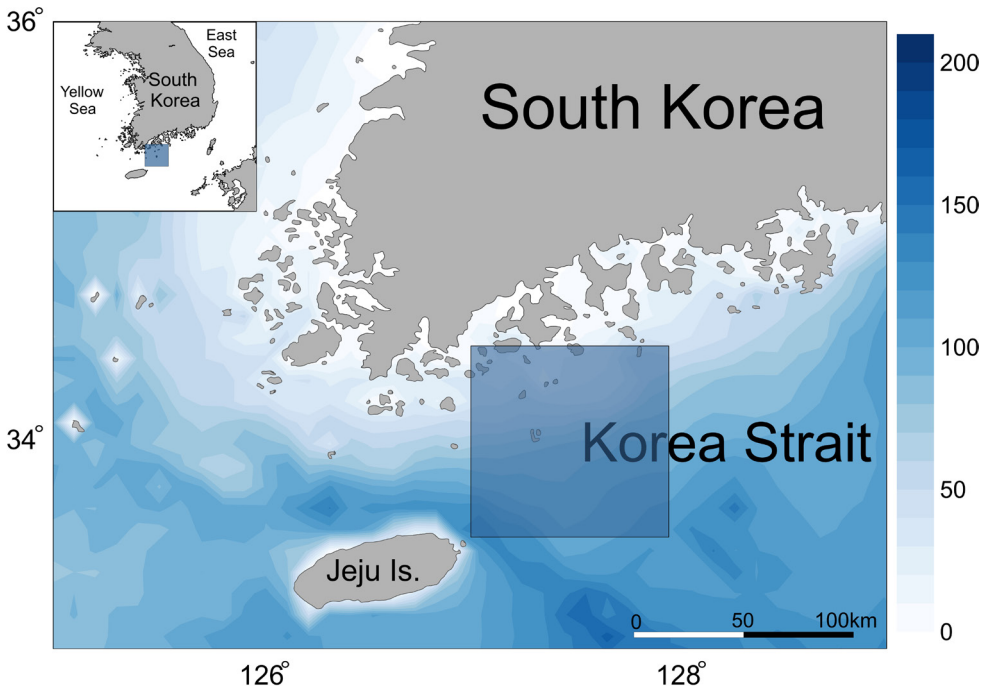

Figure 1. Map of study area showing the position where specimens of *Lateolabrax japonicus* were collected in the western Korea Strait.

$$\%N = 100 \times N_i \times N_{\mathrm{T}}^{-1}$$

$$\%W = 100 \times W_j \times W_{\mathrm{T}}^{-1}$$

where, A_i is the number of stomachs in which a particular prey item was found, and N is the total number of stomachs containing food. N_i (W_i) represents the number (weight) of individuals of a given prey category, while N_{T} (W_{T}) denotes the total number (weight) of all prey items combined.

The index of relative importance (IRI) of each prey category was calculated based on the following equation below (Pinkas et al. 1971), and the values were subsequently expressed as a percentage (%IRI) to indicate the relative contribution of each prey item to the overall diet.

$$\mathrm{IRI} = (\%N + \%W) \times \%F$$

The trophic level of *L. japonicus* was estimated using the TROPH value calculated in TrophLab (Pauly et al. 2000), as follows:

$$\mathrm{TROPH}_i = 1 + \sum_{i=1}^{G} \mathrm{DC}_{ij} \times \mathrm{TROPH}_j$$

where TROPH_i is the trophic level of predator i, DC_{ij} represents the proportion of prey j in the diet of predator i, G is the total number of prey categories consumed by the predator, and TROPH_i is the trophic level of prey j.

To assess the feeding strategy of *L. japonicus*, the graphical method proposed by Costello (1990) and later modified by Amundsen et al. (1996) was applied. This approach enables the visualization of prey importance (dominant–rare), predator feeding strategy (specialization–generalization), and trophic niche breadth (wide–narrow) through a two-dimensional plot of the frequency of occurrence (%F) against the prey-specific weight (WP) for each prey category.

The prey-specific weight abundance (P_i) was calculated using the following formula:

$$P_i = \left(\sum S_i / \sum S_{ti}\right) \times 100$$

where S_i is the weight of prey i in an individual predator's stomach, and S_{ti} is the total weight of all prey in stomachs containing prey i. According to the graphical framework proposed by Amundsen et al. (1996), the plot is defined by two axes: the vertical axis (P_i), representing prey-specific abundance, and the horizontal axis (%F), representing frequency of occurrence. The distribution of prey items within this two-dimensional space is used to infer feeding strategy, prey importance, and niche width.

To examine size-related variations in diet composition, individuals were categorized into four size classes with 20 cm interval, i.e., < 40 cm, 40–60 cm, 60–80 cm, and > 80 cm. Differences in dietary habitats in relation to reproductive season were assessed by separating the samples into non-spawning (April–September) and spawning (October–March) periods following Kang et al. (2002).

Furthermore, feeding intensity was compared across reproductive periods and seasons. Based on these classifications, the stomach content index (SCI) was calculated to assess changes in feeding intensity among groups, using the equation:

$$\mathrm{SCI} = 100 \times \mathrm{SCW} \times \mathrm{BW}^{-1}$$

where SCW is the weight of the stomach contents, and BW is the body weight of *L. japonicus*.

To identify the factors contributing most strongly to variation in diet composition, distance-based linear modelling (DistLM) was employed (Legendre and Anderson 1999; McArdle and Anderson 2001). Prior to analysis, the biomass of each prey group was converted to its proportional contribution within each stomach and then square root transformed to lessen the influence of numerically dominant prey types. A Bray–Curtis resemblance matrix was generated from the transformed data. DistLM was then used to relate the multivariate dietary dataset to five explanatory variables: size class, reproductive season, sex, total length and month. Total length was considered continuous variables while other predictors were considered categorical variables. This approach assesses the extent to which each predictor accounts for variation in the multivariate prey composition by providing marginal tests that evaluate predictors independently and sequential tests that assess their contributions when fitted in combination (Anderson et al. 2008). Model selection was guided by the Akaike Information Criterion (AIC), which identifies the combination of predictors offering the best balance between explanatory power and model simplicity (Anderson et al. 2008). All statistical analyses were performed using R statistical software (R Core Team) in RStudio (version 2025.05.1; Posit Software) and PRIMER v6 with the PERMANOVA+ module (Anderson et al. 2008).

Results

A total of 340 *Lateolabrax japonicus* specimens of 26.0–97.6 cm TL (mean ± SD = 50.8 ± 13.7 cm) were collected during the study period (Fig. 2). Most individuals distributed between TL range of 30 cm to 60 cm.

A total of 310 stomachs were analyzed, of which 134 individuals were empty, representing an empty ratio of 43.2%. The results of dietary composition from the remaining 176 individuals are shown in Table 1.

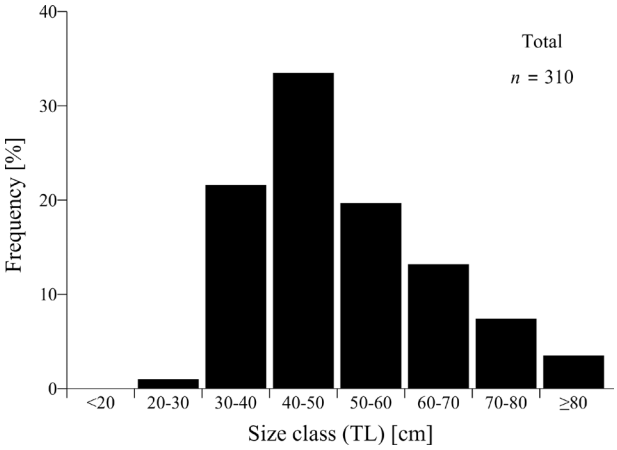

Figure 2. Frequency of length distribution of the *Lateolabrax japonicus* in the western Korea Strait.

The primary prey items for *L. japonicus* were Teleostei, comprising 70.5% by occurrence, 74.3% by number, and 91.9% by wet weight, and 92.8% in %IRI. Among Teleostei consumed, *Engraulis japonicus* Temminck et Schlegel, 1846 was the most abundant prey species, composed of 42.6% in %*W*, followed by *Trachurus japonicus* (Temminck et Schlegel, 1844) (20.5%), and *Thryssa kammalensis* (Bleeker, 1849) (7.3%). The next abundant prey item was Caridea shrimps constituting 6.8% by %IRI, and *Crangon affinis* De Haan, 1849 and *Penaeus (Fenneropenaeus) chinensis* (Osbeck, 1765) were common Caridea species in the diets of *L. japonicus*. In addition, brachyuran crabs, euphausiids, stomatopods, and cephalopods were also consumed, but their %IRI values were less than 0.2%. Estimated trophic level based on TROPH value was 4.42 ± 0.79, indicating their tertiary trophic position in marine ecosystem.

The relative importances of prey items in the diets of *L. japonicus* are shown graphically in Fig. 3, where each prey-specific weight abundance (P_i) is plotted against the frequency of occurrence (%*F*). The feeding pattern of

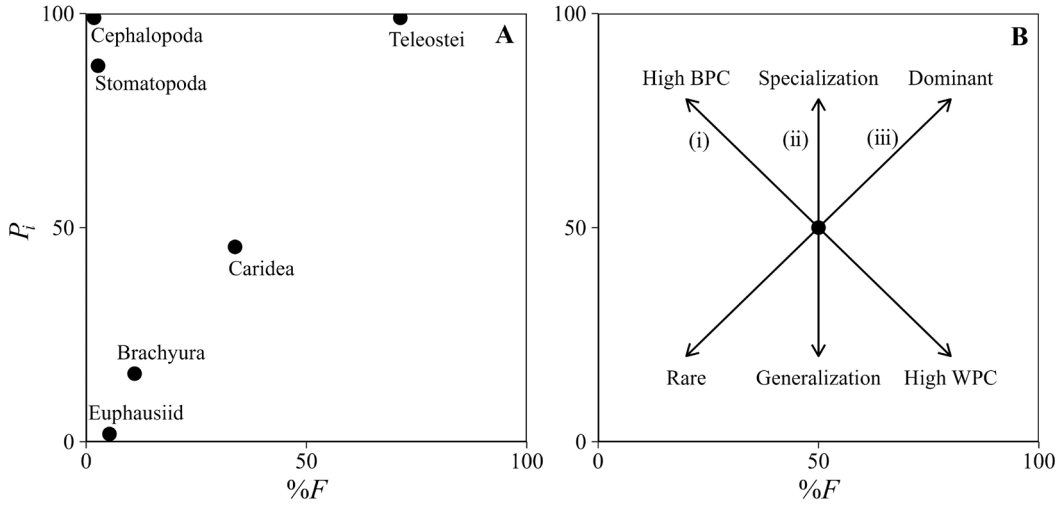

Figure 3. (**A**) Graphical representation of feeding pattern of *Lateolabrax japonicus*. (**B**) Explanatory diagram for interpretation of niche width contribution (axis i, within phenotypic component (WPC) or between phenotypic component (BPC)) of the study population, feeding strategy (axis ii), and prey importance (axis iii).

Table 1. Dietary composition of *Lateolabrax japonicus* by frequency of occurrence (%*F*), number (%*N*), weight (%*W*), index of relative importance (%IRI).

Prey organism		%*F*	%*N*	%*W*	%IRI
CRUSTACEANS					
Euphausiacea	**Unidentified**	**4.5**	**3.2**	**<0.1**	**0.1**
Caridea	**Total**	**33.0**	**19.1**	**7.0**	**6.8**
	Aegaeon lacazei	1.7	0.7	0.2	
	Alpheus sp.	1.1	0.4	0.1	
	Crangon affinis	6.8	8.9	1.6	
	Crangon sp.	3.4	2.4	1.2	
	Penaeus chinensis	7.4	2.3	2.8	
	Unidentified	12.5	4.3	1.0	
Stomatopoda	**Unidentified**	**1.9**	**0.5**	**0.5**	**<0.1**
Brachyura	**Total**	**10.2**	**2.6**	**0.5**	**0.2**
	Charybdis bimaculata	2.3	0.6	0.2	
	Unidentified Brachyura	8.0	2.0	0.3	
MOLLUSCS					
Cephalopoda	**Total**	**1.0**	**0.3**	**<0.1**	**<0.1**
	Sepiolidae	0.6	0.1	<0.1	<0.1
	Unidentified	0.6	0.1	<0.1	<0.1
FISHES					
Teleostei	**Total**	**70.5**	**74.3**	**91.9**	**92.8**
	Congridae sp.	1.1	0.3	0.2	
	Engraulis japonicus	22.2	40.5	42.6	
	Sardinella zunasi	1.1	1.0	4.3	
	Thryssa kammalensis	4.0	4.3	7.3	
	Bregmaceros japonicus	1.7	7.0	0.1	
	Benthosema pterotum	9.1	7.9	0.7	
	Acropoma japonicum	1.7	0.6	0.2	
	Champsodon snyderi	1.7	0.9	0.2	
	Leiognathus nuchalis	0.6	0.1	0.1	
	Neoditrema ransonneti	1.7	1.4	1.3	
	Pampus echinogaster	1.7	0.4	4.2	
	Scomber japonicus	1.7	0.4	3.3	
	Trachurus japonicus	7.4	2.7	20.5	
	Trichiurus japonicus	4.0	1.3	0.7	
	Chelidonichthys spinosus	1.1	0.3	1.0	
	Unidentified	29.5	12.1	5.3	

L. japonicus indicates a predominantly generalized strategy at the population level, although specialization of certain prey item is also evident through the high dominance of piscivore in a subset of individuals. Teleostei was the most important prey group, showing the highest values of both P_i (98.3%) and %*F* (70.5%) values. Caridea shrimps (P_i = 44.5%, %*F* = 33.0%) and brachyuran crabs (P_i = 14.9%, %*F* = 10.2%) were the next frequent prey items. While other prey groups including euphausiids, stomatopods, and cephalopods were positioned close to the left axis of the diagram, reflecting low overall prey importance at the population level, despite some individuals being selectively consumed cephalopods and stomatopods. The clustering of most prey items near the left axis highlights a high degree of between-individual variation in resource use within the population.

Diet composition of *L. japonicus* was strongly dominated by Teleostei prey across all reproductive seasons and size classes (Fig. 4). During the non-spawning season, Teleostei accounted for 85.2% of total prey biomass, but increased to 96.2% during the spawning season (Fig. 4a). Caridea shrimps were the second most important prey group, contributing 12.3% and 3.6% during the non-spawning and the spawning seasons, respectively. In terms of size classes, the dominance of Teleostei increased progressively with body size, changing from 54.6% in smallest size class (<40 cm) to 98.1% in largest size class (>80 cm) (Fig. 4b). Caridea shrimps, on the other hand, displayed the opposite trend to that of Teleostei, accounting for 44.6% of prey biomass in the smallest size class (<40 cm), but declining markedly to 3.2% in 60–80 cm class. Other prey items constituted only minor contributions across all reproductive seasons and size classes. Consistent with this pronounced piscivory, TROPH values estimates were high in both reproductive seasons, increasing slightly from 4.37 ± 0.69 in the non-spawning season to 4.47 ± 0.77 during the spawning season. Across size classes, TROPH values rise with increasing

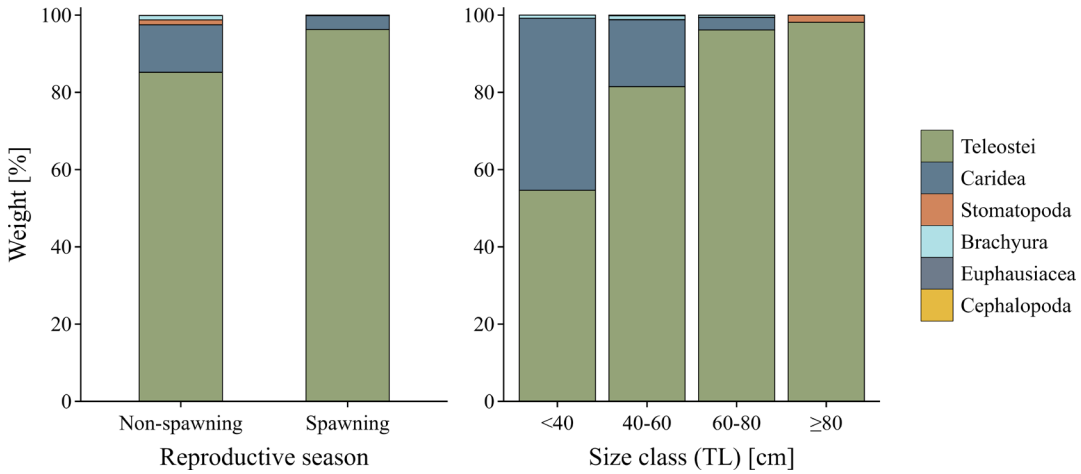

Figure 4. Variations in diet composition of *Lateolabrax japonicus* by reproductive season (left) and size class (right) expressed as percentage weight of prey groups.

body size from 4.10 ± 0.51 in < 40 cm, to 4.33 ± 0.66 in 40–60 cm, 4.46 ± 0.77 in the 60–80 cm, and reaching 4.48 ± 0.79 in > 80 cm. These results indicate a gradual transition toward higher trophic positioning associated with increasing piscivory during growth.

Multivariate DISTLM test indicated that the diet of *L. japonicus* was associated with size variables (size class and total length) and temporal variables (reproductive season and month) ($P < 0.05$), but sex did not show a significant independent contribution ($P = 0.222$) (Table 2). The most parsimonious conditional model for diet composition included all variables and explained only 19.1% of data variability, indicating that most of the variability in diet could not be explained by these predictors.

Table 2. Results of marginal tests from distance-based linear models (DistLM) examining the effects of size class, reproductive season, and sex on diet composition. Results of distance-based linear models (DistLM) analyzing *Lateolabrax japonicus* diet with respect to size class, reproductive season, sex, total length and month (marginal test) and sequentially (conditional test) for a population from south-western coast off Korea.

Predictor variables	Pseudo-*F*	R^2	*P*	Prop.
Marginal test				
Size class	8.993		**0.002**	0.049
Reproductive season	9.918		**0.001**	0.054
Sex	1.431		0.222	0.008
Total length	12.513		**0.001**	0.067
Month	17.658		**0.001**	0.092
Conditional test				
+Month	17.658	0.092	0.001	0.092
+Reproductive season	15.226	0.166	0.001	0.073
+Total length	3.368	0.181	0.043	0.016
+Size class	1.716	0.190	0.203	0.008
+Sex	0.250	0.191	0.786	0.001

Bold values indicate significance at $P = 0.05$ in marginal test. Prop. indicates the proportion of variation in diet composition explained by each predictor variable in the DistLM analysis.

Comparison between reproductive periods revealed a significant reduction in stomach fullness (Fig. 5), expressed as the stomach content index (SCI), during the spawning period. Mean SCI values decreased from 0.64 ± 0.12 in the non-spawning period to 0.35 ± 0.06 during the spawning period (one-way ANOVA, $F = 5.76$, $P < 0.05$), indicating a marked decline in feeding intensity associated with reproduction. In addition, ontogenetic variation in stomach fullness was also evident, with SCI differing significantly across size classes (one-way ANOVA, $F = 7.14$, $P < 0.05$). Mean SCI values increased progressively with size, being lowest in individuals < 40 cm (0.20 ± 0.06), followed by the 40–60 cm (0.42 ± 0.08) and 60–80 cm (0.92 ± 0.20), and reaching the highest values in individuals ≥ 80 cm (1.21 ± 0.63). This pattern suggests that feeding intensity increases with body size, reflecting enhanced predatory activity in larger individuals.

Discussion

In this present study, the primary prey of *Lateolabrax japonicus* were teleost fishes, with Japanese anchovy (*Engraulis japonicus*) being the most dominant species. Japanese anchovy generally consumes planktonic prey items and plays an essential ecological role in pelagic food webs, serving as an important trophic linkage between primary producers and higher trophic level predators (Fréon et al. 2005; Bakun et al. 2010; Pikitch et al. 2014). Due to their schooling behavior, *E. japonicus* anchovies serve as major prey for fast-swimming predatory fishes and represent an ecologically important fish resource that helps maintain the coastal ecosystem (Huh et al. 2006; Yoon et al. 2008). Previous studies on the feeding habits of *L. japonicus* in Korean have also reported *E. japonicus* anchovy as the predominant prey species, consistent with the present findings (Huh et al. 2009). Therefore, *L. japonicus* utilizes its high swimming ability to prey on the abundant *E. japonicus* specimens in the southern coastal waters (Choi 2011). In addition to *E. japonicus*,

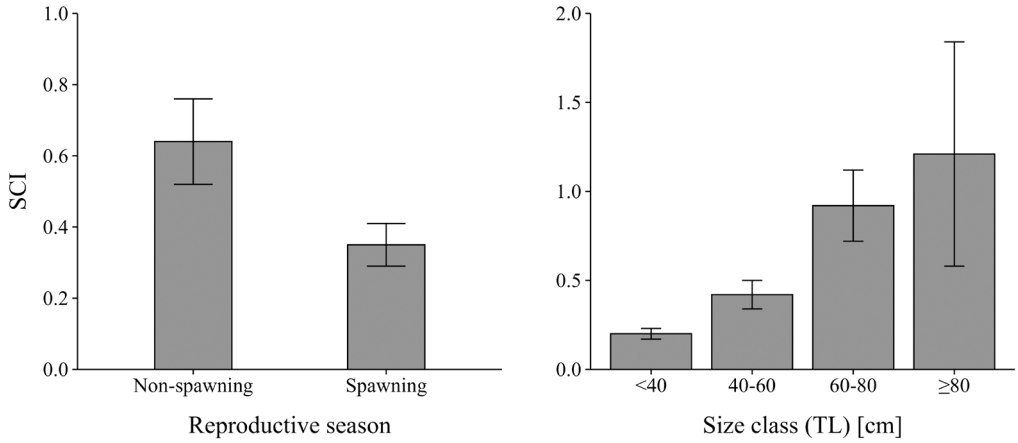

Figure 5. Stomach content index (SCI) variation of *Lateolabrax japonicus* by reproductive season (left) and size class (right).

L. japonicus also fed on migratory fishes including *Trachurus japonicus* and *Scomber japonicus* Houttuyn, 1782 and benthic or bentho-pelagic fishes such as *Chelidonichthys spinosus* (McClelland, 1844), *Trichiurus japonicus* Temminck et Schlegel, 1844, *Benthosema pterotum* (Alcock, 1890), and *Acropoma japonicum* Günther, 1859. These results suggest that feeding behavior of *L. japonicus* is mainly associated with pelagic prey items in shallow coastal regions but also performs vertical movements to the deeper offshore area (Kosaka 1969; Hayashi 1972). However, further studies are needed to clarify the physical and chemical environmental factors influencing their migratory behavior for seeking prey resources.

The feeding strategy analysis revealed that *L. japonicus* exhibited a mainly generalized feeding pattern at the population level but also indicated individual-level specialization for some prey items. High within-phenotype contribution and frequency of occurrence of Teleostei fishes indicate their piscivorous feeding mode. However, the presence of other prey groups suggests dietary flexibility and the use of alternative prey when fish prey are less available. This pattern implies that *L. japonicus* exhibits a mixed feeding strategy, characterized by a broad trophic niche with high between-individual variation in resource use. A similar feeding strategy with *L. japonicus* was also reported for various fish species inhabiting coastal waters of Korea, including *Lophius litulon* (Jordan, 1902), *Trichiurus japonicus*, and *Gadus macrocephalus* Tilesius, 1810 (see Park et al. 2014; Shin et al. 2022; Kang et al. 2025). Such variation may reflect differences in size, habitat use, or foraging behavior among individuals, allowing the population to exploit a wide range of prey resources (Bolnick et al. 2003).

The dominance of Teleostei in the diets of larger individuals clearly reflects an ontogenetic dietary shift from crustacean-feeding juveniles to fish-feeding adults, a trend commonly reported among piscivorous Teleostei (see Keast 1985; Huh et al. 2009; Kang et al. 2025). Smaller individuals (<40 cm) relied more on Caridea shrimps, whereas the dependence on Teleostei prey increased progressively with body size, reaching near-exclusive consumption in the largest size class. This size-dependent transition likely reflects improvements in predatory capacity, such as increased gape size, swimming ability, and capture efficiency, enabling larger individuals to exploit higher-energy prey items (Persson et al. 1996; Nilsson and Brönmark 2000). Such a shift is consistent with established ecological theory that larger piscivores select energetically profitable prey to maximize net energy gain and reduce foraging costs (Harper and Blake 1988; Scharf et al. 2000). Ontogenetic dietary shifts have also been reported in other seabass species, including the European seabass, *Dicentrarchus labrax* (Linnaeus, 1758), which exhibits a transition from benthic invertebrate-dominated diets in juveniles to predominantly piscivory in adults (Cardoso et al. 2015). Similarly, striped bass, *Morone saxatilis* (Walbaum, 1792), showed a pronounced ontogenetic shift from benthic invertebrates to fish prey as body size increases, reflecting enhanced predatory efficiency and energetic demands associated with growth (Overton et al. 2009). These patterns suggest that ontogenetic dietary shifts toward piscivory represent a common trophic strategy among seabass species inhabiting coastal ecosystems. Consequently, although the population functions as a generalist, individual size classes exhibit varying degrees of specialization, contributing to population-level niche expansion and reducing intraspecific competition.

According to Keast (1985), piscivorous fishes can be categorized into two types, i.e., primary piscivores, which become piscivorous shortly after birth, and secondary piscivores, which shift to piscivory during their growth stage. Huh et al. (2009) reported that small-sized individuals primarily consume amphipods and Caridea shrimps, but fish prey items became dominant in the individual diets, exceeding 25 cm in standard length. Jeong et al. (2015) also reported that juvenile *L. japonicus* (<12 cm SL) inhabiting estuarine systems feed on some freshwater and estuarine fishes but their main prey items were copepods and Caridea shrimps, suggesting that some individuals rely on estuarine fish prey items prior to recruitment into coastal marine habitats. In conjunction with these findings, *L. japonicus* in this study exhibited a high proportion of fish prey at individual sizes over 45 cm TL, indicating a piscivorous feeding pattern after

the ontogenetic transition. Consequently, these results support that *L. japonicus* can be classified as a secondary piscivore, characterized by a gradual shift from crustacean-based diets to fish prey as body size increased. This interpretation is further supported by size-related increases in SCI and TROPH values, indicating that both feeding intensity and trophic positioning tend to increase progressively with growth. Such ontogenetic dietary shifts reflect morphological and functional development that enables the exploitation of larger and mobile prey items, representing an adaptive life-history strategy to maximize net energy gain during growth (Juanes et al. 2002; Ohlberger et al. 20 11; Jacobson et al. 2018).

The increase in Teleostei consumption and the corresponding decline in Caridea shrimp prey during the spawning period may reflect a shift toward higher-energy prey items in response to elevated energetic demands associated with reproduction (Lawson et al. 2018; Volkoff and London 2018). In addition, a pronounced reduction in stomach fullness (i.e., SCI value) indicates a decline in overall feeding intensity in relation to spawning behavior, a pattern that has been widely reported in Teleostei fishes during reproductive phases (Wootton 1998; McBride et al. 2015). Such reductions are generally attributed to increased energetic investment in gonadal development and the trade-off between somatic maintenance and reproduction (Jobling 1994; Roff 2002), as well as physical constraints associated with gonadal enlargement that limit abdominal capacity for food intake (Hyslop 1980; Cortés 1997). As the gonads enlarge, they occupy a greater volume within the abdominal cavity, thereby reducing the space available for stomach contents and consequently constraining feeding activity (Bond 1979; Balanov et al. 2006; Souza et al. 2015). Reduced feeding activity associated with reproduction has been reported not only in *L. japonicus* but also in other Teleostei, including *Lycodes tanakae* Jordan et Thompson, 1914 and *Hypomesus transpacificus* McAllister, 1963 (see Choi et al. 2013; Jenkins et al. 2023). Following spawning, gonadal regression increases abdominal space, allowing individuals to intensify feeding and replenish energy reserves depleted during reproduction. Therefore, while shifts toward energetically richer prey may occur during the spawning period, the reduced SCI suggests that spawning individuals compensate for lower feeding activity rather than altering their fundamental feeding strategy (Lowerre-Barbieri et al. 2011; McBride et al. 2015). Taken together, these results indicate that reproductive processes primarily influence feeding intensity and the relative contribution of prey groups, while the overall trophic niche of *L. japonicus* remains relatively stable across reproductive periods.

Conclusion

This study demonstrates that *Lateolabrax japonicus* is a specialized piscivorous predator exhibiting clear ontogenetic and seasonal shifts in diet, reflecting its high trophic position and ecological flexibility across coastal ecosystems. These feeding patterns highlight the importance of considering trophic interactions and habitat connectivity when evaluating the ecological role and population dynamics of this species. The results of this study provide essential baseline information for ecosystem-based fisheries management by emphasizing the need to integrate coastal, estuarine, and freshwater habitats into management frameworks. In particular, long-term monitoring of key prey species can serve as an effective tool for assessing trophic linkages, ecosystem changes, and the sustainable management of *L. japonicus* resources.

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