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Predation of the Japanese Keelback, *Hebius vibakari* (Boie, 1826), by the Ussuri Pitviper, *Gloydius ussuriensis* (Emelianov, 1929) in South Korea, with remarks on prey size

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A basic knowledge of diet in pitvipers is important to better understand many aspects of their biology, including venom composition (Holding et al., 2021; Mason et al., 2022; Smith et al., 2023). The Ussuri Pitviper, *Gloydius ussuriensis* (Emelianov, 1929), is a small-bodied, medically relevant terrestrial species distributed widely across northeastern China, the Russian Far East, and the Korean Peninsula (Shin et al., 2021a; 2025; Lee et al., 2023). It is a generalist species known to consume a variety of prey types, including small mammals, amphibians, reptiles, and invertebrates (Kim and Oh, 2014; Shin et al., 2021b; Lee et al., 2023). While the overall types of prey consumed by this species is known, other ecologically important information, such as prey size and prey weight, has remained unavailable due to a lack of published accounts and focused dietary studies.

At 16:40h on 18 June 2025, I collected a male *G. ussuriensis* with a large food bolus at Seogwipo Recreational Forest, Jeju Island, South Korea (33.3125°N, 126.4596°E, elevation 714 m, WGS 84). I humanely euthanised it with a cardiac injection of tricaine methanesulfonate (MS-222) for the collection of blood and liver tissue for genetic analyses. In doing so, I also excised the stomach and retrieved the content, which was ingested head-first. I identified the prey species as *Hebius vibakari* (Boie, 1826) based on olive-brown dorsal body colouration and strongly keeled dorsal scales (Lee et al., 2023). I fixed both specimens with 10% buffered formalin and later transferred them to 70% ethanol for long-term preservation. I deposited both specimens in the herpetology collections of the American Museum of Natural History (AMNH) under the field numbers AMNH 21054 for *G. ussuriensis* and AMNH 21055 for *H. vibakari* (Fig. 1).

I used a measuring tape to measure the snout-vent length (SVL) and tail length (TL) to the nearest mm and used a digital scale to measure weight to the nearest

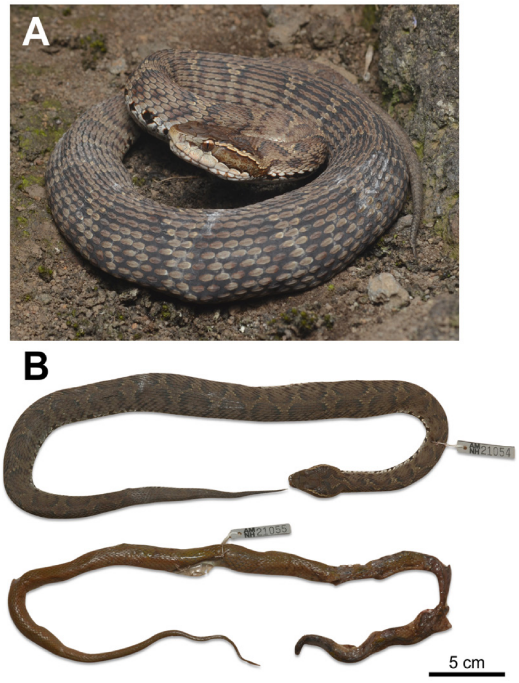

Figure 1. (A) A male *Gloydius ussuriensis* (field number AMNH 21054) collected from Seogwipo Recreational Forest, Jeju Island, South Korea in life with a large food bolus. (B) The *G. ussuriensis* (top) and its stomach content, *Hebius vibakari* (field number AMNH 21055; bottom). Note the almost equivalent lengths of the two specimens. Photos by Yucheol Shin.

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gram. The female *H. vibakari* (AMNH 21055) was partially digested with the head missing, but the tail was intact. The length measured from the anterior tip to the vent was 390 mm and TL was 120 mm, and the weight measured at 32 g. On the other hand, the *G. ussuriensis* (AMNH 21054) had an SVL of 430 mm, TL of 80 mm, and weight of 77 g without its stomach content. This suggests that this *H. vibakari* had a total body length longer than that of *G. ussuriensis* that consumed it. The relative prey weight was 41.5% and the relative prey length was 118.6% (*H. vibakari* total length / *G. ussuriensis* SVL) and 100.0% (*H. vibakari* total length / *G. ussuriensis* total length). However, considering that the *H. vibakari* was already partially digested, the actual relative prey weight and length should be greater than the estimated values.

While predation of *H. vibakari* by *G. ussuriensis* on Jeju Island has been reported previously (Kim and Oh, 2014), this observation is notable for the relative size of the consumed prey item. The relative prey length and weight reported herein are greater than, or comparable to, the values reported from other snake species, including other pitviper species. For example, a published observation on the Pygmy Rattlesnake (*Sistrurus miliarius*) reported prey length relative to SVL of 79.6% and relative prey weight of 38.6% (Balchan et al., 2025), and relative prey weight of 50.9% has been reported for the Timber Rattlesnake (*Crotalus horridus*; Whitlock et al., 2024). While such information for *G. ussuriensis* has not been available prior to this observation, Kim and Oh (2014) noted positive correlation between head size and prey diameter in *G. ussuriensis* population from Jeju Island, and some of its prey species are known to have considerably larger body sizes on Jeju Island (e.g., *Hyla japonica*; Jang et al., 2011). Therefore, further studies are needed to test whether this island population consumes on average larger prey items than their mainland counterparts.

Overall, snakes do not seem to comprise major prey items for *G. ussuriensis*, with previous studies reporting a higher proportion of amphibians, small mammals, and centipedes in their diet (Kim and Oh, 2014; Choi et al., 2022). *Hebius vibakari* is currently the only documented snake species in the diet of *G. ussuriensis* and likely to be one of few snake species that could be consumed by *G. ussuriensis* considering its small adult body size. To the best of my knowledge, this is the first report on the relative prey size for *G. ussuriensis*, and it represents a useful starting point to better understand the dietary ecology of this species. Future work is also needed to determine the diversity and prevalence of snake species consumed by *G. ussuriensis*. Such information will be useful for informing other studies related to diet, such as investigations on venom function and prey handling.

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