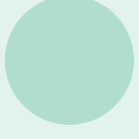
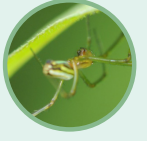


# Field Photography of Korean Spiders: Diversity and Distribution

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## 01

## Introduction

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Living organisms face several challenges as a result of climate change and habitat destruction. Distributions and communities of organisms are changing rapidly, and many species have become extinct. Some biologists consider modern times as one of the eras of mass extinction. Therefore, investigating the worldwide status of various organisms is necessary to understand the patterns of diversity and changes to these patterns due to climate change and habitat destruction. Arthropods, other than butterflies, are surveyed by collecting them. This is because there are too many species and it is difficult to identify them in the field. However, the problem with surveys that involve specimen collection is that many creatures must be killed for the investigation. Although arthropods are very small, they are also creatures with the right to live.

Hence the question, is it possible to study biodiversity through photographs taken in the field? This study was conducted on spiders to answer this question. Spiders have evolved about 400 million years ago, and 48,450 species are known worldwide (World Spider Catalog Association 2020), of which 748 species have been reported in South Korea (Yoo et al. 2015). Unlike insects that have a wide variety of foods such as plants, litters, and other insects, spiders are all predatory and mainly eat insects and other arthropods. Spiders are therefore a major natural enemy of pest control. In this study, we focused on determining whether the results of photographic surveys are appropriate for researching diversity. First, we examined whether the spiders surveyed and identified by photographs were significantly clustered by region. Second, we investigated whether the number of photographed species is correlated with the number of recorded species in South Korea. The correlation should be positive if the photographic surveys represent the diversity of Korean spiders. In addition, we have described the distribution and characteristics of each species. Finally, the Gwangneung area around the National Arboretum is the biodiversity hotspot especially for plants and insects in South Korea. However, spiders in this area have

not been documented to date. A list of spider species has been made from this survey and from the personal collection of CYG.

## 02 Method

Spider surveys were conducted at 68 sites nationwide over 12 years from 2007 to 2019 (Figs. 1 and 2). The sites were grouped into five regions, 1) the Midwestern region; Seoul and Gyeonggi, 2) Youngdong region; the east coast region in Gangwon and Gyeongbuk, 3) Yeongseo region; Baekdudaegan western region in Gangwon, Chungbuk, and Gyeongbuk, 4) southern region; Jeonbuk, Jeonnam, Gyeongnam, and 5) Jeju (Table 1). Four sites located in Gyeonggi and Seoul were surveyed either weekly or monthly, accounting for 14–16 surveys, undertaken either a year or two. The remaining sites were surveyed 1–4 times. The spiders were photographed using a camera (Nikon D300) equipped with a macro lens (Nikon, AF Micro NIKKOR 200 mm 1: 4D). The survey involved walking 1–4 km at a slow pace for 1–4 hours at the site and photographing any spiders that were found. Until 2018, spiders and all other insects were photographed, but in 2019, only spiders were photographed. In 2019, a spider sitting on its web was photographed as it was, after which the spider was placed in a paper cup and photographed again. Once the pictures were taken, the spider was released near her (or his) web. The coordinates of the survey were determined using Google Earth.

Identification of spiders was first performed by KTS using Namgung (2003) and then by CYG based his long experience of spider identification. Records from the survey were then binned as binary data of 1 (presence) and 0 (absence) of a species for each site (Appendix). Multivariate analysis was performed using correspondence analysis (CCA). Four sites in the mid–western region, where a relatively large number of species were observed with several surveys, were treated as separate sites, and the remaining sites were grouped into the identified regions for analysis. The significance

of the CCA model was tested using the 'anova' function in vegan package. The number of species in families that was photographed might be positively correlated with that recorded in South Korea (Yoo et al. 2015). Hence, regression analysis was used to find relationships between the two richness values (previously recorded richness as the dependent variable and photographed richness as an independent variable). In addition, the same analysis was conducted with the data (Kwon et al. 2013) surveyed at about 300 sites nationwide using pitfall traps. The data from pitfall traps are expected to be of low correlation, because they collect spiders that inhabit the ground. In the photographic survey, however, spiders found in vegetation rather than those that live in the ground are more easily recorded. Annual mean temperatures at the sites were determined using a multiple regression temperature model with latitude, longitude, and altitude (Kwon et al. 2012). Distribution maps showing the recorded sites were made for the identified species using ArcGIS 10.5. Statistical analyses were conducted in R (R Core Team 2017).

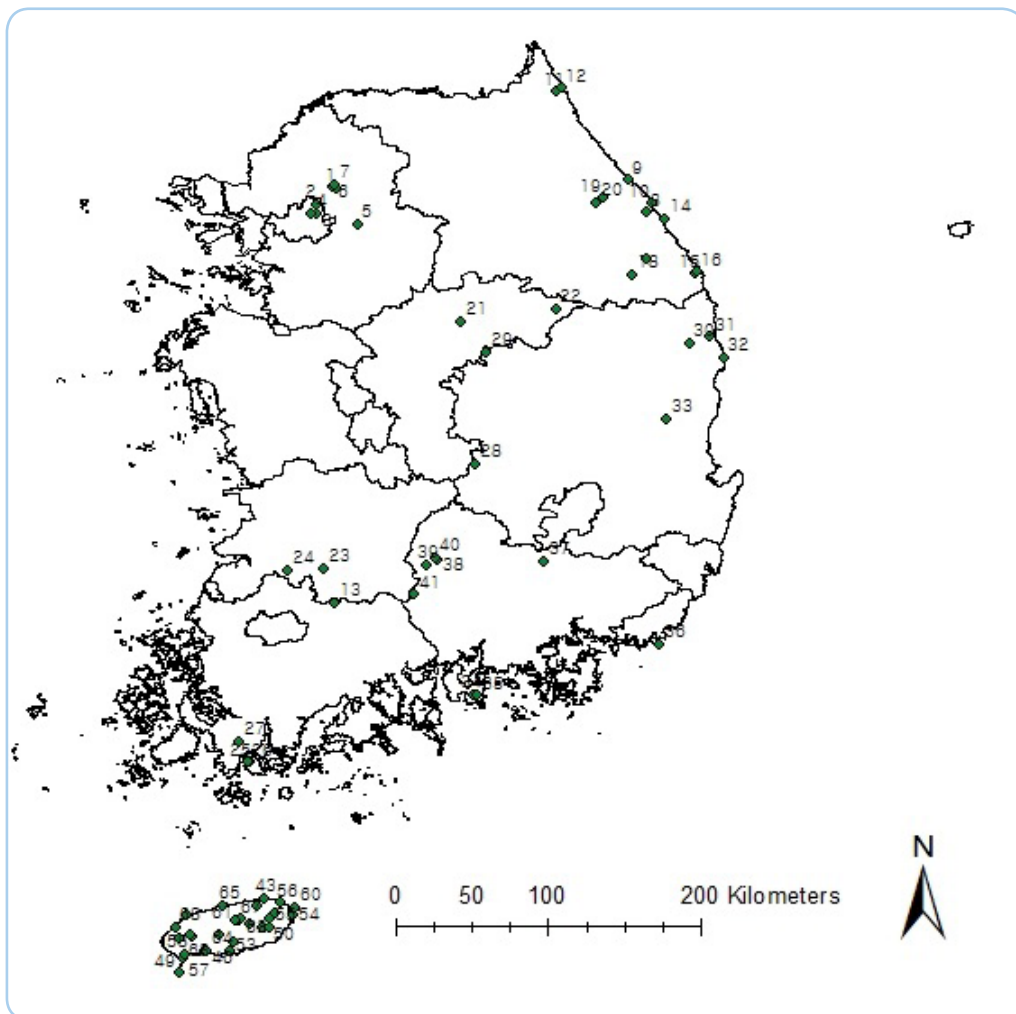


Fig. 1. Sites where spider photographic survey was undertaken in South Korea. The sites on Jeju Island are shown in Fig. 2 on fine scale. Details of the location are given in Table 1.

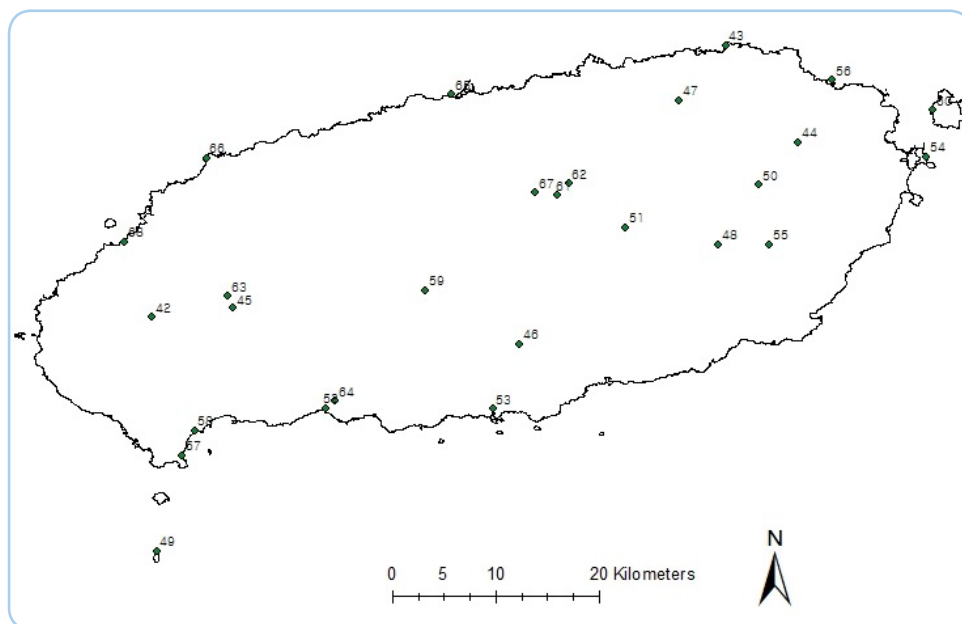


Fig. 2. Sites on Jeju Island where spider photographic surveys were undertaken. The locations are detailed in Table 1.

Table 1. Sites where spider surveys using photos were undertaken in South Korea. Site number is used in the location where the photos were taken and in the distribution maps in Figs. 1 and 2. Temp. is the annual mean temperature calculated by the following regression model (Kwon et al. 2012).  $Temp. = 10.48825 - 0.87007 \times \text{latitude} + 0.25965 \times \text{longitude} - 0.00457 \times \text{altitude}$ . This model was constructed using data from 344 forest sites on a digital climate map with 30 m grid scale ( $R^2 = 0.91$ ,  $p \ll 0.0001$ ; Kwon et al. 2012). Therefore, Temp. for urban is likely to be underestimated.

Region	Province	Couty	Site	Latitude	Longitude	Altitude (m)	Temp. (°C)	site	Date
Mid Western	Gyeonggi	Namyangju	Bongseonsa	37.746135	127.185471	91	10.3	1	2017-05-27
Mid Western	Gyeonggi	Namyangju	Bongseonsa	37.746135	127.185471	91	10.3	1	2017-06-29
Mid Western	Gyeonggi	Namyangju	Bongseonsa	37.746135	127.185471	91	10.3	1	2017-07-20
Mid Western	Gyeonggi	Namyangju	Bongseonsa	37.746135	127.185471	91	10.3	1	2017-07-27
Mid Western	Gyeonggi	Namyangju	Bongseonsa	37.746135	127.185471	91	10.3	1	2017-08-07
Mid Western	Gyeonggi	Namyangju	Bongseonsa	37.746135	127.185471	91	10.3	1	2017-08-17
Mid Western	Gyeonggi	Namyangju	Bongseonsa	37.746135	127.185471	91	10.3	1	2017-08-24
Mid Western	Gyeonggi	Namyangju	Bongseonsa	37.746135	127.185471	91	10.3	1	2017-09-08
Mid Western	Gyeonggi	Namyangju	Bongseonsa	37.746135	127.185471	91	10.3	1	2017-09-15
Mid Western	Gyeonggi	Namyangju	Bongseonsa	37.746135	127.185471	91	10.3	1	2017-09-29
Mid Western	Gyeonggi	Namyangju	Bongseonsa	37.746135	127.185471	91	10.3	1	2017-10-02
Mid Western	Gyeonggi	Namyangju	Bongseonsa	37.746135	127.185471	91	10.3	1	2017-10-13
Mid Western	Gyeonggi	Namyangju	Bongseonsa	37.746135	127.185471	91	10.3	1	2018-08-27
Mid Western	Seoul	Seoul	Nonwon Junggae	37.647719	127.069823	34	10.6	2	2019-05-17
Mid Western	Seoul	Seoul	Danghyencheon	37.593082	127.069533	17	10.7	3	2016-04-23
Mid Western	Seoul	Seoul	Danghyencheon	37.593082	127.069533	17	10.7	3	2017-10-14

Table 1. Continued.

Region	Province	Couty	Site	Latitude	Longitude	Altitude (m)	Temp. (°C)	site	Date
Mid Western	Seoul	Seoul	Danghyencheon	37.593082	127.069533	17	10.7	3	2018-04-02
Mid Western	Seoul	Seoul	Danghyencheon	37.593082	127.069533	17	10.7	3	2018-05-14
Mid Western	Seoul	Seoul	Danghyencheon	37.593082	127.069533	17	10.7	3	2018-05-22
Mid Western	Seoul	Seoul	Danghyencheon	37.593082	127.069533	17	10.7	3	2018-06-04
Mid Western	Seoul	Seoul	Danghyencheon	37.593082	127.069533	17	10.7	3	2018-07-08
Mid Western	Seoul	Seoul	Danghyencheon	37.593082	127.069533	17	10.7	3	2018-07-30
Mid Western	Seoul	Seoul	Danghyencheon	37.593082	127.069533	17	10.7	3	2018-08-10
Mid Western	Seoul	Seoul	Danghyencheon	37.593082	127.069533	17	10.7	3	2018-08-17
Mid Western	Seoul	Seoul	Danghyencheon	37.593082	127.069533	17	10.7	3	2018-08-26
Mid Western	Seoul	Seoul	Danghyencheon	37.593082	127.069533	17	10.7	3	2018-09-28
Mid Western	Seoul	Seoul	Danghyencheon	37.593082	127.069533	17	10.7	3	2018-10-13
Mid Western	Seoul	Seoul	Danghyencheon	37.593082	127.069533	17	10.7	3	2018-10-27
Mid Western	Seoul	Seoul	Hongleung	37.593091	127.043656	34	10.6	4	2016-05-17
Mid Western	Seoul	Seoul	Hongleung	37.593091	127.043656	34	10.6	4	2018-09-27
Mid Western	Seoul	Seoul	Hongleung	37.593091	127.043656	34	10.6	4	2018-10-22
Mid Western	Seoul	Seoul	Hongleung	37.593091	127.043656	34	10.6	4	2019-05-07
Mid Western	Gyeonggi	Yangpyeong	Dumulmeori	37.532186	127.311388	29	10.8	5	2019-06-24
Mid Western	Gyeonggi	Pochon	National Arboretum	37.754571	127.165946	107	10.2	6	2016-04-25
Mid Western	Gyeonggi	Pochon	National Arboretum	37.754571	127.165946	107	10.2	6	2017-04-12
Mid Western	Gyeonggi	Pochon	National Arboretum	37.754571	127.165946	107	10.2	6	2017-05-31
Mid Western	Gyeonggi	Pochon	National Arboretum	37.754571	127.165946	107	10.2	6	2017-06-09
Mid Western	Gyeonggi	Pochon	National Arboretum	37.754571	127.165946	107	10.2	6	2018-06-18
Mid Western	Gyeonggi	Pochon	National Arboretum	37.754571	127.165946	107	10.2	6	2018-09-10
Mid Western	Gyeonggi	Pochon	National Arboretum	37.754571	127.165946	107	10.2	6	2018-10-05
Mid Western	Gyeonggi	Pochon	National Arboretum	37.754571	127.165946	107	10.2	6	2018-10-15
Mid Western	Gyeonggi	Pochon	National Arboretum	37.754571	127.165946	107	10.2	6	2019-04-24
Mid Western	Gyeonggi	Pochon	National Arboretum	37.754571	127.165946	107	10.2	6	2019-05-15
Mid Western	Gyeonggi	Pochon	National Arboretum	37.754571	127.165946	107	10.2	6	2019-06-05
Mid Western	Gyeonggi	Pochon	National Arboretum	37.754571	127.165946	107	10.2	6	2019-07-24
Mid Western	Gyeonggi	Pochon	National Arboretum	37.754571	127.165946	107	10.2	6	2019-08-20
Mid Western	Gyeonggi	Pochon	National Arboretum	37.754571	127.165946	107	10.2	6	2019-09-17
Mid Western	Gyeonggi	Pochon	National Arboretum	37.754571	127.165946	107	10.2	6	2019-10-04
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2017-05-04
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2018-04-13
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2018-04-20
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2018-05-18
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2018-06-08
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2018-06-15
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2018-06-29
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2018-07-06
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2018-07-20
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2018-07-27
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2018-08-06
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2018-08-13
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2018-09-22
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2018-10-01
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2018-10-20

Table 1. Continued.

Region	Province	Couty	Site	Latitude	Longitude	Altitude (m)	Temp. (°C)	site	Date
Mid Western	Gyeonggi	Pochon	Jukyeobsan	37.766168	127.178755	186	9.8	7	2018-10-29
Youngdong	Gangwon	Gangleung	Okgae	37.601511	129.011227	72	10.9	8	2011-06-14
Youngdong	Gangwon	Gangleung	Okgae	37.601511	129.011227	72	10.9	8	2013-06-04
Youngdong	Gangwon	Gangleung	Okgae	37.601511	129.011227	72	10.9	8	2016-06-22
Youngdong	Gangwon	Gangleung	Okgae	37.601511	129.011227	72	10.9	8	2018-09-17
Youngdong	Gangwon	Gangleung	Gyeongpo lake	37.792697	128.905760	0	11.1	9	2019-05-19
Youngdong	Gangwon	Gangleung	Gyeongpo lake	37.652265	129.049819	8	11.2	10	2018-09-18
Youngdong	Gangwon	Goseong	Guseongri	38.313816	128.489751	91	10.1	11	2012-05-11
Youngdong	Gangwon	Goseong	Guseongri	38.313816	128.489751	91	10.1	11	2016-06-21
Youngdong	Gangwon	Goseong	Songjiho	38.332274	128.512515	9	10.5	12	2012-05-12
Youngdong	Gangwon	Goseong	Songjiho	38.332274	128.512515	9	10.5	12	2013-07-19
Youngdong	Gangwon	Goseong	Songjiho	38.332274	128.512515	9	10.5	12	2014-06-04
Youngdong	Gangwon	Goseong	Songjiho	38.332274	128.512515	9	10.5	12	2015-10-10
Youngdong	Gangwon	Goseong	Songjiho	38.332274	128.512515	9	10.5	12	2016-06-21
Youngdong	Jeonnam	Gokseong	KBIL	35.299903	127.175050	105	12.3	13	2019-07-10
Youngdong	Gangwon	Donghae	Eodalhang	37.561743	129.120012	8	11.3	14	2018-09-17
Youngdong	Gangwon	Samcheok	Geombongsan recreation forest	37.238190	129.301022	147	11.0	15	2016-06-23
Youngdong	Gangwon	Samcheok	Geombongsan recreation forest	37.238190	129.301022	147	11.0	15	2018-05-11
Youngdong	Gangwon	Samcheok	Geombongsan recreation forest	37.238190	129.301022	147	11.0	15	2018-10-25
Youngdong	Gangwon	Samcheok	Geombongsan recreation forest	37.238190	129.301022	147	11.0	15	2019-04-04
Youngdong	Gangwon	Samcheok	Geombongsan recreation forest	37.238190	129.301022	147	11.0	15	2019-04-05
Youngdong	Gangwon	Samcheok	Imwon	37.249708	129.309230	125	11.1	16	2007-09-12
Youngdong	Gangwon	Samcheok	Imwon	37.249708	129.309230	125	11.1	16	2011-08-18
Youngdong	Gangwon	Samcheok	Imwon	37.249708	129.309230	125	11.1	16	2012-09-22
Youngdong	Gangwon	Samcheok	Imwon	37.249708	129.309230	125	11.1	16	2014-10-20
Youngdong	Gangwon	Samcheok	Imwon	37.249708	129.309230	125	11.1	16	2015-05-03
Youngdong	Gangwon	Samcheok	Imwon	37.249708	129.309230	125	11.1	16	2016-06-23
Youngdong	Gangwon	Samcheok	around Whanseongul	37.323722	129.014710	354	9.9	17	2018-05-10
Youngseo	Gangwon	Taebaek	Geumryongso	37.230745	128.933410	911	7.4	18	2018-07-31
Youngseo	Gangwon	Pyeongchang	Daegwanlyeong people forest	37.685483	128.761003	852	7.2	19	2019-05-29
Youngseo	Gangwon	Pyeongchang	Olympic trail	37.655554	128.720398	856	7.2	20	2019-05-28
Youngseo	Chungbuk	Chungju	Hoam lake	36.960791	127.922450	95	11.1	21	2018-06-19
Youngseo	Chungbuk	Danyang	Guinsa	37.031839	128.480060	488	9.4	22	2018-06-21
Southern	Jeonbuk	Sunchang	Himusan reacreation forest	35.502875	127.113889	452	10.5	23	2019-07-11
Southern	Jeonbuk	Jeongeup	Naejangsa	35.488627	126.905068	217	11.6	24	2019-07-11
Southern	Jeonnam	Wando	Wando LTER	34.360100	126.675200	270	12.2	25	2019-05-24
Southern	Jeonnam	Wando	Wando Arboretum	34.360140	126.664380	77	13.1	26	2019-05-24
Southern	Jeonnam	Haenam	Daeheungsa	34.478938	126.613812	128	12.8	27	2019-05-25
Youngseo	Gyeongbuk	Gimcheon	Jikjisa	36.116023	128.007262	193	11.4	28	2018-04-03
Youngseo	Gyeongbuk	Gimcheon	Jikjisa	36.116023	128.007262	193	11.4	28	2018-05-08
Youngseo	Gyeongbuk	Mungyeong	Mungyengasejae	36.775598	128.067847	290	10.4	29	2018-06-20
Youngseo	Gyeongbuk	Yeongyang	Firefly Ecological Forest	36.829500	129.268742	304	10.6	30	2018-08-01
Youngseo	Gyeongbuk	Uljin	Hyunjonsan	36.866767	129.392691	345	10.4	31	2007-05-04
Youngseo	Gyeongbuk	Uljin	Wolsongjeong	36.743709	129.468295	10	12.1	32	2018-08-03
Youngseo	Gyeongbuk	Cheongsong	Juwansan village	36.383857	129.135613	272	11.1	33	2018-08-02
Southern	Gyeongnam	Namhae	Namhae LTER	34.759592	127.990750	428	11.5	34	2018-05-30
Southern	Gyeongnam	Namhae	Pyenbaek recreation forest	34.751835	128.017684	131	12.9	35	2018-05-31

Table 1. Continued.

Region	Province	Couty	Site	Latitude	Longitude	Altitude (m)	Temp. (°C)	site	Date
Southern	Gyeongnam	Namhae	Pyeonbaek recreation forest	34.751835	128.017684	131	12.9	35	2018-05-31
Southern	Pusan	Busan	Taejongdae	35.055226	129.088549	144	12.8	36	2019-07-09
Southern	Pusan	Busan	Taejongdae	35.055226	129.088549	144	12.8	36	2019-07-09
Southern	Gyeongnam	Changnyeong	Upo wetland	35.547236	128.411312	9	12.9	37	2018-04-03
Southern	Gyeongnam	Changnyeong	Upo wetland	35.547236	128.411312	9	12.9	37	2018-05-29
Southern	Gyeongnam	Hamyang	Namgaeseowon	35.549015	127.783670	155	12.0	38	2019-05-23
Southern	Gyeongnam	Hamyang	Sanglim	35.523745	127.719782	172	12.0	39	2019-05-23
Southern	Gyeongnam	Hamyang	Ildugotaek	35.566263	127.768310	173	11.9	40	2019-05-23
Southern	Gyeongnam	Hamyang	Jirisan recreation forest	35.346714	127.642857	618	10.1	41	2019-05-23
Jeju	Jeju	Jeju	goj-jawal	33.323469	126.263668	133	13.7	42	2017-09-19
Jeju	Jeju	Jeju	Gimnyeong coast	33.559680	126.762443	3	14.2	43	2017-09-20
Jeju	Jeju	Jeju	Gimnyeong coast	33.559680	126.762443	3	14.2	43	2018-10-11
Jeju	Jeju	Jeju	Daranshi oreum	33.475250	126.825336	211	13.3	44	2018-10-04
Jeju	Jeju	Jeju	Dang oreum	33.331912	126.333898	385	12.5	45	2018-10-04
Jeju	Jeju	Jeju	Donnaeko	33.300210	126.583583	263	13.2	46	2016-10-02
Jeju	Jeju	Jeju	Dongbaek dongsan	33.512365	126.721831	144	13.6	47	2018-10-07
Jeju	Jeju	Jeju	Ttarabi oreum	33.387163	126.755947	275	13.1	48	2018-10-07
Jeju	Jeju	Jeju	Marado	33.120637	126.267120	12	14.4	49	2018-10-03
Jeju	Jeju	Jeju	Marado	33.120637	126.267120	12	14.4	49	2018-10-03
Jeju	Jeju	Jeju	Baekyagi oreum	33.438546	126.791841	318	12.9	50	2018-10-10
Jeju	Jeju	Jeju	Bulgeun oreum recreation forest	33.401622	126.675078	455	12.2	51	2016-10-06
Jeju	Jeju	Jeju	Bulgeun oreum recreation forest	33.401622	126.675078	455	12.2	51	2017-04-19
Jeju	Jeju	Jeju	Saekdal coast	33.244787	126.414031	18	14.3	52	2018-10-08
Jeju	Jeju	Jeju	Seogwipo	33.244003	126.559768	14	14.4	53	2017-04-23
Jeju	Jeju	Jeju	Seogwipo	33.244003	126.559768	14	14.4	53	2017-04-24
Jeju	Jeju	Jeju	Seongsan	33.462893	126.937011	22	14.2	54	2018-10-07
Jeju	Jeju	Jeju	Seongeup folk village	33.386516	126.800266	123	13.8	55	2018-10-06
Jeju	Jeju	Jeju	Sehwa breakwater	33.529580	126.855214	1	14.2	56	2018-10-04
Jeju	Jeju	Jeju	Songaksan	33.203732	126.289685	31	14.2	57	2017-04-22
Jeju	Jeju	Jeju	Songaksan	33.203732	126.289685	31	14.2	57	2018-10-08
Jeju	Jeju	Jeju	Songak coast	33.225459	126.300238	3	14.4	58	2018-10-09
Jeju	Jeju	Jeju	Youngsil	33.346792	126.500834	1314	8.3	59	2017-04-19
Jeju	Jeju	Jeju	Youngsil	33.503369	126.942671	4	14.3	60	2017-04-20
Jeju	Jeju	Jeju	Jeolmul Smoru forest trail	33.429668	126.615892	635	11.4	61	2017-09-21
Jeju	Jeju	Jeju	Jeolmul recreation forest	33.439803	126.625770	550	11.8	62	2017-05-26
Jeju	Jeju	Jeju	Jeolmul oreum	33.342033	126.329376	362	12.6	63	2016-10-03
Jeju	Jeju	Jeju	Jeolmul oreum	33.342033	126.329376	362	12.6	63	2018-10-09
Jeju	Jeju	Jeju	Jungmun village	33.250603	126.422779	96	13.9	64	2018-10-08
Jeju	Jeju	Jeju	Tapdong	33.517032	126.524004	8	14.1	65	2017-09-19
Jeju	Jeju	Jeju	Handam coast	33.461609	126.310521	4	14.2	66	2018-10-02
Jeju	Jeju	Jeju	Hanla ecology forest	33.431880	126.597079	573	11.7	67	2018-10-10
Jeju	Jeju	Jeju	Hanlim park	33.389438	126.239504	14	14.2	68	2018-10-09



## 03

## Results and Discussion

### Diversity

A total of 147 species belonging to 17 families were observed (Table 2, Appendix 1). Among them, 68 species were identified up to the species level, and the species identification rate was only 46%. As the species identification rate, Lycosidae, Thomisidae, and Pisauridae were the most identified at 60% or higher. The identification rate for the families, Philodromidae, Salticidae, and Tetragnatidae was also relatively high (>40%). The species of these families are characterized by their relatively large size with conspicuous morphologies and being relatively active during the day. On the other hand, the families Gnaphosidae and Pholcidae, which includes species that are mainly active at night or are found mostly hiding in dark places, have very low species identification rates. In the case of spiders, for many species, male and female genitalia are used in identification, and so, few species can be identified from photographs. Table 3 compares the photographic survey with the collection survey. CYG and Jaewon Kim collected spiders in various biotopes at the National Arboretum for two hours on May 25, 2019, by shaking litters, sweeping over vegetation layers using insect nets, and catching those that they observed in the built area. Thirty eight species were collected, which were higher than that (31 species) noted from the photographic survey, the effort for which included sampling more than a dozen times at three sites. Therefore, investigating spider diversity using photographs is inefficient in terms of species identification than collecting them. Nevertheless, it could be used to monitor population changes in species that can be identified from photographs. The total number of species found in the Gwangneung area (1, 6, and 7) in this survey was 55, including unidentified species (Appendix 1). Although the Gwangneung area is a region of very high diversity, there has been no documentation of spiders, and Table 3 is the first species list to be published.

Table 2. Number of spider species recorded in the photographic survey

Family	Unidentified		Identified		Total
	no	no	%		
Pholcidae	3	0	0.0		3
Theridiidae	11	6	35.3		17
Linyphiidae	5	3	37.5		8
Tetragnatidae	3	2	40.0		5
Araneidae	13	14	51.9		27
Lycosidae	6	9	60.0		15
Pisauridae	1	2	66.7		3
Oxyopidae	1	1	50.0		2
Ctenidae	0	1	100.0		1
Agelenidae	3	2	40.0		5
Titanoecidae	0	1	100.0		1
Phrurolithidae	1	1	50.0		2
Gnaphosidae	4	1	20.0		5
Sparassidae	1	0	0.0		1
Philodromidae	3	4	57.1		7
Thomisidae	4	6	60.0		10
Salticidae	19	15	44.1		34
Unidentified	1	0	0.0		1
<b>Total</b>	<b>79</b>	<b>68</b>	<b>46.3</b>		<b>147</b>

Table 3. List of spider species in the Gwangneung area. Collection survey was conducted by CYG and Jaewon Kim for two hours in the National Arboretum (6) on 25 May 2019. Details of sites (1, 6, 7) are given Table 1. The latter "1" indicates presence.

Family	Species	Photographical survey			Collection
		1	6	7	6
Pholcidae	<i>Pholcus woongil</i>				1
Uloboridae	<i>Octonoba varians</i>				1
Theridiidae	<i>Nihonhimea japonica</i>		1		
	<i>Paidiscura subpallens</i>				1
	<i>Parasteatoda tabulata</i>				1

Table 3. Continued.

Family	Species	Photographical survey			Collection
		1	6	7	6
	<i>Parasteatoda tepidariorum</i>		1		1
	<i>Phycosoma mustelinum</i>				1
	<i>Rhomphaea sagana</i>				1
	<i>Stemmops nipponicus</i>				1
	<i>Takayus latifolius</i>				1
	<i>Yunohamella subadulta</i>				1
Linyphiidae	<i>Doenitzius pruvus</i>				1
	<i>Neriere albolimbata</i>				1
	<i>Neriere longipedella</i>		1		
	<i>Nippononeta projecta</i>				1
	<i>Syedra oii</i>				1
Tetragnatidae	<i>Leucauge celebesiana</i>				1
	<i>Tetragnatha shinanoensis</i>				1
Araneidae	<i>Araneus ventricosus</i>		1		
	<i>Argiope bruennichi</i>	1	1	1	
	<i>Argiope minuta</i>		1		
	<i>Cyclosa japonica</i>		1		
	<i>Cyclosa octotuberculata</i>				1
	<i>Cyclosa sedeculata</i>				1
	<i>Gasteracantha kuhli</i>		1		
	<i>Mangora crescopicta</i>		1		1
	<i>Mangora herbeoides</i>				1
	<i>Neoscona pseudonautica</i>				1
	<i>Neoscona scylla</i>		1	1	
	<i>Nephila clavata</i>	1	1	1	
	<i>Plebs sachalinensis</i>				1
Lycosidae	<i>Arctosa kwangreungensis</i>		1		1
	<i>Arctosa subamylacea</i>			1	
	<i>Arctosa subamylacea</i>		1	1	
	<i>Pardosa astrigera</i>	1		1	

Table 3. Continued.

Family	Species	Photographical survey			Collection
		1	6	7	6
	<i>Pardosa brevivulva</i>				1
	<i>Pardosa herbosa</i>				1
	<i>Pirata subpiraticus</i>	1			
Pisauridae	<i>Dolomedes sulfureus</i>		1	1	1
	<i>Pisaura lama</i>	1		1	
Ctenidae	<i>Anahita fauna</i>				1
Agelenidae	<i>Agelena limbata</i>	1	1		
Phrurolithidae	<i>Phrurolithus pennatus</i>	1			
	<i>Phrurolithus sinicus</i>				1
Gnaphosidae	<i>Drassyllus biglobus</i>				1
	<i>Gnaphosa potanini</i>				1
Philodromidae	<i>Philodromus spinitarsis</i>				1
Thomisidae	<i>Diaea subdola</i>		1		
	<i>Oxytate parallela</i>		1		
	<i>Oxytate striatipes</i>		1		1
	<i>Xysticus ephippiatus</i>				1
Salticidae	<i>Asianellus festivus</i>			1	
	<i>Evarcha albaria</i>		1		
	<i>Evarcha coreana</i>				1
	<i>Hakka himeshimensis</i>		1		
	<i>Heliophanus ussuricus</i>			1	
	<i>Marpissa milleri</i>		1		
	<i>Neon reticulatus</i>			1	
	<i>Orienticius vulpes</i>		1		
	<i>Phintella abnormis</i>		1		
	<i>Phintella abnormis</i>			1	
	<i>Phintella cavaleriei</i>				1
	<i>Rhene atrata</i>				1
	<i>Sibianor pullus</i>				1
	<i>Synagelides agoriformis</i>				1
<b>Number of species</b>		<b>7</b>	<b>23</b>	<b>12</b>	<b>38</b>

Table 4. Number of spider species recorded in South Korea (Yoo et al. 2015), photographic survey (this study), and pitfall trap survey (Kwon et al. 2013).

Family	Recorded	Photo	Pitfall
Pholcidae	23	3	0
Theridiidae	85	17	22
Linyphiidae	96	8	41
Tetragnatidae	26	5	4
Araneidae	74	27	16
Lycosidae	49	15	18
Pisauridae	7	3	5
Oxyopidae	3	2	0
Ctenidae	1	1	1
Agelenidae	41	5	15
Titanoecidae	1	1	1
Phrurolithidae	10	2	4
Gnaphosidae	56	5	20
Sparassidae	4	1	2
Philodromidae	19	7	5
Thomisidae	46	10	13
Salticidae	65	34	27

Table 4 compares the number of species previously recorded in South Korea (Yoo et al. 2015) with those identified in this survey, and the number of species identified from surveys in over 300 forests nationwide using pitfall traps (Kwon et al. 2013). Comparing the number of species within families, this study shows a significant correlation between the number of species recorded and those of the pitfall trap survey (Recorded species  $F_{1,15} = 13.4$ ,  $R^2 = 0.44$ ,  $p = 0.002$ ; Pitfall trap survey,  $F_{1,15} = 7.98$ ,  $R^2 = 0.3$ ,  $p = 0.013$ ). The number of previously recorded species and those of the pitfall trap show a very high correlation ( $F_{1,15} = 12.55$ ,  $R^2 = 0.84$ ,  $p \ll 0.0001$ ). It is likely that the patterns of diversity in the photographic survey represent the diversity pattern of spiders. The significant correlation with the pitfall trap results was not as expected as pitfall traps tend to capture spiders that are active on the ground, while photograph survey is likely to have accounted for spiders that are active in the vegetation. The

high correlation between the previously recorded and the pitfall traps was also unexpected. As the taxonomists who recorded spiders collect spiders by catching by sights, sweeping over vegetation, and shaking litters, richness of the species previously recorded by taxonomists was not expected to have high correlation with that of pitfall traps, which mainly collect spiders actively foraging over the ground.

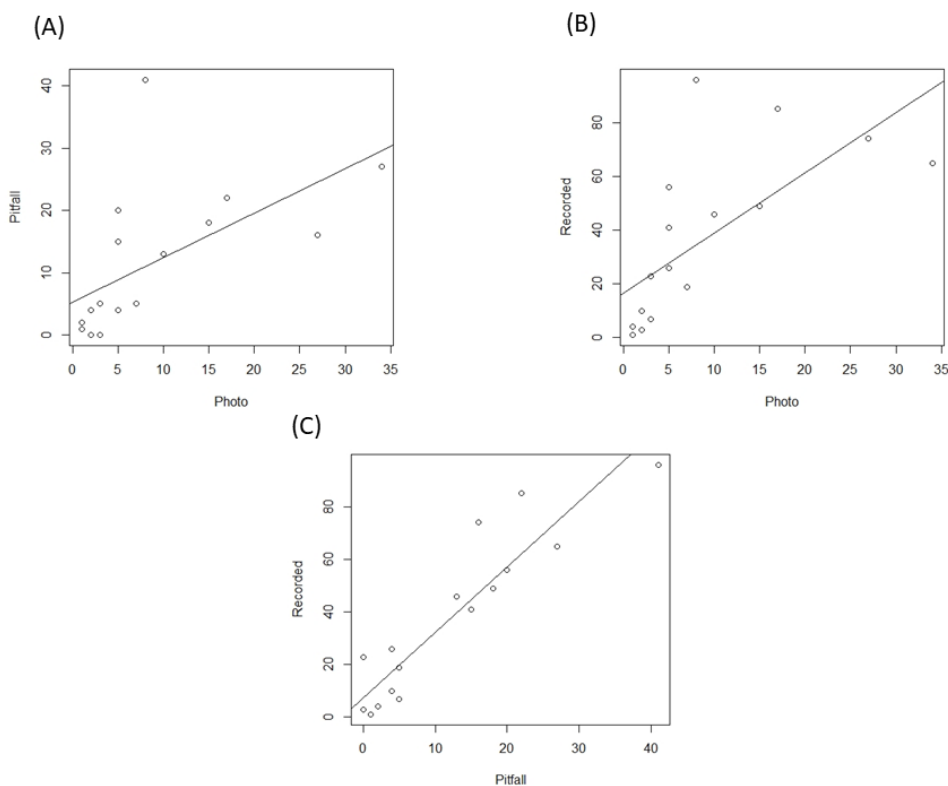


Fig. 3. Correlation of species richness (richness of families) of spiders between the pitfall trap survey (Kwon et al. 2013) and the photographic survey (A), between the recorded species in South Korea (Yoo et al. 2015) and the photographic survey (B), and between the recorded species in South Korea and the pitfall trap survey (C). The data in Table 4 were used for this figure and regression analysis. The results of the regressions are detailed in text.

Multivariate analysis of spider communities using CCA (Fig. 4) showed that the model was significant when all species were included ( $F_{5,2} = 1.09$ ,  $p = 0.031$ ), but

was not significant when singleton species were excluded ( $F_{5,2} = 1.12$ ,  $p = 0.183$ ). In general, due to the high effects of chance on the collection and recording of singleton species, these species are often excluded from multivariate analysis. In this study, however, the inclusion of singleton species is more reliable. The results of the CCA were somewhat in line with expectations. First, Jeju Island is far from the inland, which is reflected the Jeju spider fauna (species composition) very different. In the inland region, three sites in the mid-western region (Gwangneung region) were separated from other regions. Danghyeoncheon in Seoul was separated from the Gwangneung area, but was closer to the fauna of the southern region. Regarding the influence of environmental factors, the region was not significant but the temperature was marginally significant (Adonis, region,  $F_4 = 1.03$ ,  $R^2 = 0.55$ ,  $p = 0.39$ ; temperature,  $F_1 = 1.33$ ,  $R^2 = 0.18$ ,  $p = 0.087$ ). In Seoul, spider fauna is likely to be influenced by the increased temperature due to the effect of urban heat islands. The results of the CCA indicate that the photographic survey can be used to determine the distribution pattern of spider (species composition). To date, there have been no results of ordination analysis in terms of national comparison of spider assemblages in South Korea. Similar results are expected to be obtained using data collected using standardized investigation methods such as pitfall traps.

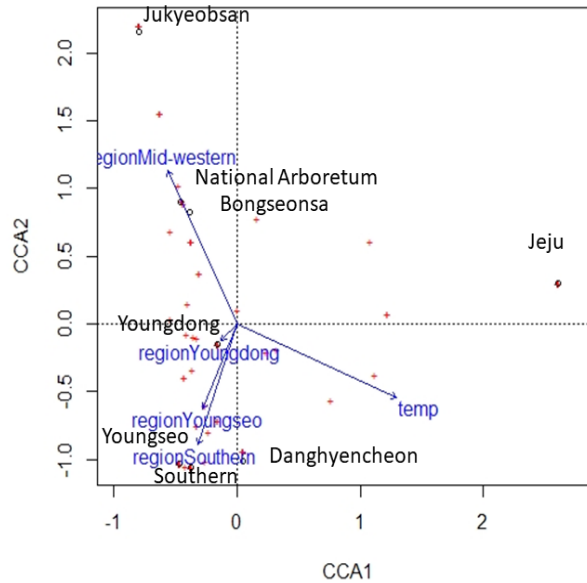


Fig. 4. Correspondence Analysis of spider communities recorded by the photographic survey. Four sites (Jukeopsan, National Arboretum, Bonsensa, and Danghyencheon) in the mid–western regions where many surveys were undertaken are separately analyzed. Other sites were grouped into regions. Circles indicate sites or regions, and crosses indicate species.

## Distribution

Of the 147 species recorded in the photography survey, the number of singleton species recorded at only one site was 102, accounting for 69% of the total number of species recorded, which was very high (Fig. 5). In contrast, only 3% (4 species) were found at more than seven sites, and more than 10% of the survey sites. In general, common species are rare (low richness) and rare species are common (high richness) (Gaston and Blackburn 2000). The species recorded at most sites was *Nephila clavata* (29 sites, 43%), and the next most common species was *Araneus ventricosus* (12 sites, 18%). Although *Araneus ventricosus* is more common than most other species, our personal observation suggests that its population size has reduced considerably. Forty to fifty years ago, the webs of this species hung high in the sky could be easily seen everywhere. Because of the strong webs, children used web-rolled net to catch dragonflies. This species was common in the cities as well as in the countryside.



However, nowadays, the nets spread widely in the air are hard to find, and even if found, the nets are found in some corners. Large-sized individuals were observed only in some sites (Samcheok, Uljin, and Jeju) during the survey.

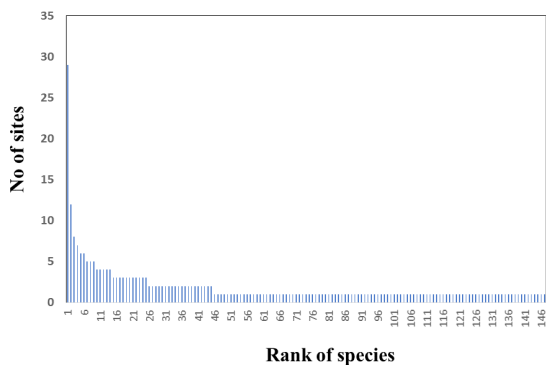


Fig. 5. Number of sites from commonest spider species to rarest species recorded in the photographic survey.

*Nephila clavata* was the most common species recorded in this study. However, given the lack of past data, it is not known that this species was the most common in the past. This species was found most frequently in the woods, outside the woods, in grassland, in the gardens, in wetlands, and on beach shrublands. More than 90% of spiders observed after August at the National Arboretum were this species. Thus, this species is not only common but also very abundant. Why are *Nephila clavata* so many and common? What strengths lead to their success? A couple of large and fatty female and small and thin male are often in the net together. In Jungmun village, Jeju Island, there were dozens of adult females and males in a large net in one neighborhood. Does this species have sociality? *Hakka himeshimensis* is known to be found mainly in coastal breakwater, rocks, and on ships (Lee 2012, Namkung J 2003). It is noteworthy that we found one male in the Jugyeobsan of Pocheon, indicating that this species inhabits forests as well as coastal area. In following section, the distribution of each species along with a description of the species following Namkung (2003), is provided. Locations of sites (number) in photos are shown in Figs 1 and 2, and Table 1.

Pholidae 유령거미과

*Pholcus* sp. 1



13 (2019.7.10.)

Recorded sites: 13

*Pholcus* sp. 2



4 (2018.9.27.)

Recorded sites: 4

Pholidae 유령거미과

*Pholcus* sp. 3



24 (2019.7.11.)

Recorded sites: 24

*Chikunia albipes* 삼각점연두꼬마거미

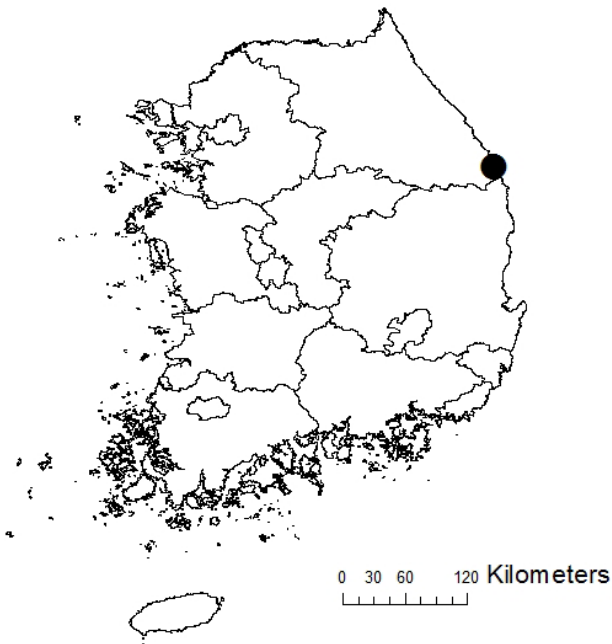


15 (2016.6.23.)

Recorded sites: 15

Distribution: Russia, China, Korea, Japan

Notes: Female: 2.5–3.5 mm. Male: 1.5–2 mm. Abdomen triangular with a pointed end. Tan or black in color. They build net under the hardwood leaves. Mothers protect egg sacks. This species has been collected at a site with an annual mean temperature of 12.2°C by the national survey using pitfall traps (Kwon et al. 2013).



Theridiidae 꼬마거미과

*Episinus nubilus* 민마름모거미



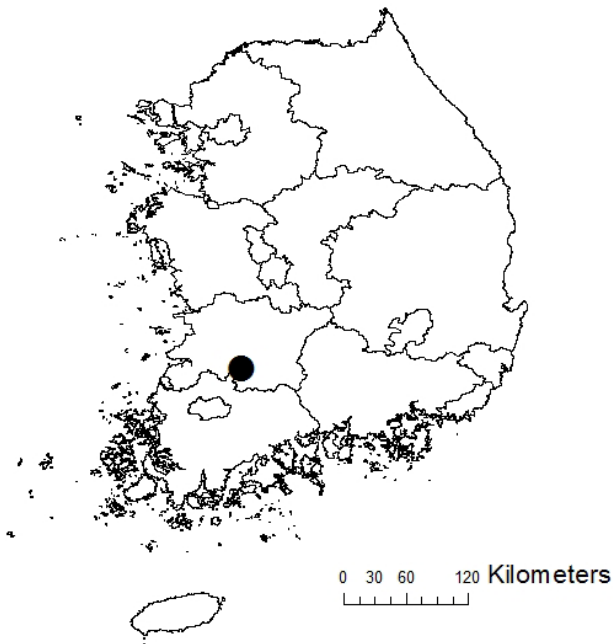
23 (2019.7.11.)

Recorded sites: 23

Distribution: China, Korea, Taiwan, Japan

Notes: Female: 4–5 mm. Male: 3–4 mm.

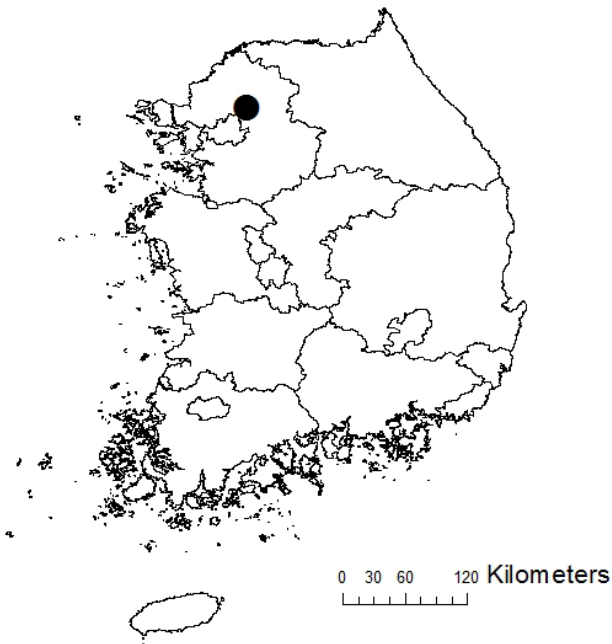
Back of abdomen wide and angled. Black or brown. Legs black and white. An X-shaped web is built between the vegetation and stone wall. This species has been collected widely in Gangwon, Chungbuk, Gyeongsang, Jeonnam by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 7.3–13.8°C with an average of 10.8°C.



*Nihonhimea japonica* 점박이꼬마거미



6 (2019.8.20.)



Recorded sites: 6

Distribution: China, Laos, Taiwan, Korea, Japan

Notes: Female: 4–5 mm, Male: 2–3 mm.

This species is reddish brown in color with reddish brown abdomen, with black and white stripes. The legs are black. They build irregular nets between branches. They move stealthily on fallen leaves, and bark. This species has been collected at sites (143, 144, 218, 265, and 357) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 8.7–13.1°C with average of 10.3°C.

Theridiidae 꼬마거미과

*Parasteatoda kompsonis* 석점박이꼬마거미



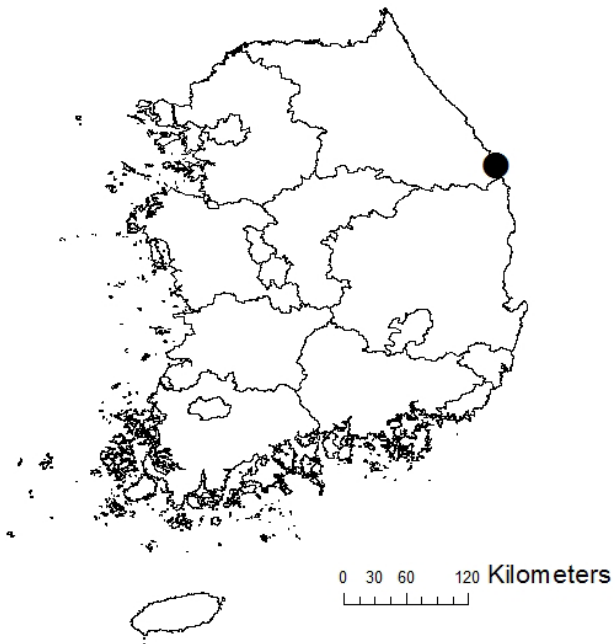
16 (2012.9.22.)

Recorded sites: 16

Distribution: China, Korea, Japan

Notes: Female: 3.5–4.5 mm. Male: 2.5–3 mm.

This spider has three black dots on the abdomen. Their webs are characterized by irregular netting between branches or leaves.





*Parasteatoda tabulata* 큰종꼬마거미



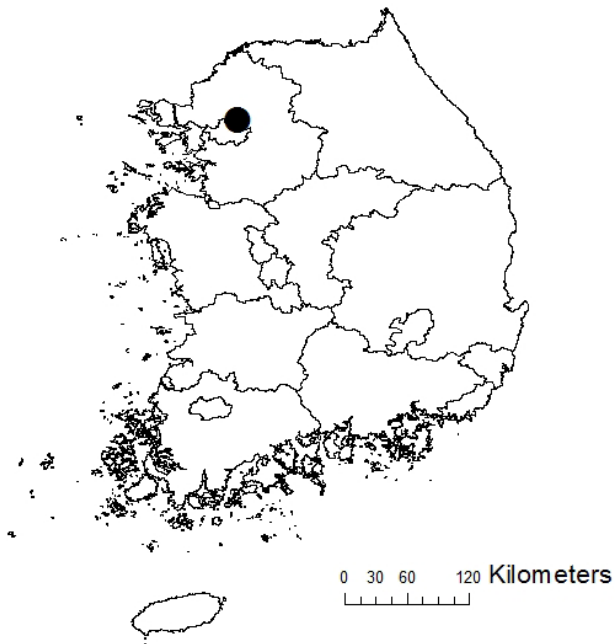
2 (2019.5.17.)

Recorded sites: 2

Distribution: Holarctic

Notes: Female: 4–5 mm, Male: 3–3.5 mm.

Their cephalothorax is dark brown in color, and the abdomen is speckled with black and white. They are commonly found under rocks, forming a loose net. They overwinter as a larva.





Theridiidae 꼬마거미과

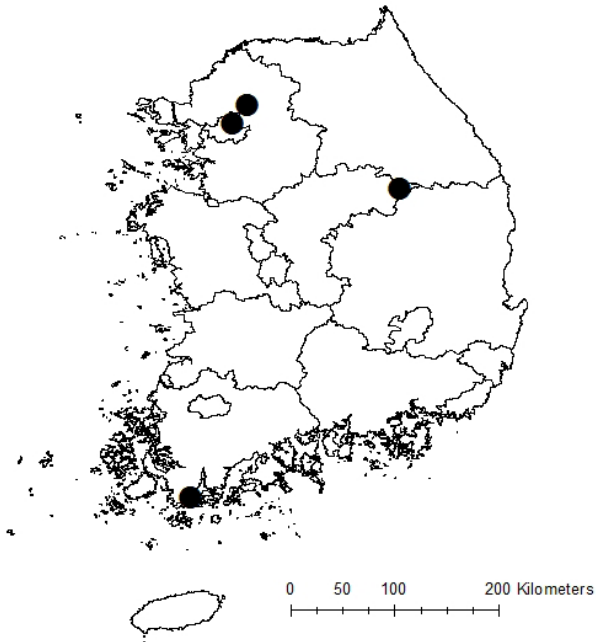
*Parasteatoda tepidariorum* 말꼬마거미



6 (2019.9.17.)



22 (2018.6.21.)



Recorded sites: 4, 6, 22, 25

Distribution: Cosmopolitan

Notes: Female: 6–8 mm. Male: 4–6 mm.

This spider shows various colorations including brown, grayish yellow, black, and green. They are commonly found both inside and outside houses. They build irregular nets under rocks or in caves. Adults are found throughout the year.

Theridiidae 꼬마거미과

*Parasteatoda* sp. (*culicivora*?)



6 (2019. 7. 24.)

Recorded sites: 6

*Parasteatoda* sp. (*japonica* or *kompirensis*?)



6 (2019.7.24.)

Recorded sites: 6, 24

Theridiidae 꼬마거미과

*Parasteatoda* sp. (*kompirensis* or *asiatica*?)



6 (2019.7.4.)

Recorded sites: 6

*Parasteatoda* sp. 1



40 (2019.5.23.)

Recorded sites: 3, 12, 40

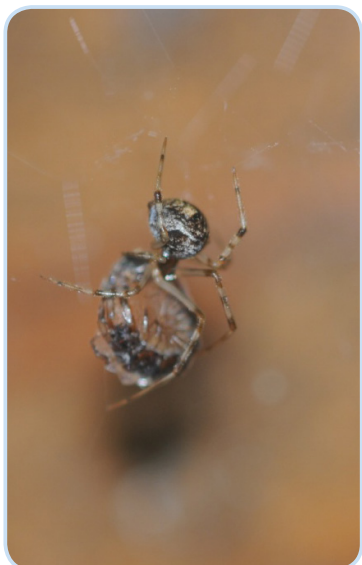
*Parasteatoda* sp. 2



27 (2019,5,25.)

Recorded sites: 24 ,27

*Parasteatoda* sp. 3



6 (2019,6,5.)

Recorded sites: 6,



Theridiidae 꼬마거미과

*Parasteatoda* sp. 4



6 (2019.6.5.)

Recorded sites: 6

*Parasteatoda* sp. 5



24 (2019.7.11.)

Recorded sites: 6, 24, 31

Theridiidae 꼬마거미과

*Steatoda* sp.



7 (2018.6.15.)

Recorded sites: 7

Theridiidae sp. 1



6 (2019.7.24.)

Recorded sites: 6

Theridiidae 꼬마거미과

Theridiidae sp. 2



27 (2019.5.25.)

Recorded sites: 27

*Eskovina clava* 못금오접시거미

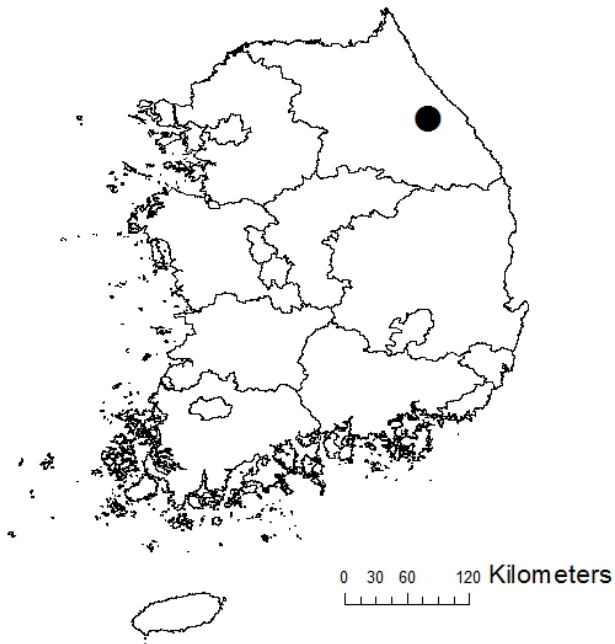


20 (2019,5,28.)

Recorded sites: 20

Distribution: Russia, China, Korea

Notes: Female: 3.5–3.8 mm. Male: 3.2–3.4 mm. Tan, sometimes black stripes on abdomen. A loose net between tree branches.





Linyphiidae 접시거미과

Linyphiidae sp. 1



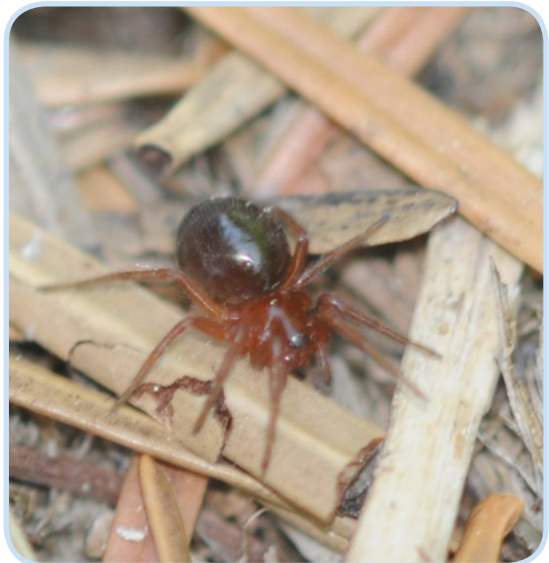
59 (2017.4.19.)

Recorded sites: 17 ,59

Linyphiidae sp. 2



41 (2019.5.23.)



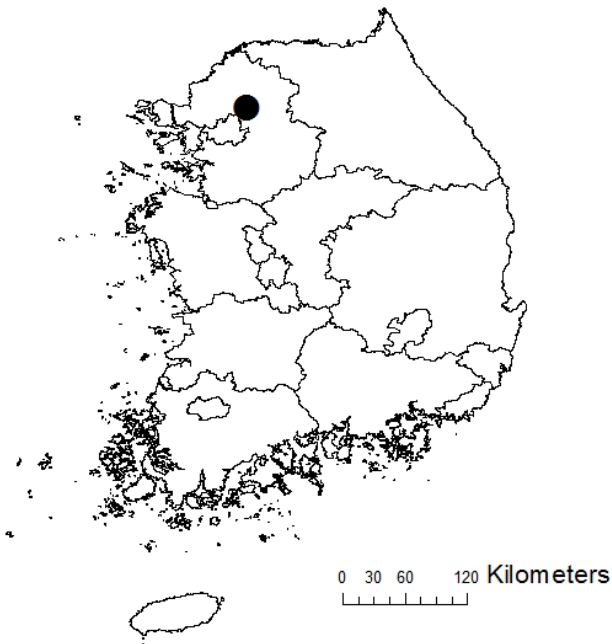
19 (2019.5.29.)

Recorded sites: 19, 41

*Neriene longipedella* 농발접시거미



6 (2019.9.17.)



Recorded sites: 6

Distribution: Russia, China, Korea, Japan

Notes: Female: 5.5–6.5 mm. Male: 5–6 mm. This species is dark brown or brown in color. The edge of their body is white. The first leg is very long (3.5 times the body length). They build dome-shaped dish netting. This species has been collected at a site (36) in Gyeonggi with an annual mean temperature of 8.1°C by the national survey using pitfall traps (Kwon et al. 2013).

Linyphiidae 접시거미과

*Neriene* sp. 1



62 (2017.5.26.)

Recorded sites: 62

*Neriene* sp. 2



23 (2019.7.11.)

Recorded sites: 23, 24

Linyphiidae 접시거미과

*Neriene?* sp.



3 (2018.10.27.)

Recorded sites: 3



Linyphiidae 접시거미과

*Strandella pargongensis* 팔공접시거미

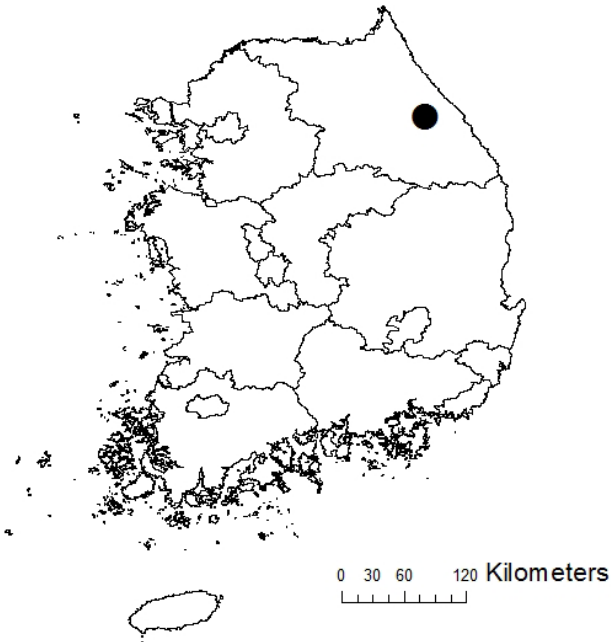


20 (2019.5.28.)

Recorded sites: 20

Distribution: Russia, China, Korea, Japan

Notes: Female: 5.5–6.5 mm. Male: 5–6 mm. Their cephalothorax is black while the abdomen and legs are white. Black vertical lines are seen on the back of the abdomen. They build sheet nets between leaves.



*Leucauge blanda* 중백금거미

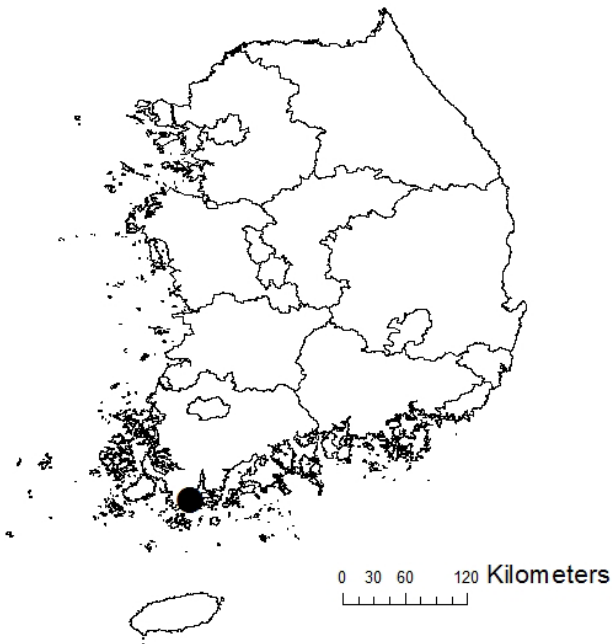


25 (2019.5.24.)

Recorded sites: 25

Distribution: Russia, China, Korea, Taiwan, Japan

Notes: Female: 9–12 mm. Male: 6–8 mm. This species has yellow brown colored cephalothorax, the abdomen is white with black vertical lines. They build horizontally spread round nets and are found in mountainous areas, and in the plains. Specimens have been collected at sites (264, and 273) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 10.7–12.6°C with an average of 11.7°C.



Tetragnathidae 갈거미과

*Leucauge subblanda* 왕백금거미



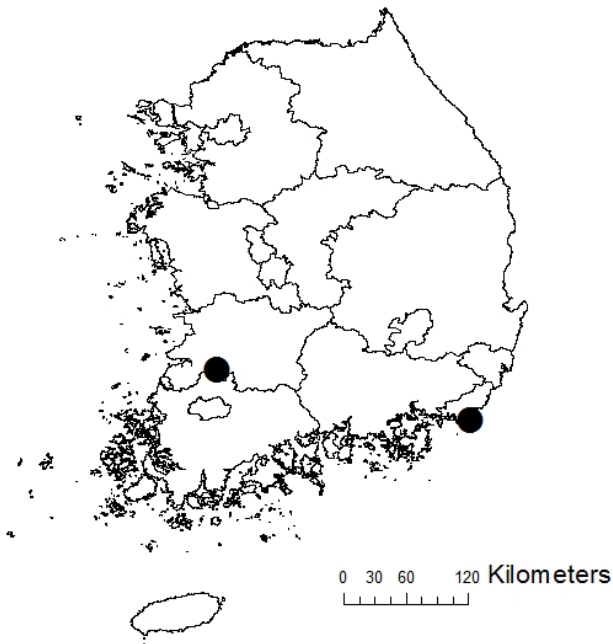
36 (2019.7.9.)

Recorded sites: 24, 36

Distribution: China, Korea, Taiwan, Japan

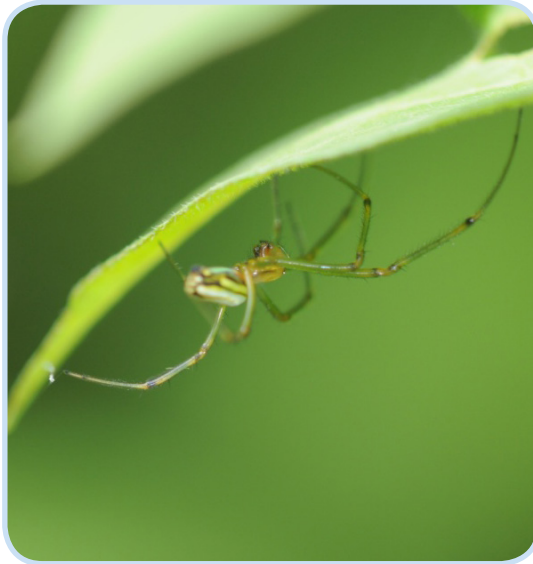
Notes: Female: 12–15 mm, Male: 8–12 mm.

The cephalothorax in this species is yellow brown, and the abdomen is white with three dark vertical lines. Legs are dark greenish brown. They build round webs spread horizontally. This species is mostly found upstream.





*Leucauge* sp. 1



11 (2016.6.21.)

Recorded sites: 11, 23, 24

Theridiidae sp. 1



63 (2016.10.3.)

Recorded sites: 63

Tetragnathidae 갈거미과

*Tetragnatha?* sp.



37 (2018.4.3.)

Recorded sites: 37

Araneidae 왕거미과

**Araneidae sp. 1**



41 (2019.5.23.)

Recorded sites: 41

**Araneidae sp. 2**

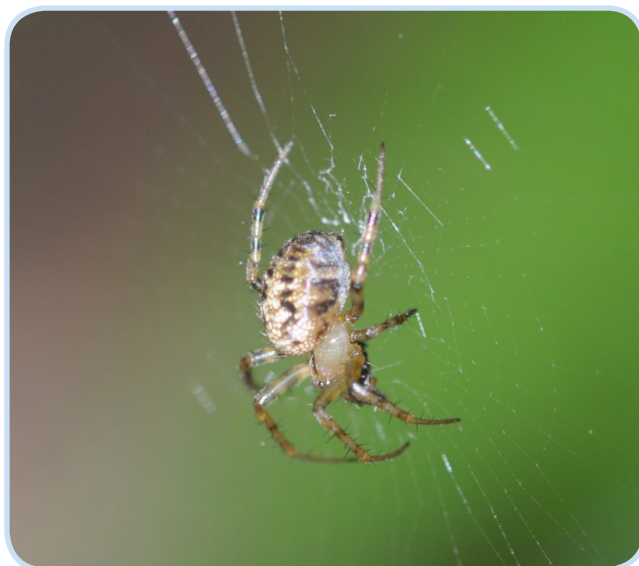


42 (2017.9.19.)

Recorded sites: 42

Araneidae 왕거미과

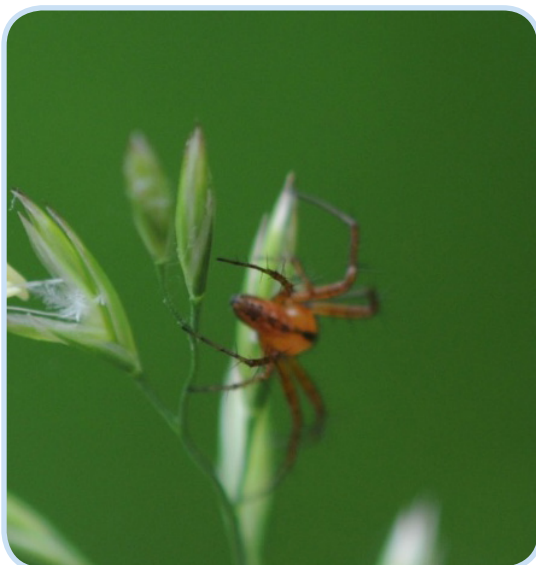
Araneidae sp. 3



47 (2016.10.7.)

Recorded sites: 47

Araneidae sp. 4



35 (2018.5.31.)

Recorded sites: 35

*Araneus ejusmodi* 노랑무늬왕거미



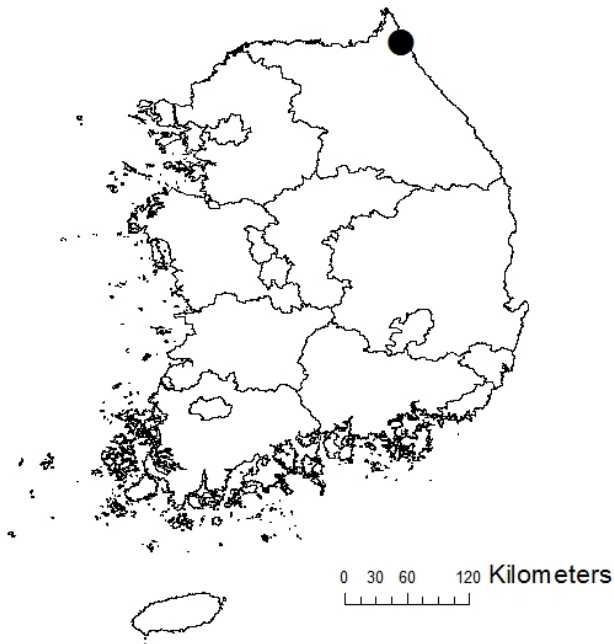
11 (2016.6.21.)

Recorded sites: 11

Distribution: China, Korea, Japan

Notes: Female: 6–8 mm, Male: 5–6 mm.

This species has black colored cephalothorax, while the abdomen is black with yellow wave-like pattern, and legs show alternate black and yellow. This species builds round nets, and often found in mountainous areas and in grasslands. This species feed mainly at night.



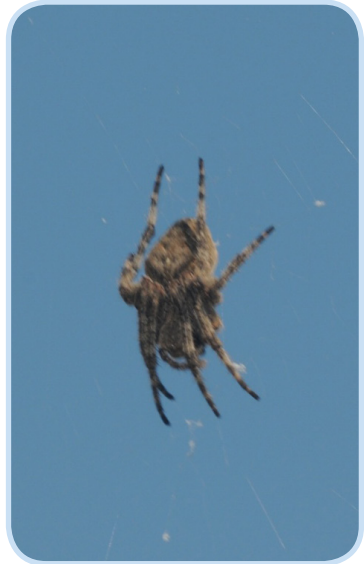


Araneidae 왕거미과

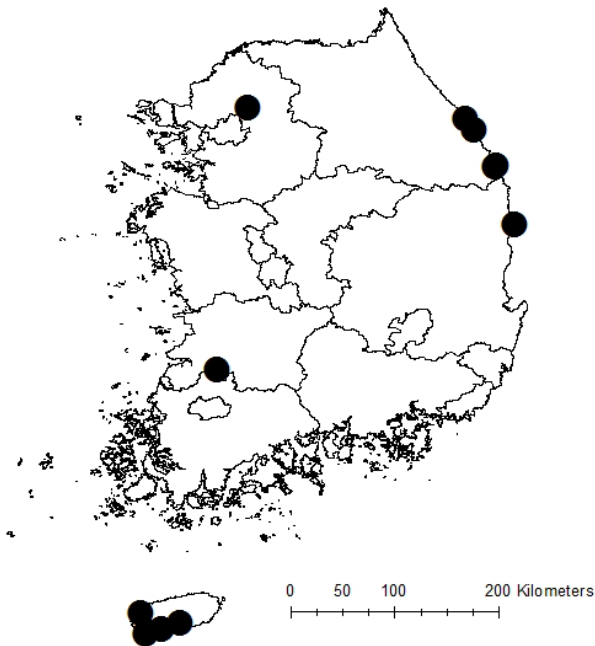
*Araneus ventricosus* 산왕거미



16 (2007.9.12.)



32 (2018.8.3.)



Recorded sites: 6, 10, 14, 15, 16, 24, 32, 46, 57, 58, 64, 68

Distribution: Russia, China, Korea, Taiwan, Japan

Notes: Female: 20–30 mm. Male: 15–20 mm. This species is dark brown in color with legs that are thick with ring-shaped pattern. The width of the wave pattern on the abdomen is reduced towards the end. They are widely distributed in mountainous areas, and plains. They build a large round web.

*Araneus* sp. (*ventricosus*?)



23 (2019.7.11.)



66 (2018.10.2.)

Recorded sites: 23, 66

*Araneus* sp. 1



24 (2019.7.11.)

Recorded sites: 24



Araneidae 왕거미과

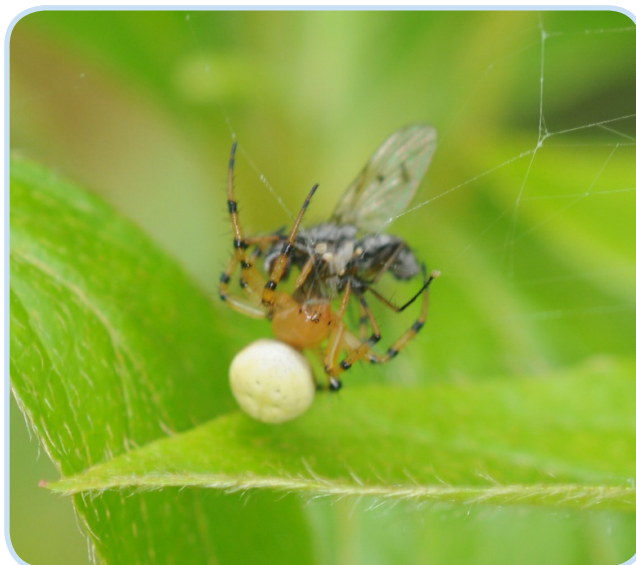
*Araneus* sp. 2



63 (2018.10.9.)

Recorded sites: 63

*Araniella* sp.



7 (2018.5.18.)

Recorded sites: 7

*Argiope btruennichi* 긴호랑거미

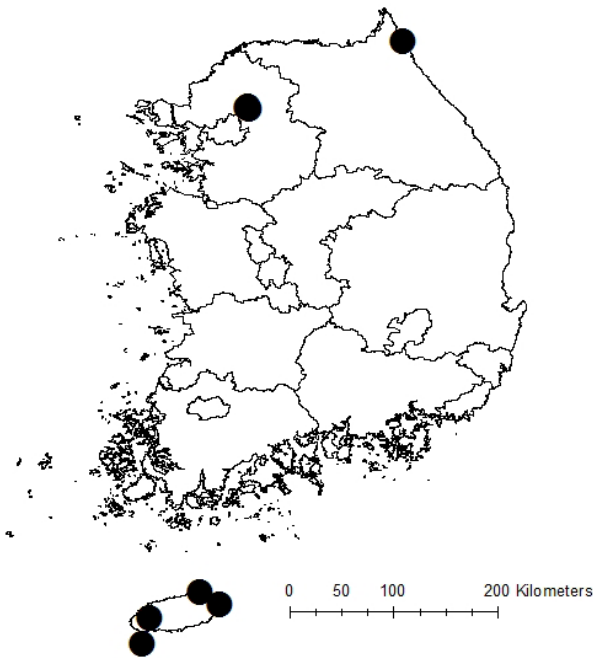


1 (2017,8,24.)

Recorded sites: 1, 6, 7, 12, 43, 49, 54, 63

Distribution: Palearctic

Notes: Female: 20–25 mm. Male: 8–12 mm. Their abdomen is long, yellow in color with black stripes. Legs are yellow brown and have black ring patterns. This species is common in mountainous areas, fields, paddy fields, and grasslands. It builds a vertical round web with a zigzag white band at the center. This species has been collected at a site (116) with an annual mean temperature of 11.9°C by the national survey using pitfall traps (Kwon et al. 2013).



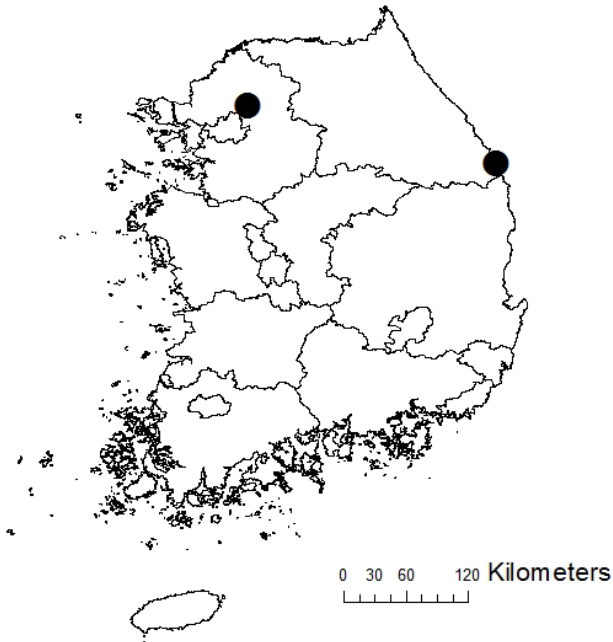
*Argiope minuta* 꼬마호랑거미



6 (2019.8.20.)



16 (2007.9.12.)



Recorded sites: 6, 16

Distribution: Bangladesh, Taiwan, Korea, Japan, China

Notes: Female: 8–12 mm. Male: 4–5 mm. In this species, the back of abdomen yellow with a reddish brown transverse pattern. Their web has X-shaped band.

Araneidae 왕거미과

*Argiope* sp.



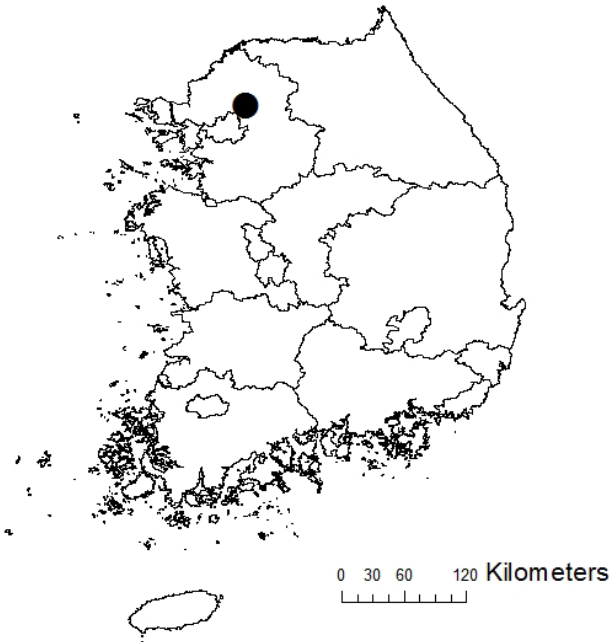
24 (2019.7.11.)

Recorded sites: 24

*Cyclosa japonica* 복면지거미



6 (2019.10.4.)



Recorded sites: 6

Distribution: Russia, China, Korea, Taiwan, Japan

Notes: Female: 5–6 mm, Male: 4–5 mm. Their abdomen is brown in color with a white vertical pattern. This spider makes a vertically spread round web and occasionally the web is horizontally oriented.



*Cyclosa omonaga* 섬먼지거미



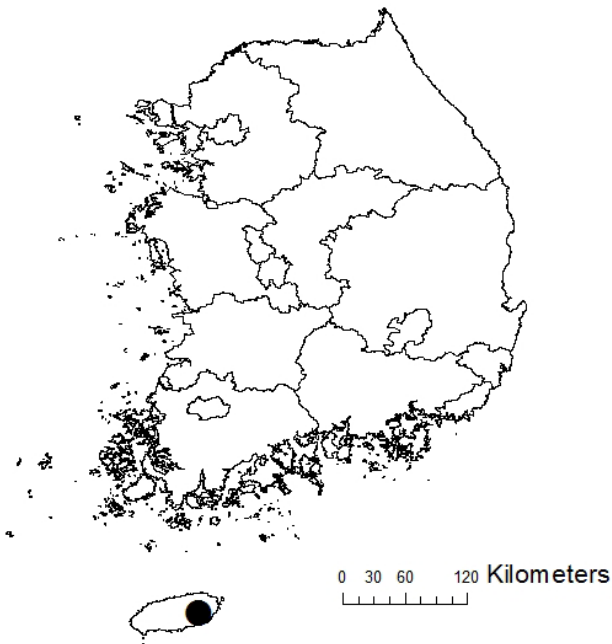
48 (2016.10.7.)

Recorded sites: 48

Distribution: Korea, Taiwan, Japan

Notes: Female: 6–8 mm. Male: 4–5 mm.

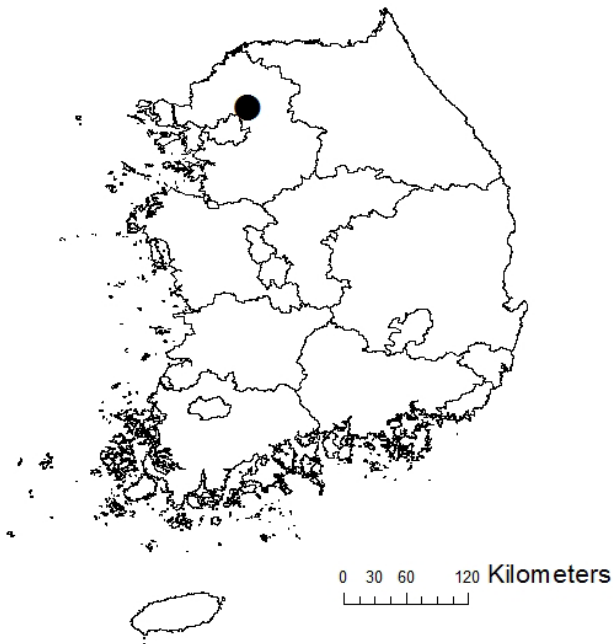
The cephalothorax in this species is yellowish brown, and the abdomen is brown with two white vertical lines. Legs have brown ring patterns. They build vertically spread round nets between trees or grass, and are commonly found on the southern coast and on the southern islands.



*Gasteracantha kuhli* 가시거미



6 (2018.9.10.)



Recorded sites: 6

Distribution: India to Japan, Philippines.

Notes: Female: 6–8 mm. Male: 3–4 mm.

The abdomen is a rigid chitin plate with six spinous processes. They build round net between trees. They are found in the mountainous areas.



*Larinioides cornutus* 기생왕거미



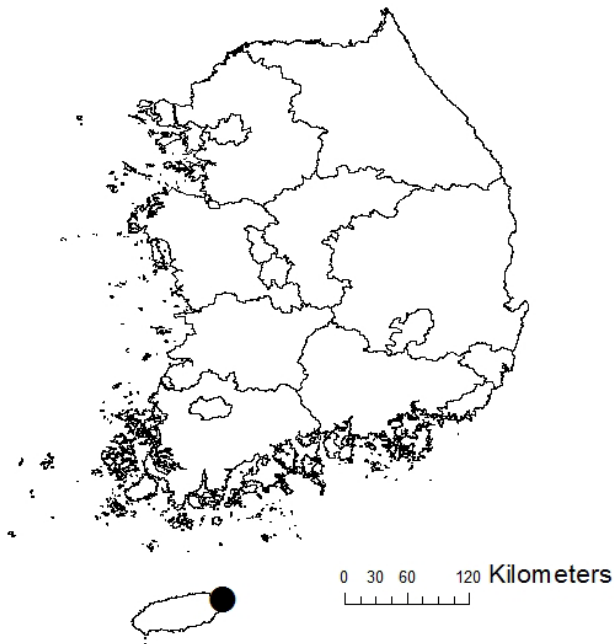
60 (2017.4.20.)

Recorded sites: 60

Distribution: Holarctic

Notes: Female: 10–12 mm. Male: 7–9 mm.

They are yellowish brown in color with a black stain. They often make round nets in mountainous areas and in meadows, where they fold grass to hide. This species has been collected at a site (151) with an annual mean temperature of 10.9°C by the national survey using pitfall traps (Kwon et al. 2013).

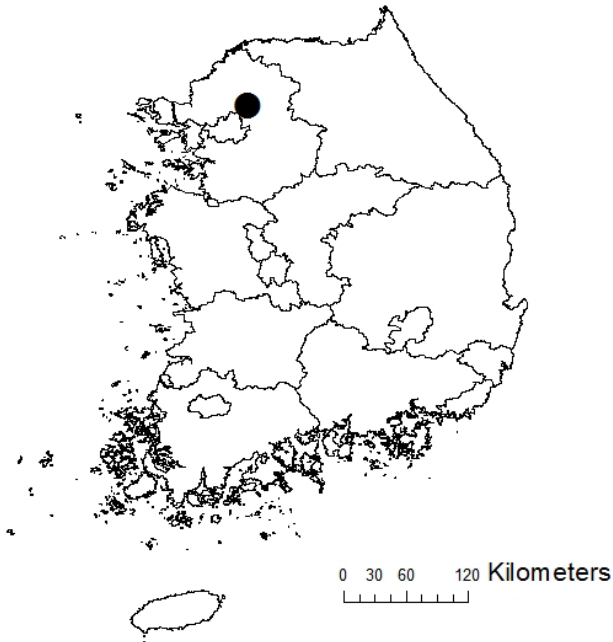


Araneidae 왕거미과

*Mangora crescopicta* 무당귀털거미



6 (2019.4.24.)



Recorded sites: 6

Distribution: China, Korea, Japan

Notes: The cephalothorax in this species is tan in color with a vertical black line. Their abdomen is light yellow with a black vertical line.

*Neoscona multiplicans* 아가지이어리왕거미

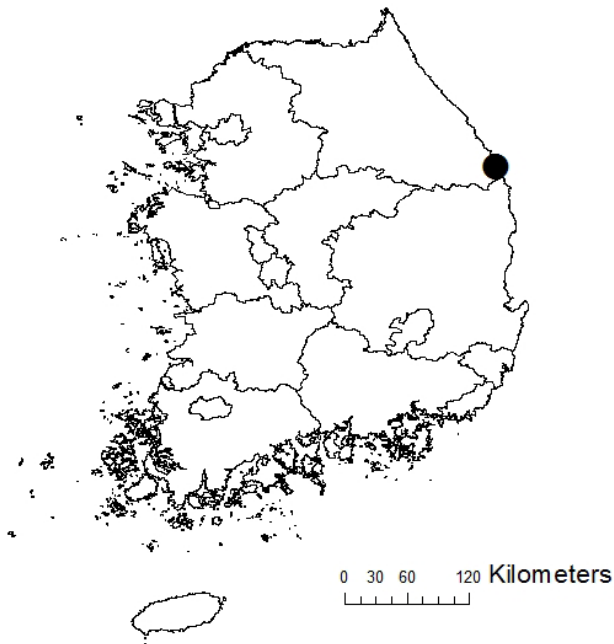


15 (2016.6.23.)

Recorded sites: 15

Distribution: China, Korea, Japan

Notes: Female: 9.2–10.3 mm. This species is yellowish brown in color with many fine hairs. Black ring patterns are visible on their leg. Their nets are vertically spread and round shape.



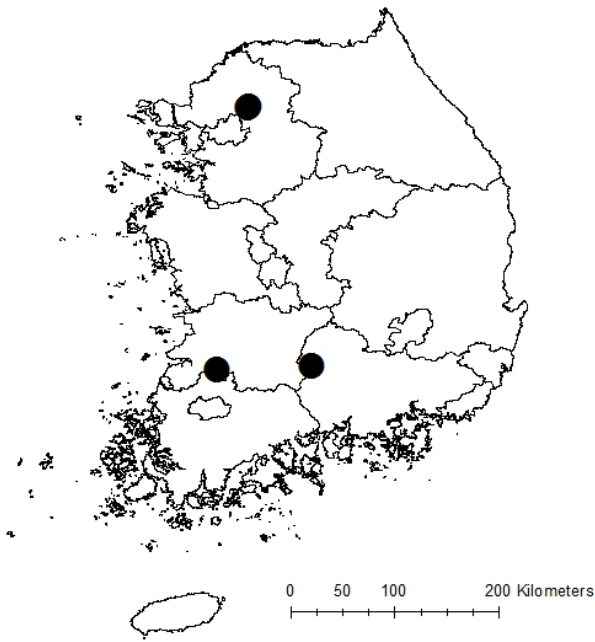
*Neoscona scylla* 지이어리왕거미



24 (2019.7.11.)



39 (2019.5.23.)



Recorded sites: 6, 7, 24, 39

Distribution: Russia, China, Korea, Japan

Notes: Female: 12–15 mm, Male: 8–10 mm.

Cephalothorax and legs are yellowish brown, and the abdomen is light yellow with small black patterns. The nets of this species are large vertical and round, and are found in mountainous areas or in field. The spider sits at the center of the web. This species has been collected at sites (52, 116, 201, 210, 306, and 309) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 6.2–12.9°C with an average of 10.7°C.

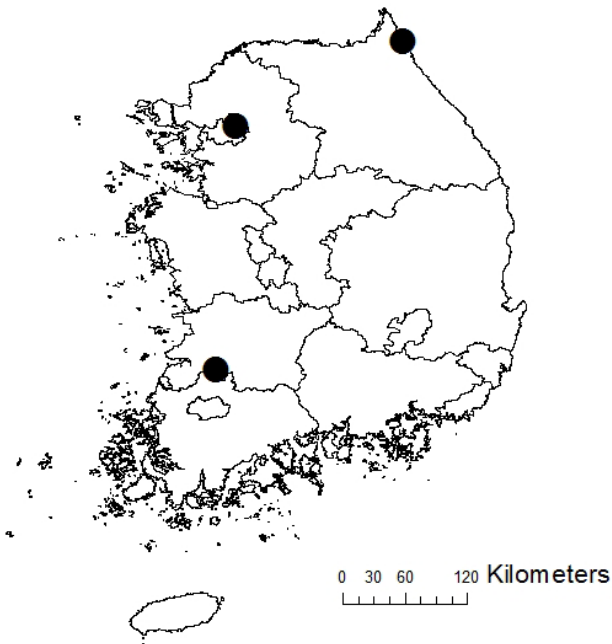
*Neoscona scylloides* 연두어리왕거미



24 (2019.7.11.)



3 (2018.8.26.)



Recorded sites: 3, 12, 24

Distribution: China, Korea, Taiwan, Japan

Notes: Female: 8–10 mm. Male: 7–8 mm.

Cephalothorax is yellowish brown with sparse long hairs and the abdomen is green in color. These spiders make a vertical round web between branches or grass in mountainous areas, hiding in the daytime behind the leaves. This species has been collected at a site (59) with an annual mean temperature of 8.8°C by the national survey using pitfall traps (Kwon et al. 2013).



*Neoscona* sp. 1



7 (2018.8.13.)

Recorded sites: 7

*Neoscona* sp. 2



24 (2019.7.11.)

Recorded sites: 24

Araneidae 왕거미과

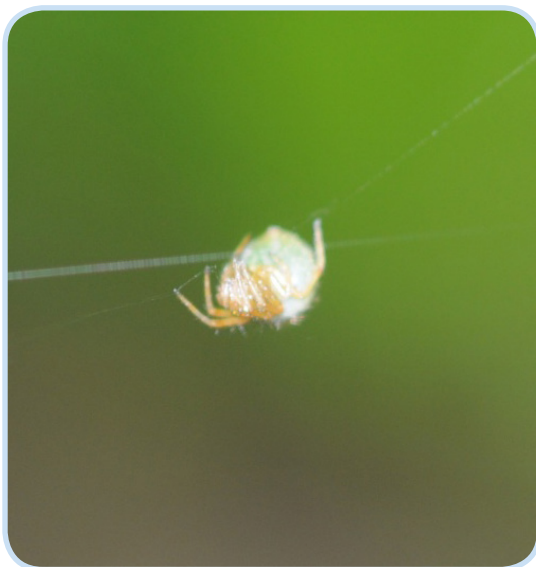
*Neoscona* sp. 3



24 (2019.7.11.)

Recorded sites: 23, 66

*Neoscona* sp. 4



23 (2019.7.11.)



66 (2018.10.2.)

Recorded sites: 24



*Nephila clavata* 무당거미



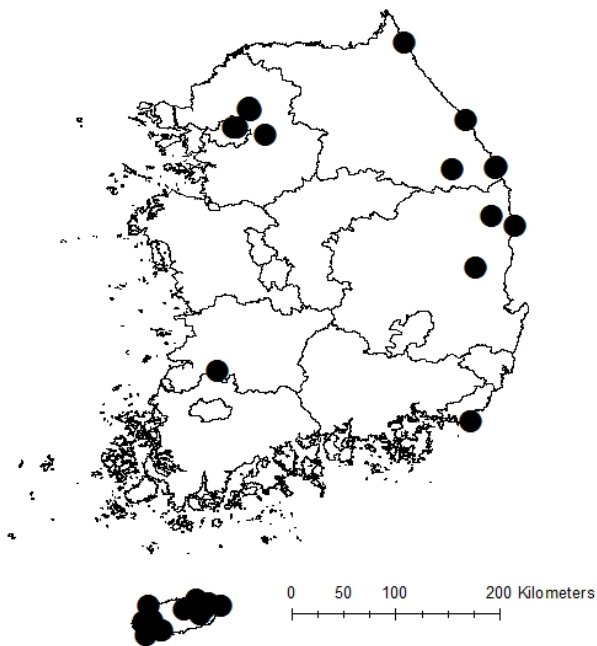
1 (2017.10.13.)



7 (2018.7.20.)



36 (2019.7.9.)



Recorded sites: 1, 3, 4, 5, 6, 7, 10, 12, 15, 16, 18, 24, 30, 32, 33, 36, 42, 44, 47, 48, 50, 52, 54, 57, 61, 63, 64, 66

Distribution: India to Japan

Notes: Female: 20–30 mm. Male: 6–10 mm.

This species is yellowish green in color with black ring patterns on the legs, four black horizontal patterns on the abdomen of females, and black plaids on the abdomen of males. They build large round nets between tree branches in garden, and forests. It is the most common spider in South Korea. However, this species was collected at only one site (333, annual mean temperature 13.2°C) by the national survey using pitfall traps (Kwon et al. 2013).

*Plebs sachalinensis* 북왕거미



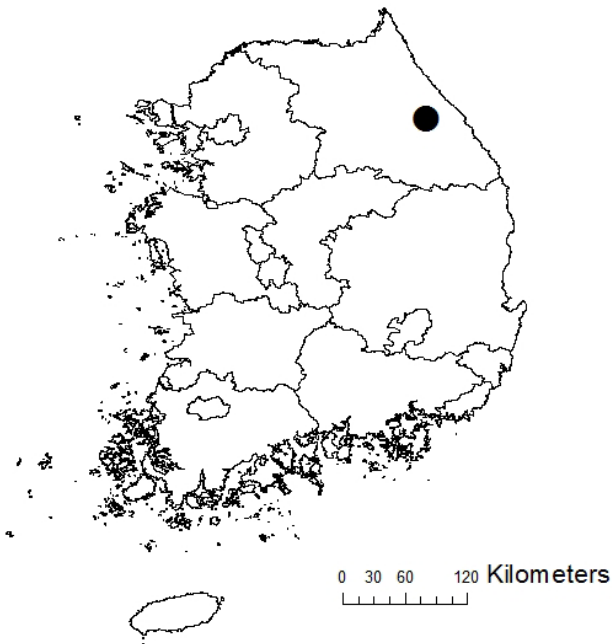
20 (2019.5.28.)

Recorded sites: 20

Distribution: Russia, China, Korea, Japan

Notes: Female: 7–9 mm. Male: 4–5 mm.

Their cephalothorax is brown, while the rest of their body is yellowish brown. Black ring patterns are seen on the leg, and black speckle pattern on the abdomen. This spider makes a vertical round net between branches and they attach the pouch of eggs to the bark or leaves. This species has been collected at a site (95) with an annual mean temperature of 5.5°C by the national survey using pitfall traps (Kwon et al. 2013).



Lycosidae 늑대거미과

*Alopecosa moriutii* 일본늑대거미

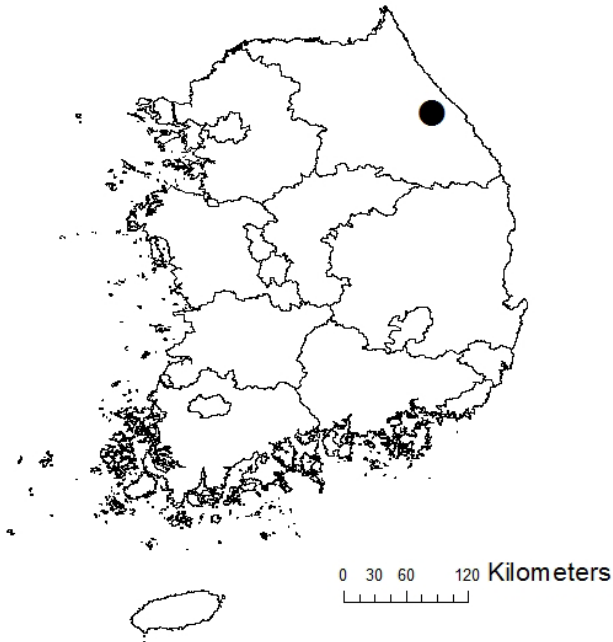


19 (2019.5.29.)

Recorded sites: 19

Distribution: Russia, Korea, Japan

Notes: Female: 9.5–12.5 mm. Male: 7.5–9.5 mm. The inside of cephalothorax is bright and the outside is black. This species is found between the stream edges and grasses.



*Arctosa kwangreungensis* 광릉논늑대거미



6 (2019.9.17.)



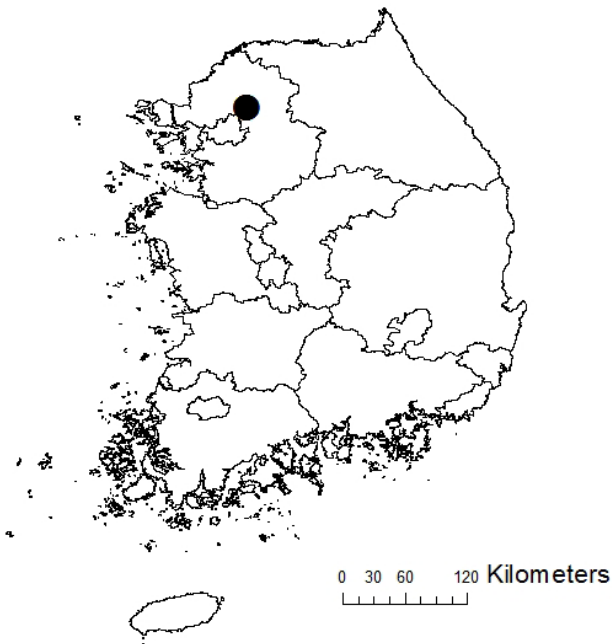
6 (2019.4.24.)

Recorded sites: 6

Distribution: China, Korea

Notes: Female: 6–8 mm. Male: 5–6 mm.

Cephalothorax is reddish brown with bright vertical stripes on the inside. Their abdomen and legs are tawny, and black dots are seen on legs. This species is found in mountainous regions and in fields. This species has been collected in Gyeonggi, Chungcheong, Jeolla, and Gyeongbuk by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 9.7–13.4°C with average of 11.6°C.

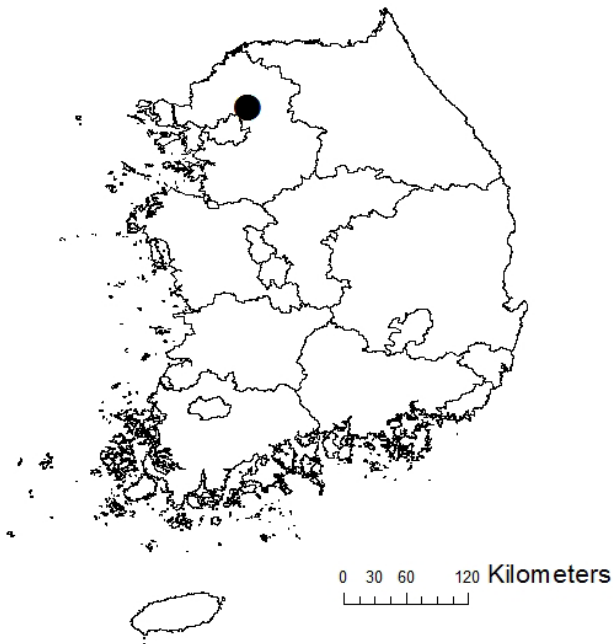




*Arctosa subamylacea* 논늑대거미



7 (2017.5.4.)



Recorded sites: 6, 7

Distribution: Kazakhstan, China, Korea, Japan

Notes: Female: 9–11 mm. Male: 7–8 mm. They are yellowish brown or blackish brown in color with black ring patterns on the legs and black spots on the abdomen. This spider forages on the ground and is found in mountainous regions, plains, grasslands, and rice fields. This species has been collected at sites (1, 187, and 213) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 10–12.8°C with average of 12°C.

*Arctosa* sp. 1



20 (2019.5.28.)

Recorded sites: 20

*Arctosa* sp. 2



8 (2018.9.17.)

Recorded sites: 8



Lycosidae 늑대거미과

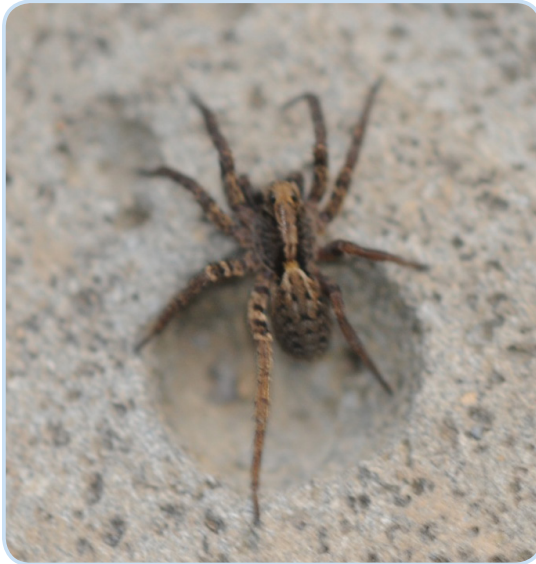
*Arctosa* sp. 3



11 (2016.6.21.)

Recorded sites: 11

*Lycosa coelestis* 제주늑대거미



51 (2017.4.19.)

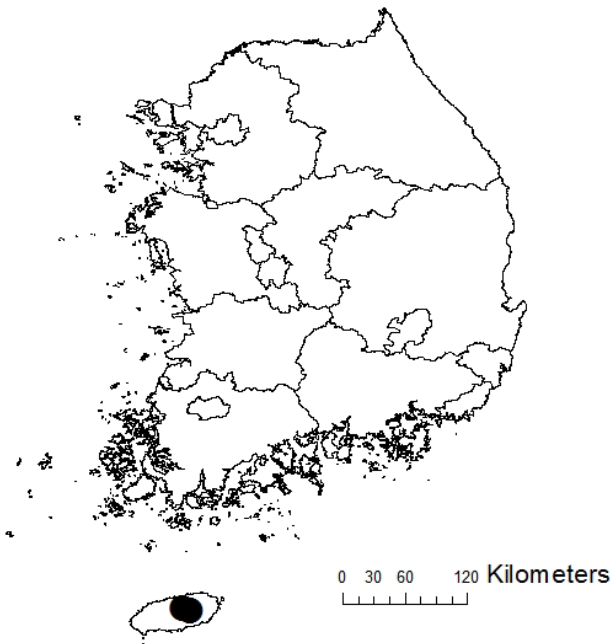


61 (2018.9.21.)

Recorded sites: 51, 61

Distribution: China, Korea, Japan

Notes: Female: 10–15.5 mm. Male: 9.5–11.5 mm. Yellowish brown in color, their cephalothorax edges are black. They show black dotted patterns on the abdomen, and black ring patterns on the legs. They are common in Jeju Island. They forage in mountainous areas, meadows, and rice fields. This species has been collected at sites (242, and 279) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 11.5–12.9°C with average of 12.2°C.



Lycosidae sp.

Lycosidae 늑대거미과



41 (2019.5.23.)

Recorded sites: 41

*Pardosa astrigera* 별늑대거미



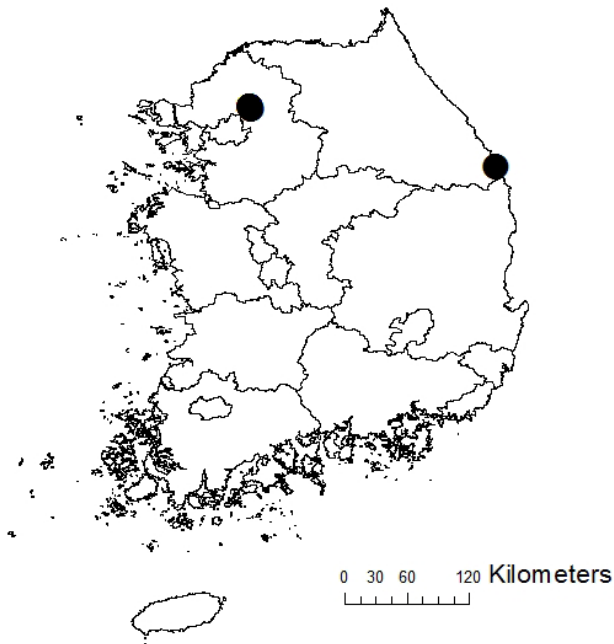
7 (2018.10.1.)

Recorded sites: 1, 7, 15

Distribution: Russia, China, Korea, Taiwan, Japan

Notes: Female: 7–10 mm. Male: 6–8 mm.

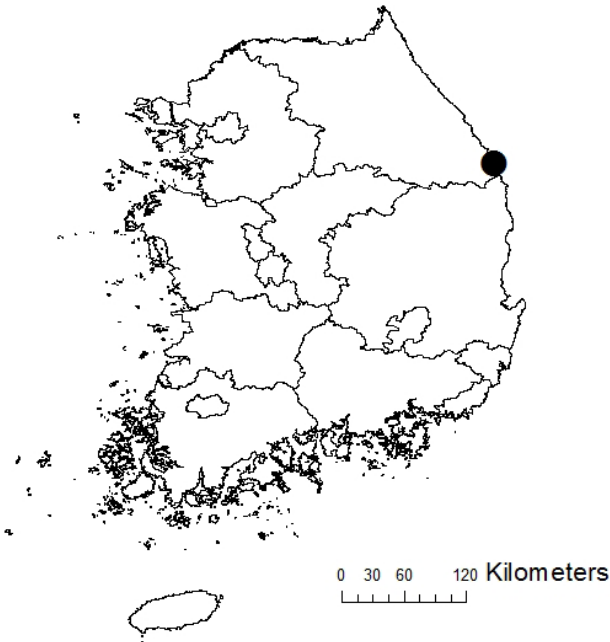
Their dark brown cephalothorax has a central yellowish–brown pattern forming a T shape as mid–part narrowing, and a tan border and black edge lines. There is much color variations seen in this species such as brown type and black type. It is common in mountainous areas, meadows, and fields. They are known to protect the hatched larvae on their backs. This species has been collected at a site (314) in Chungbuk with an annual mean temperature of 9.5°C by the national survey using pitfall traps (Kwon et al. 2013).



*Pardosa hedini* 중국늑대거미



16 (2015.5.3.)



Recorded sites: 16

Distribution: Russia, China, Korea, Japan

Notes: Female: 4.5–5.5 mm. Male: 4–5 mm. They are black in color with a central white pattern running from head to end. It is found in both mountainous areas and the plains. This species has been collected at sites (273, 313) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 9.6–12.6°C with average of 11.1°C.



*Pardosa koponeni* 흰표늑대거미



18 (2018.7.31.)

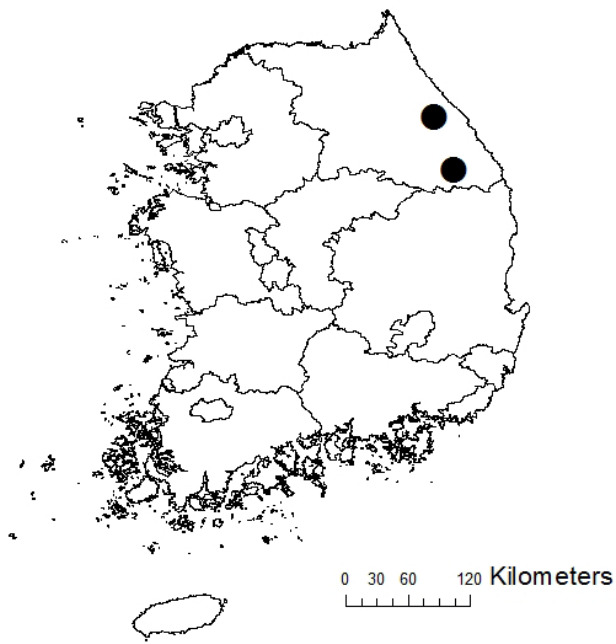


19 (2019.5.29.)

Recorded sites: 18, 19

Distribution: Palearctic

Notes: Female: 5–6 mm. Male: 4.5–5.5 mm. This species has black colored cephalothorax with a central whitish pattern. Legs are yellow brown with dark brown ring patterns, and have many thorn-like hairs. They are found in mountainous areas, and in meadows. This specie has been collected at sites (233, 234, 236, and 237) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 7.6–9.3°C with an average of 8.3°C.

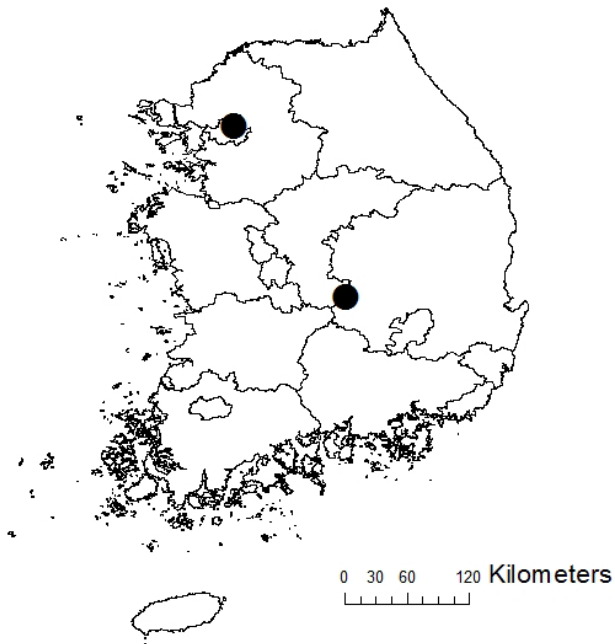




*Pardosa laura* 가시녹대거미



4 (2019.5.7.)



Recorded sites: 4, 28

Distribution: Russia, China, Korea, Taiwan, Japan

Notes: Female: 6–8 mm. Male: 5–7 mm. Their cephalothorax is blackish brown in color with a central whitish pattern. Legs are brown with black ring patterns. This species has been collected at sites (88, 110, 111, 142, 154, 246, 266, 267, 285, and 356) in the mid-region of South Korea by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 3.9–12.3°C with average of 9.6°C.

Lycosidae 늑대거미과

*Pardosa* sp.



49 (2018.10.3.)

Recorded sites: 49, 51

Lycosidae 늑대거미과

*Pirata subpiraticus* 황산적늑대거미



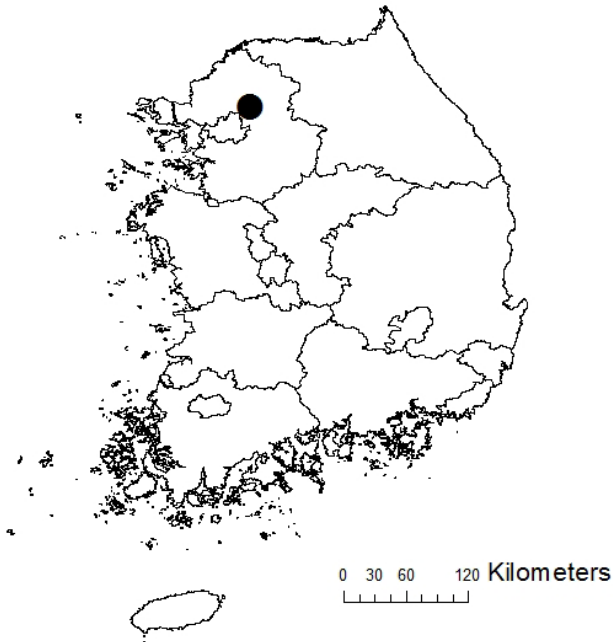
1 (2017.8.24.)

Recorded sites: 1

Distribution: China, Korea, Japan

Notes: Female: 6–8 mm, Male: 5–7 mm.

This species has tawny cephalothorax with a V-shaped central pattern. Their abdomen is brown in color with white edges. They are found in meadows, and agricultural fields. They are an important natural enemy to rice pests.



*Pirata* sp.



9 (2019,5,29.)

Recorded sites: 9

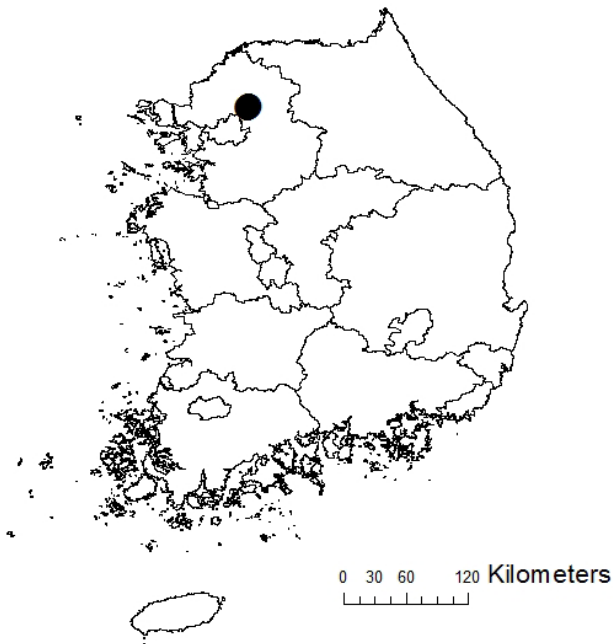
*Dolomedes sulfureus* 황땃거미



6 (2018.6.18.)



7 (2018.6.15.)



Recorded sites: 6, 7

Distribution: : Russia, China, Korea, Japan

Notes: Female: 20–28 mm, Male: 14–20 mm. The color variation in this species is large, ranging from yellow to dark brown with white band patterns. This species is found among vegetation, and is known to spawn between July and September, carrying an egg pouch in its mouth. This species has been collected at sites (35, and 211) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 5.1–8.1°C with an average of 6.6°C.



*Pisaura lama* 아기늪서성거미



1 (2017.8.24.)



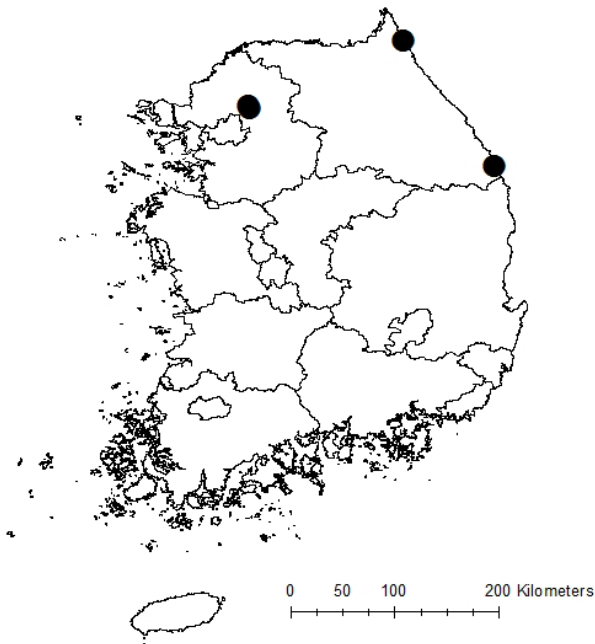
12 (2014.6.4.)

Recorded sites: 1, 7, 12, 15

Distribution: Russia, China, Korea, Japan

Notes: Female: 10–13 mm. Male: 7–11 mm.

This species is gray brown in color, and their cephalothorax has a white narrow vertical line in the center. They are mostly found among vegetation. This species has been collected at sites (1, 8, 125, 139, 200, 208, 241, and 259) in Chungbuk and Gyengsang the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 7.2–12.4°C with an average of 10.5°C.





Pisauridae 땃거미과

*Pisaura* sp.



8 (2016.6.22.)

Recorded sites: 8

*Oxyopes sertatus* 낮표스라소니거미



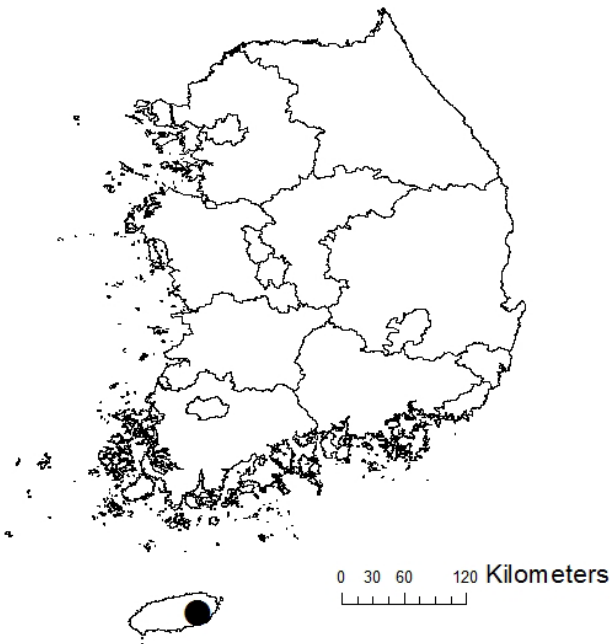
48 (2016.10.7.)

Recorded sites: 48

Distribution: China, Korea, Taiwan, Japan

Notes: Female: 9–11 mm. Male: 7–9 mm.

This species is light yellow in color with yellow green vertical patterns on the cephalothorax. Legs have long spine-like hairs. Red brown individuals have been recorded. This species predate on insects among the vegetation, and is common in the southern islands.



Oxyopidae 스투소니거미과

*Oxyopes* sp.



7 (2018.5.18.)

Recorded sites: 7

*Anahita fauna* 너구리거미



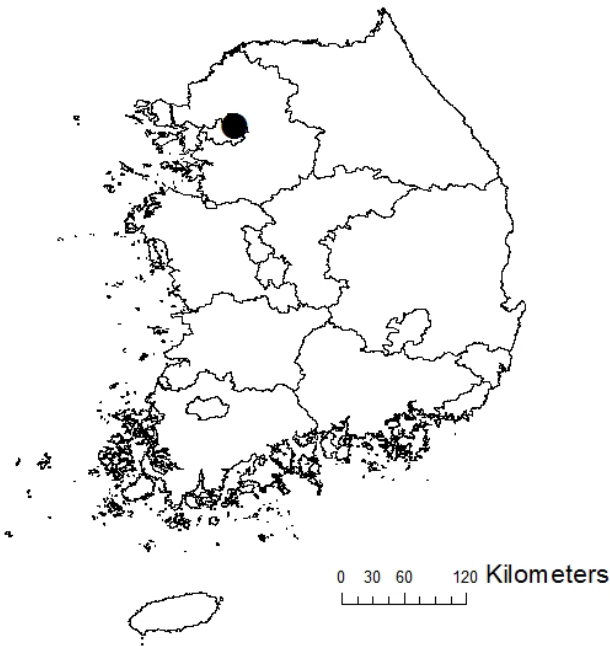
3 (2018.4.2.)

Recorded sites: 3

Distribution: Russia, China, Korea, Japan

Notes: Female: 9–11 mm. Male: 8–9 mm.

This species has a vertical central dark and light pattern from the head to the end of its body on a tan background. It is found living on the ground, under stones, and litters in mountainous areas, and in grasslands. This species has been collected at many sites in all provinces except Jeju by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 8–14.1°C with an average of 11.4°C. It is a climate indicator species with an expected increase in abundance as climate warms.



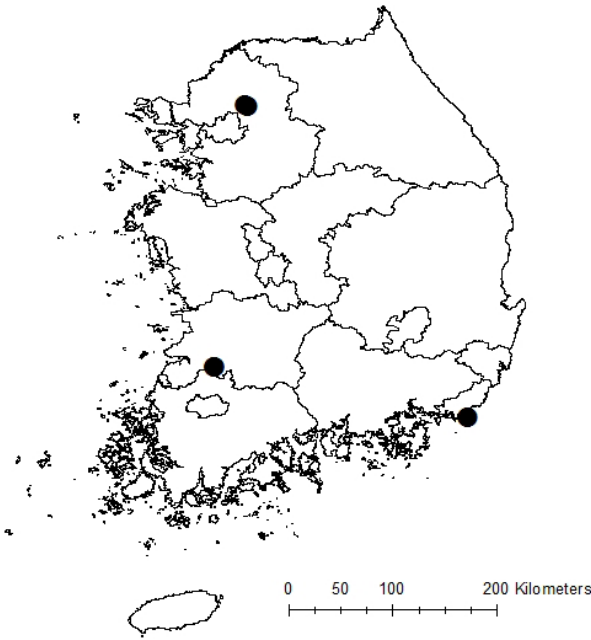
*Agelena limbata* 들풀거미



1 (2017.6.29.)



24 (2019.7.11.)



Recorded sites: 1, 6, 24, 36

Distribution: China, Korea, Myanmar, Laos, Japan

Notes: Female: 15–19 mm. Male: 12–14 mm. This spider is a light tan background with black patterns on both sides extending vertically from its head to the end of its body. The abdominal black pattern is lined with several light horizontal and parallel patterns. Legs have a black ring pattern. This spider attacks its prey from a tunnel web built in corners. This species has been collected at sites (6, 9, 46, 312, and 333) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 8.7–13.2°C with an average of 10.8°C.



Agelenidae 풀거미과

*Agelena* sp. 1



43 (2018.10.11.)



58 (2016.10.9.)

Recorded sites: 43, 58, 64

*Agelena* sp. 2



27 (2019.5.25.)

Recorded sites: 27



Agelenidae 풀거미과

*Alloclubionoides* sp.



2 (2019.5.17.)

Recorded sites: 2

Agelenidae 풀거미과

*Pireneitega spinivulva* 한국갈때기거미

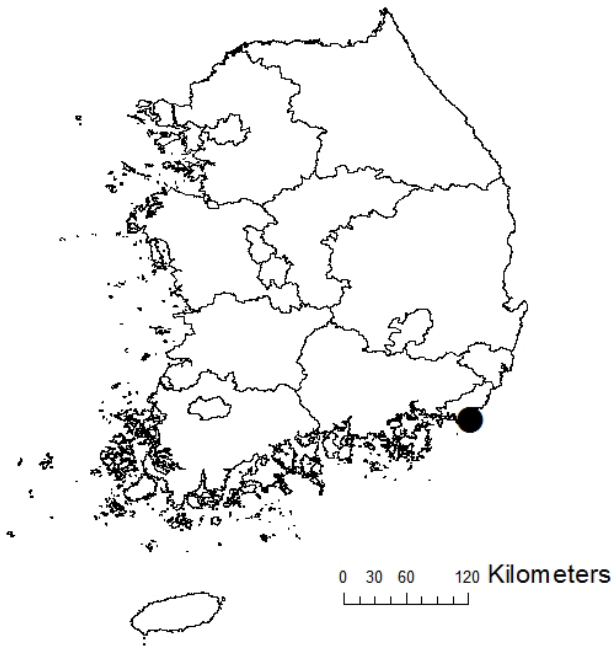


36 (2019.7.9.)

Recorded sites: 36

Distribution: : Russia, China, Korea, Japan

Notes: Female: 14–19 mm. Male: 12–16 mm. Black or dark brown in color, this spider builds funnel-shaped webs on cliffs or rocks. This species has been collected at a site (29) in Gyeonggi with an annual mean temperature of 11.6°C by the national survey using pitfall traps (Kwon et al, 2013).



Titanoecidae 자갈거미과

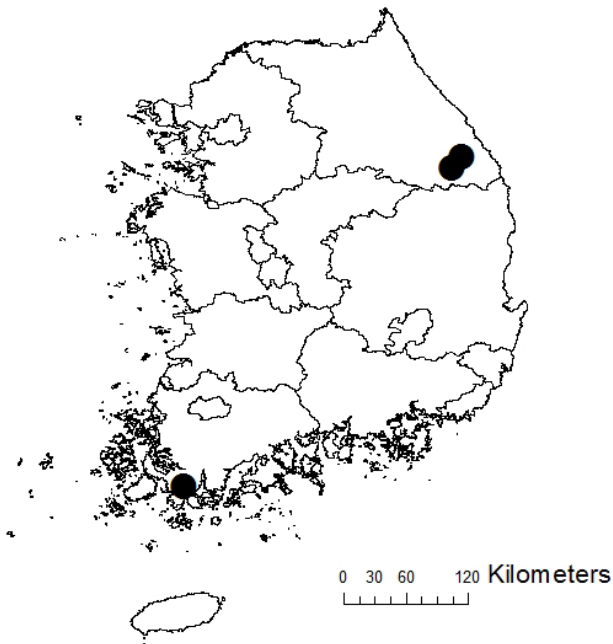
*Nurscia albofasciata* 살깃자갈거미



27 (2019.5.25.)



17 (2018.5.10.)



Recorded sites: 17, 18, 27

Distribution: Russia, China, Korea, Taiwan, Japan

Notes: Female: 5–8 mm, Male: 4–6 mm.

This species is black in color with eight white patterns on the abdomen. They build coarse webs on slopes in mountainous areas, under litters, gravel fields, and between stream stones. This species has been collected at sites (55, 156, and 233) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 9.3–9.6°C with average of 9.4°C.

*Phrurolithus pennatus* 살깃도사거미

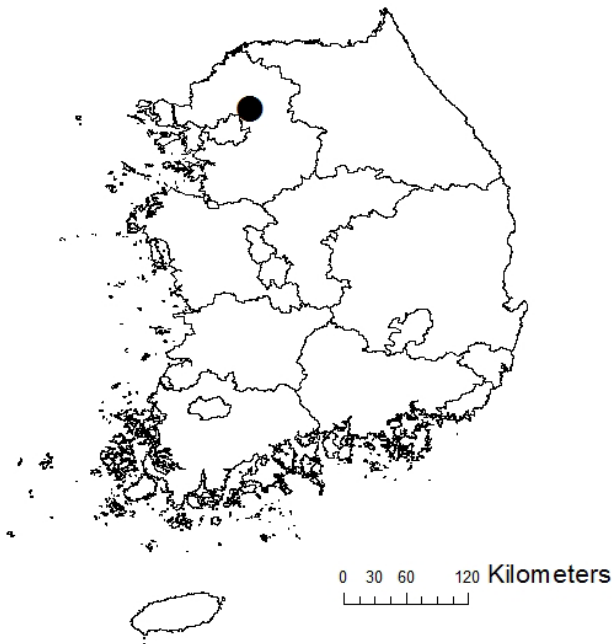


1 (2017.5.27.)

Recorded sites: 1

Distribution: Russia, China, Korea, Japan

Notes: Female: 3.5–4.5 mm. Male: 3–3.7 mm. This species is black in color with white patterns on its abdomen and legs. It is commonly found in litters, grounds, and under stones in forests and meadows. This species has been collected in all provinces except Jeju by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 5.1–14.1°C with average of 10.5°C.



Phrurolithidae 도사거미과

*Phrurolithus* sp.



6 (2019.6.5.)

Recorded sites: 6



Gnaphosidae 수리거미과

*Drassodes* sp.



7 (2018.6.8.)

Recorded sites: 7

*Drassyllus* sp.



21 (2018.6.19.)

Recorded sites: 21

Gnaphosidae 수리거미과

*Gnaphosa* sp.



37 (2018.5.29.)

Recorded sites: 37

*Urozelotes rusticus* 주황염라거미

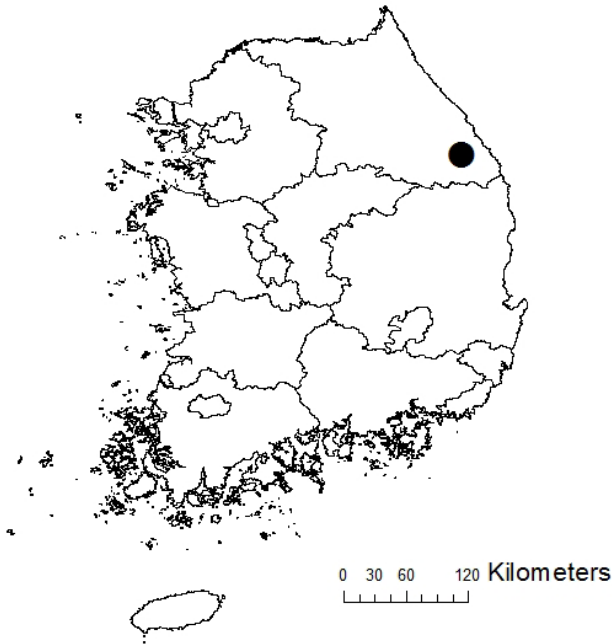


17 (2018.5.10.)

Recorded sites: 17

Distribution: Cosmopolitan

Notes: Female and male: 8–9 mm. Tan to reddish brown in color, this species is commonly found indoors, and on the ground around houses, in mountainous areas and in meadows.



Gnaphosidae 수리거미과

*Zelotes* sp.



37 (2018.4.3.)

Recorded sites: 37

*Sinopoda* sp.



6 (2017.6.9.)

Recorded sites: 6

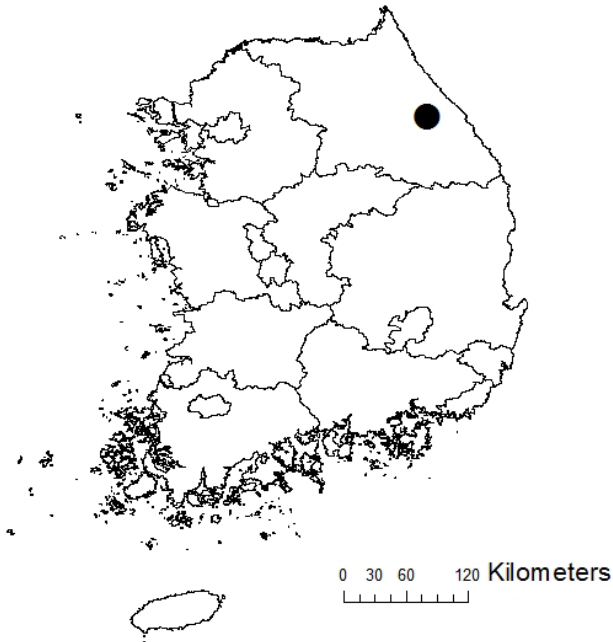


Philodromidae 새우게거미과

*Philodromus rufus* 북방새우게거미



20 (2019.5.28.)



Recorded sites: 20

Distribution: Holarctic

Notes: Female: 5–6 mm. Male: 3–4 mm.

This species has brown cephalothorax with a central light yellow or whitish pattern. The abdomen and legs show brown speckles on a light background. This species has been collected at a site (246) with an annual mean temperature of 11.1°C by the national survey using pitfall traps (Kwon et al. 2013).

*Philodromus spinitarsis* 나무결새우게거미

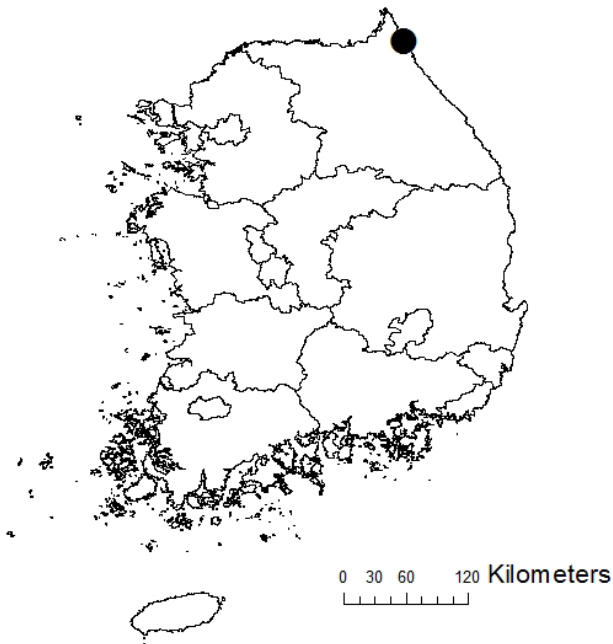


12 (2013.7.19.)

Recorded sites: 12

Distribution: Russia, China, Korea, Japan

Notes: Female: 6–8 mm. Male: 4–6 mm. This species has speckled black patterns on a whitish gray background. It is active in vegetation and moves very fast. This species has been collected at a site (127) with an annual mean temperature of 8°C by the national survey using pitfall traps (Kwon et al. 2013).



Philodromidae 새우게거미과

*Philodromus* sp. 1



15 (2016.6.23.)



28 (2018.5.8.)

Recorded sites: 15, 24, 28

*Philodromus* sp. 2



23 (2019.7.11.)

Recorded sites: 23, 36

*Thanatus coreanus* 한국창게거미



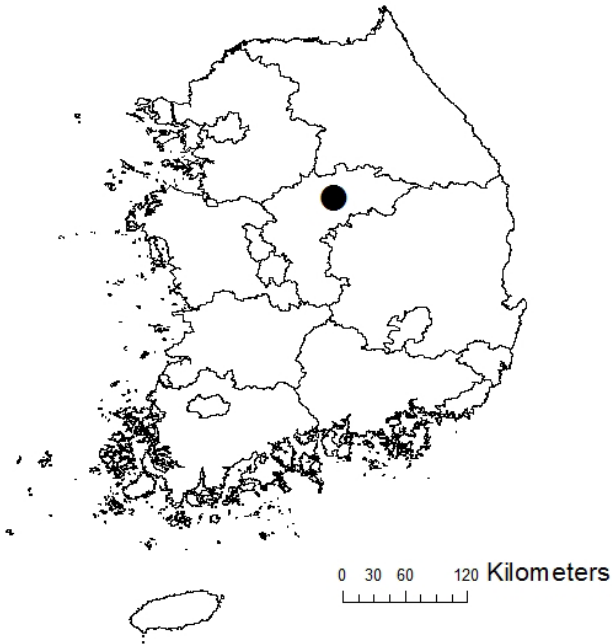
21 (2018.6.19.)

Recorded sites: 21

Distribution: Russia, China, Korea

Notes: Female: 7–8 mm. Male: 5–6 mm.

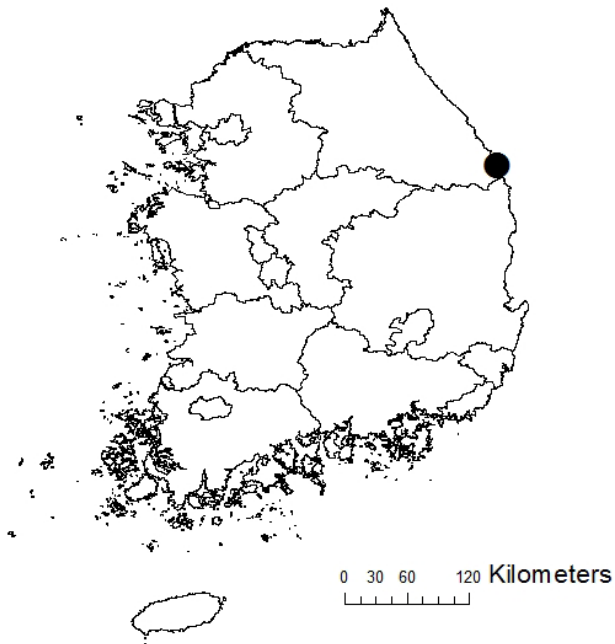
This species has black rhombus pattern on its abdomen. It inhabits forests, and meadows.



*Thanatus miniaceus* 중국창게거미



16 (2015.5.3.)



Recorded sites: 16

Distribution: China, Taiwan, Korea, Japan

Notes: Female: 6–7 mm. Male: 4–5 mm.

This species has black rhombus pattern on its abdomen, and is found on leaves, fallen leaves, and the surface of mountainous regions and meadows. This species has been collected at sites (113, 142, 156, 159, 168, 172, 259, 266, and 267) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 7.2–12.4°C with average of 10.5°C.



*Thanatus* sp.



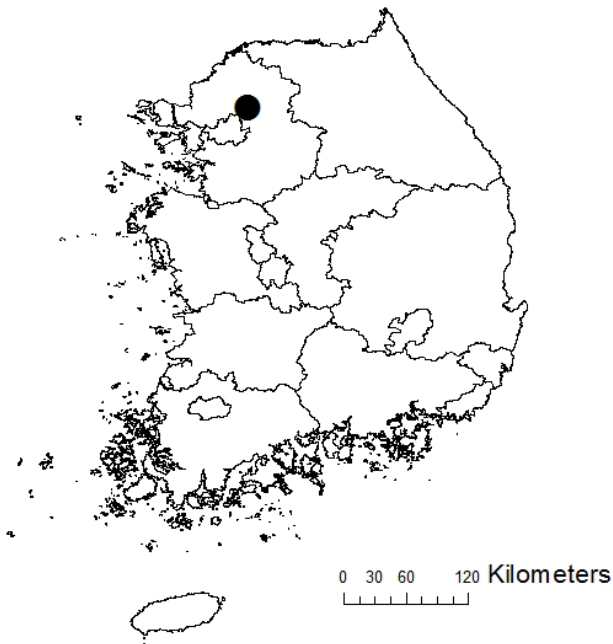
1 (2017.9.8.)

Recorded sites: 1

*Diaea subdola* 각시꽃게거미



6 (2017.6.9.)



Recorded sites: 6

Distribution: Russia, India, Pakistan to Japan

Notes: Female: 4–6 mm. Male: 3–4 mm.  
In this species, the cephalothorax and legs are green in color, and the abdomen is yellow with several horizontal light brown patterns. It hides in grass or petals and attacks insects such as flies. This species has been collected at sites (140, 148, 267, and 288) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 8.7–11.8°C with an average of 10°C.

*Ebrechtella tricuspidata* 꽃게거미



3 (2018.7.8.)



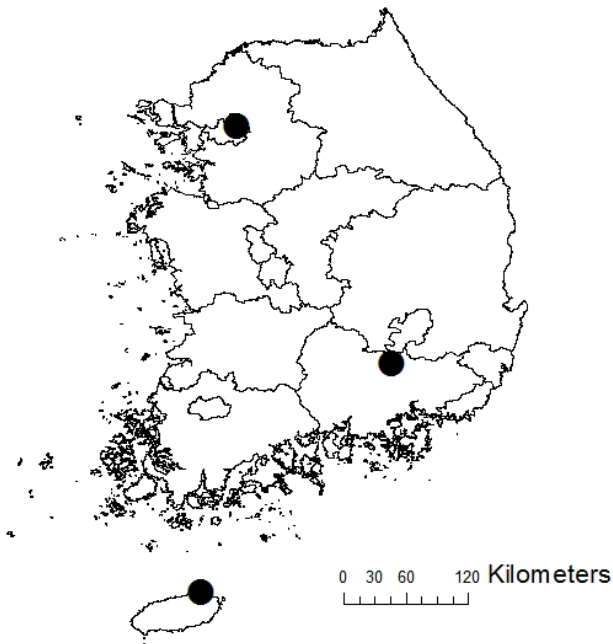
37 (2018.5.29.)

Recorded sites: 3, 37, 43

Distribution: Palearctic

Notes: Female 6–8 mm. Male 3–4 mm.

In this species, the abdomen is a pentagon with a wide back. The cephalothorax and legs are green, and the abdomen yellow. Some individuals have brown and green colored cephalothorax and legs. This species attacks insects by hiding behind leaves or petals. Around July–August, it folds the leaves to spawn and protects the hatched larvae.

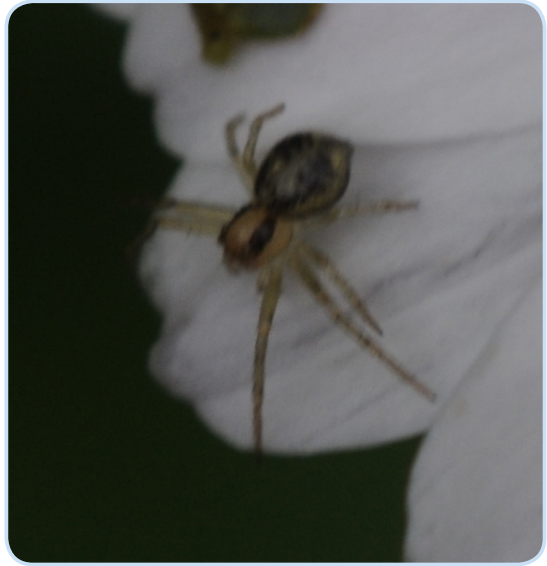


Thomisidae 계거미과

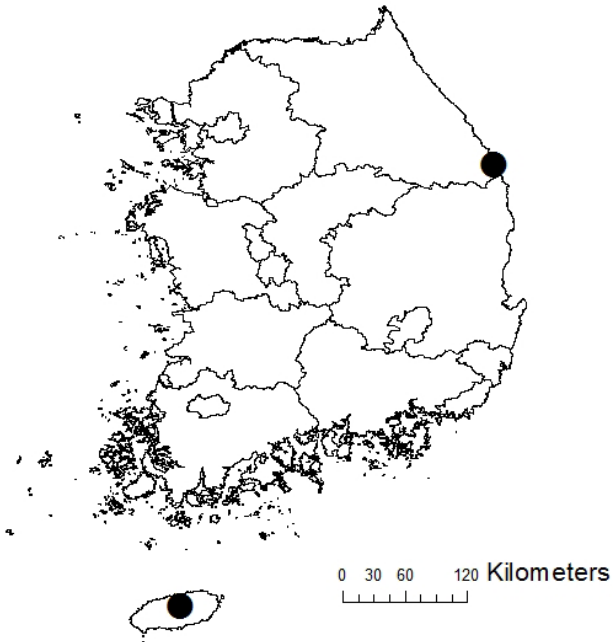
*Lysiteles coronatus* 황갈플게거미



15 (2019.4.5.)



67 (2018.10.10.)



Recorded sites: 15, 67

Distribution: Russia, China, Korea, Japan

Notes: Female: 3.5–4.5 mm. Male 3–3.5 mm. In cephalothorax, females have two thick dark brown vertical patterns on a light tan background, and males are shiny brown. It is found in the leaves or petals of shrubs or herbs in forests and meadows from low altitude to alpine.

Thomisidae 게거미과

*Lysiteles* sp.



6 (2019.4.24.)

Recorded sites: 6

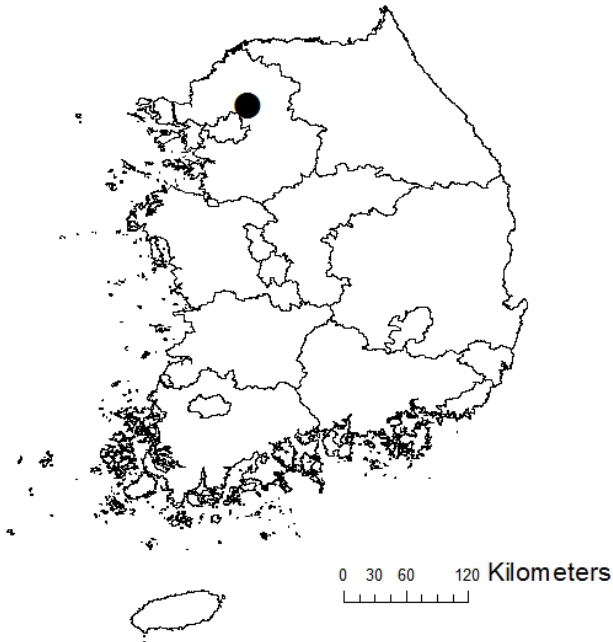


Thomisidae 게거미과

*Oxytate parallela* 중국연두게거미



6 (2018.10.5.)



Recorded sites: 6

Distribution: China, Korea

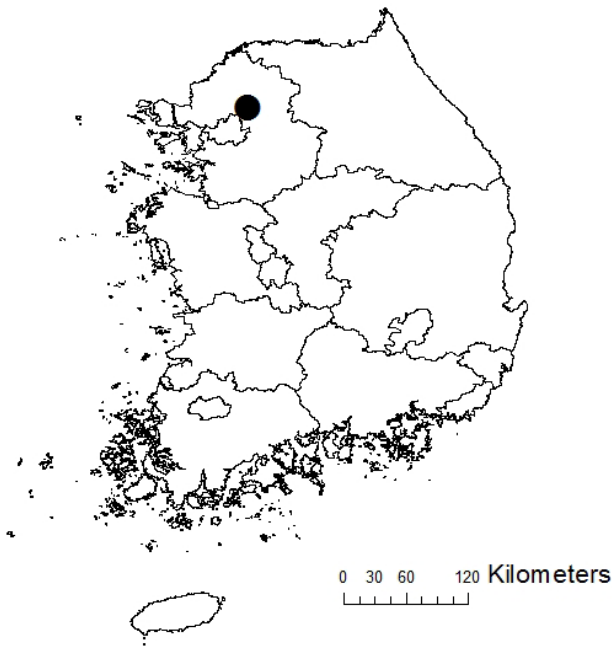
Notes: Female: 8–11 mm. Male: 7.5–8 mm.

This species is green in color with a long abdomen. It can be seen on leaves of trees and herbs in fields, plains, orchards, and forests. Females lay eggs in June and July, and protect their egg pouches.

*Oxytate striatipes* 줄연두게거미



6 (2019.6.5.)



Recorded sites: 6

Distribution: Russia, China, Korea, Taiwan, Japan

Notes: Female: 10–13 mm, Male: 8–10 mm. Green in color, the males become reddish brown in the head, palp and femora when mature. It is common in mountainous areas and fields. This species has been collected at 10 sites in Chuncheong, Jeolla, and Gyengsang by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 9.3–12.6°C with an average of 11.1°C.

Thomisidae 거거미과

*Oxytate* sp. 1



51 (2016.10.6.)

Recorded sites: 51

*Oxytate* sp. 2



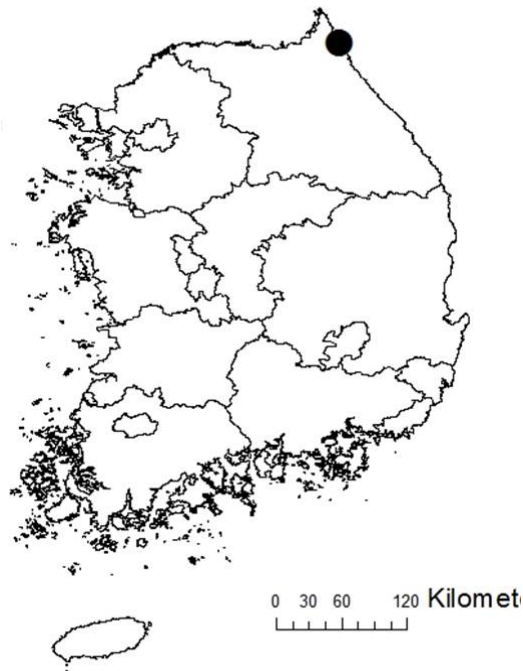
12 (2015.10.10.)

Recorded sites: 12

*Ozyptila nongae* 논개곤봉게거미



12 (2014.6.4.)



Recorded sites: 12

Distribution: Russia, China, Korea, Japan

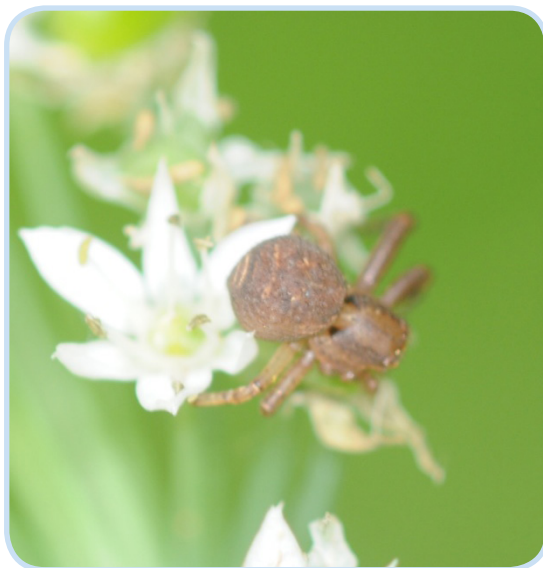
Notes: Female 3.5–4.5 mm. Male 3–3.5 mm. While the cephalothorax in the females has vertical yellowish brown pattern on a dark brown background, in the males it is darker brown. A straight dark pattern in the center of the abdomen is seen. It can be found in leaf litters or on the ground in mountainous areas, plains, and orchards (mulberry fields). This species has been collected at sites (183, 207, 287, 302, 305, and 310) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 9.3–12.2°C with average of 11.1°C.

Thomisidae 거거미과

*Xysticus* spp.



22 (2018.6.21.)



6 (2019.9.17.)

Recorded sites: 6, 8, 12, 16, 22



*Asianellus festivus* 산길강충거미



15 (2019.4.4.)

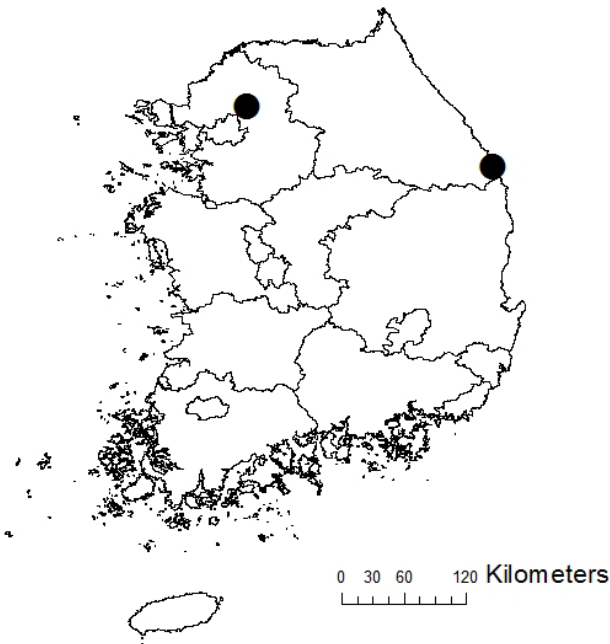
7 (2018.5.18.)

Recorded sites: 7, 15

Distribution: Palearctic

Notes: Female: 7–9 mm. Male: 6–7 mm.

The female is covered with grayish brown hair on a black background, and the male has black colored cephalothorax and abdomen, and brown legs. This species inhabits mountainous areas, roadsides, and meadows. This species has been collected in all provinces except Jeju by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 3.9–13.2°C with an average of 10.1°C.



Salticidae 강충거미과

*Asianellus* sp.



53 (2017.4.23.)

Recorded sites: 53

*Attulus avocator* 홀아비강충거미



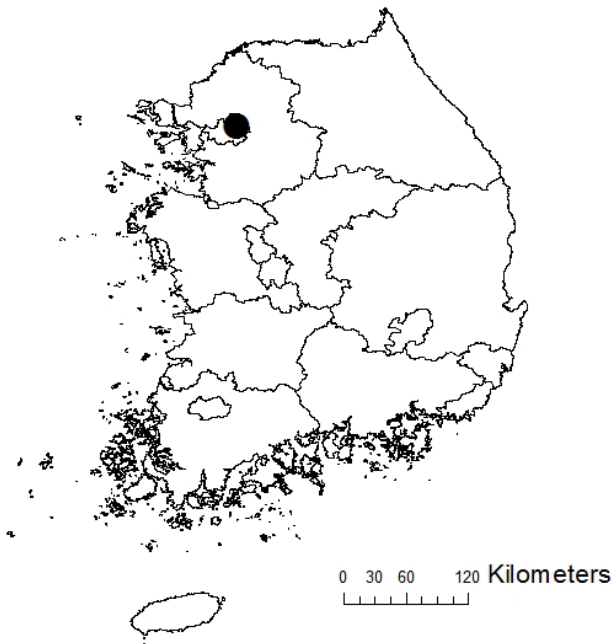
3 (2018.6.4.)

Recorded sites: 3

Distribution: Turkey to Japan

Notes: Female: 5–6 mm. Male: 3.5–4 mm.

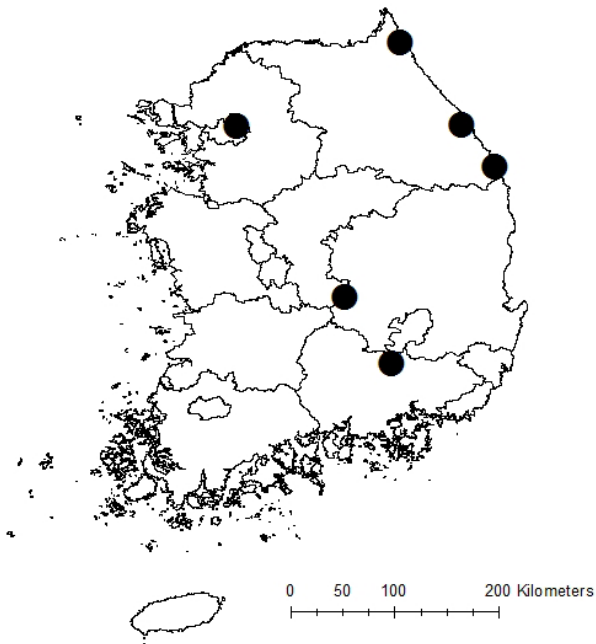
This specie has a black background covered with yellowish brown hairs. It is common around built areas, and spawns in June–July.



*Carrhotus xanthogramma* 털보강총거미



28 (2018.4.3.)



Recorded sites: 3, 8, 11, 15, 28, 37

Distribution: Palearctic

Notes: Female 7–9 mm. Male 5–7 mm.

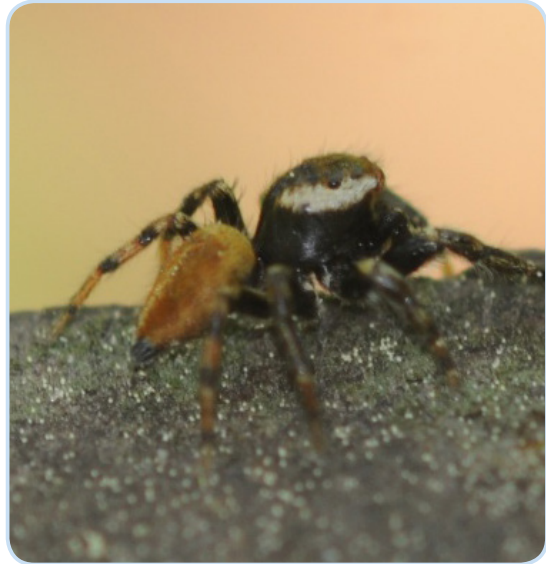
Females have white markings on a black background and have many long hairs in front of the head. The male's cephalothorax and legs are black, and the abdomen is black in the center, and both edges are yellow. It is found moving over leaves of forests, shrubs, and meadows. This species spawns in May–June, and overwinters in the bark or dry leaves.



*Evarcha albaria* 흰눈썹강충거미



15 (2019.4.4.)

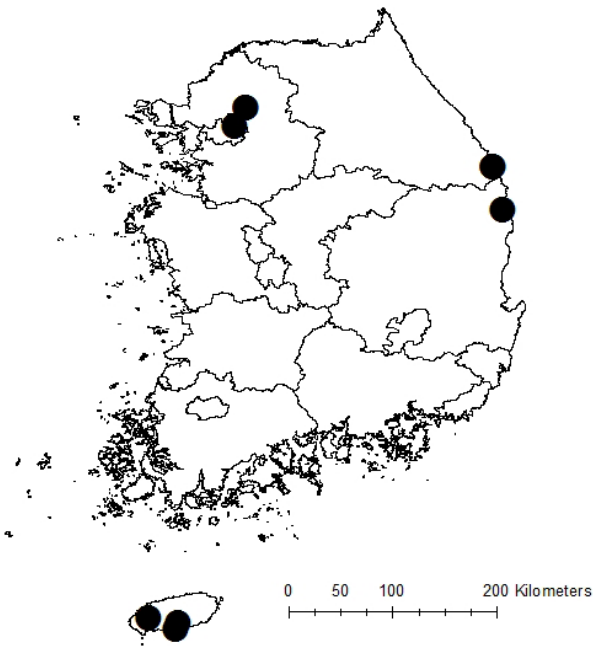


6 (2016.4.25.)

Recorded sites: 3, 6, 15, 31, 46, 53, 63

Distribution: Russia, China, Korea, Japan

Notes: Female: 7–8 mm. Male: 5–6 mm. The cephalothorax and legs are black in color, while the abdomen is tan. A white horizontal stripe pattern can be seen on the front part of the cephalothorax. It is common in mountainous areas, meadows, and in houses. This species spawns in July. This species has been collected in all provinces except Jeju by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 7.6–13.6°C with average of 11.5°C. Indicator species for climate change with an expected increase in abundance in South Korea.





Salticidae 강충거미과

*Evarcha* sp.



16 (2012.9.22.)

Recorded sites: 16

*Hakka himeshimensis* 해안갯충거미



56 (2018.10.4.)

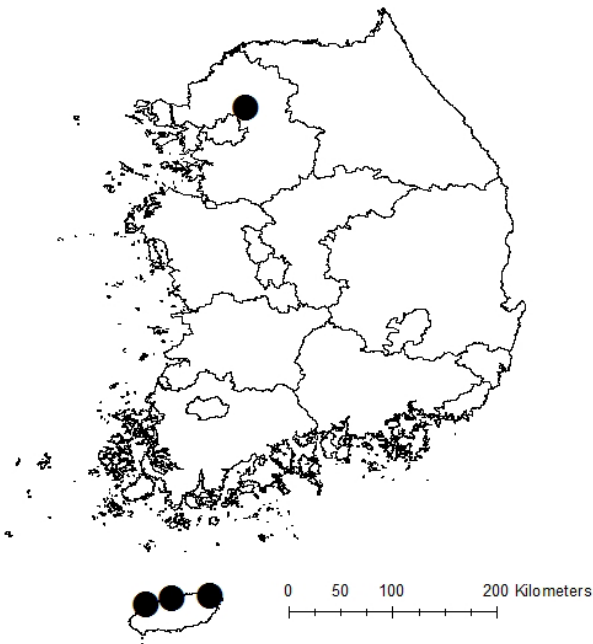


6 (2019.4.24.)

Recorded sites: 6, 56, 65, 66

Distribution: China, Korea, Japan, Hawaii, USA

Notes: Female 8–10 mm, Male 7–8 mm. The female is black in color, while the male is black with the abdomen covered white scales. It can be found among rocks on beach, in breakwaters, and fishing boats. This species moves very fast. It spawns in semi-elliptical chambers in the crevices of rocks to protect the eggs.



Salticidae 강충거미과

*Helcius* sp.



57 (2016.10.8.)

Recorded sites: 57

*Heliophanus lineiventris* 줄무늬해님강충거미

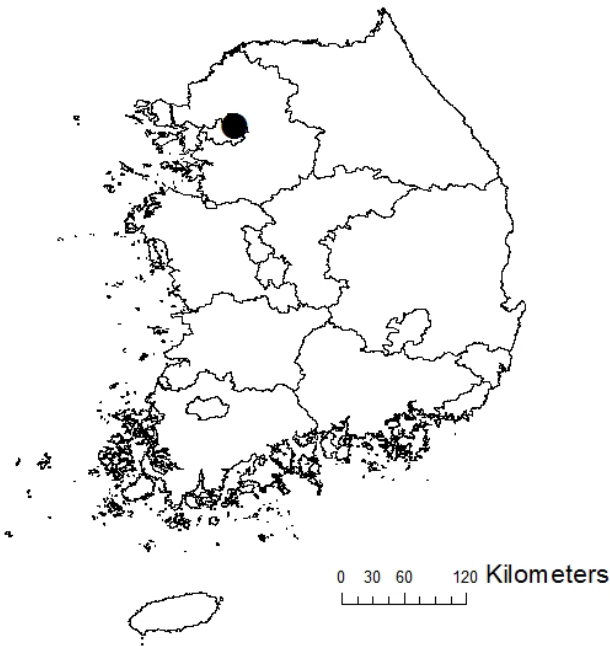


3 (2018.4.2.)

Recorded sites: 3

Distribution: Palearctic

Notes: Female: 5.5–7 mm. Male: 4.5–6 mm. It is black in color and has a thin white line on the frontal edge of the abdomen. It can be found wandering between stones in mountainous areas and along streams. Ecdysis and spawning occur in pocket-shaped houses.





Salticidae 강총거미과

*Heliophanus ussuricus* 우수리해님강총거미

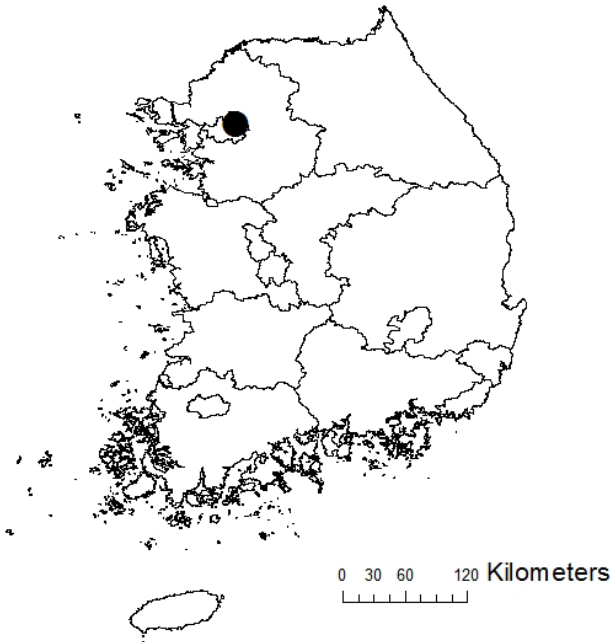


7 (2018.6.8.)

Recorded sites: 7

Distribution: Russia, Mongolia, China, Korea, Japan

Notes: Female: 3.5–4.5 mm, Male: 2.5–3.5 mm. The cephalothorax in this species is black in color, and the abdomen is brown with a metallic luster. There is a white line on the front edge. Legs are tan. It can be found on the leaves in mountainous and in meadows.





*Marpissa milleri* 왕강충거미

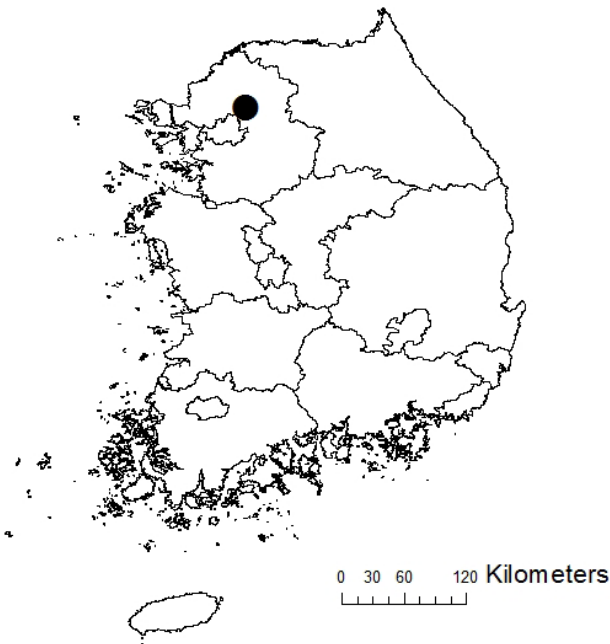


6 (2016.4.25.)

Recorded sites: 6

Distribution: Russia, China, Korea, Japan

Notes: Female: 10–12 mm. Male 8–10 mm. The body of this species is wide and the sides are black in color. The palp tarsus in the male is very large. It can be found on large wood, on walls or pillars of a temple or private houses. They overwinter in the bark. This species has been collected at sites (32, 132, 264, 266, and 298) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 8.9–12.1°C with average of 10.9°C.

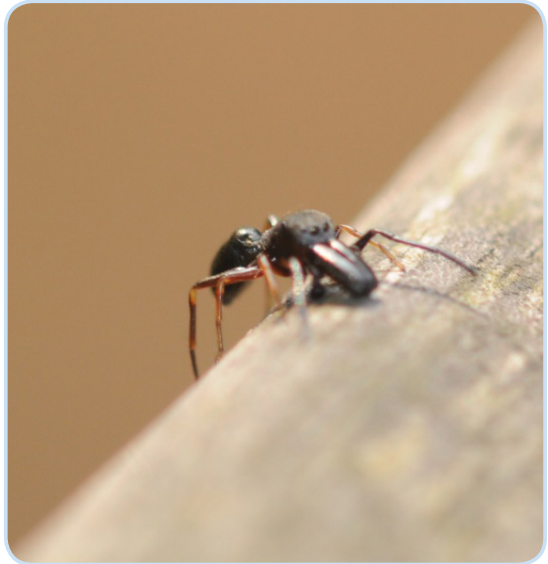


Salticidae 강총거미과

*Myrmarachne* spp.



17 (2018.5.10.)



6 (2017.6.9.)



16 (2015.5.3.)



8 (2013.6.4.)

Recorded sites: 6, 8, 16, 17, 39

*Neon reticulatus* 네온강충거미

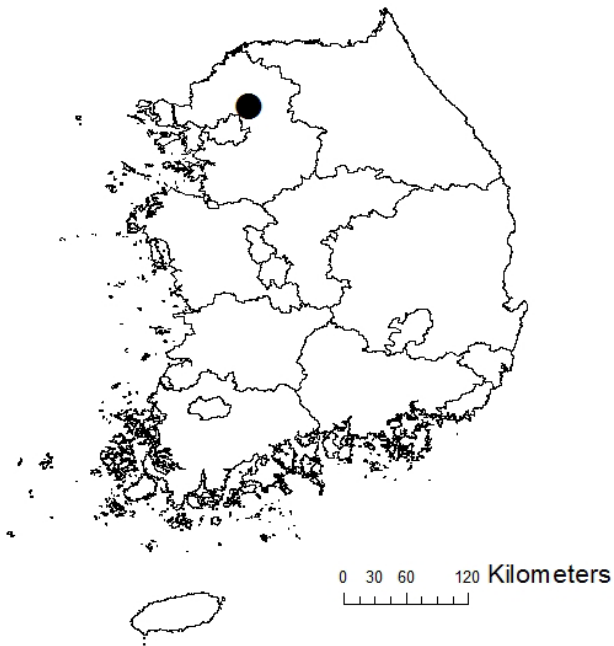


7 (2018.7.27.)

Recorded sites: 7

Distribution: Holarctic

Notes: Female: 2–3 mm. Male: 2–2.5 mm. Dark brown in color, this species is found in litters, and under stones in the forest. It can be often seen moving on the ground. This species has been collected widely in eastern region such as Gangwon, Chungbuk, Gyengsang by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 7.1–12.2°C with an average of 10.6°C.



Salticidae 강총거미과

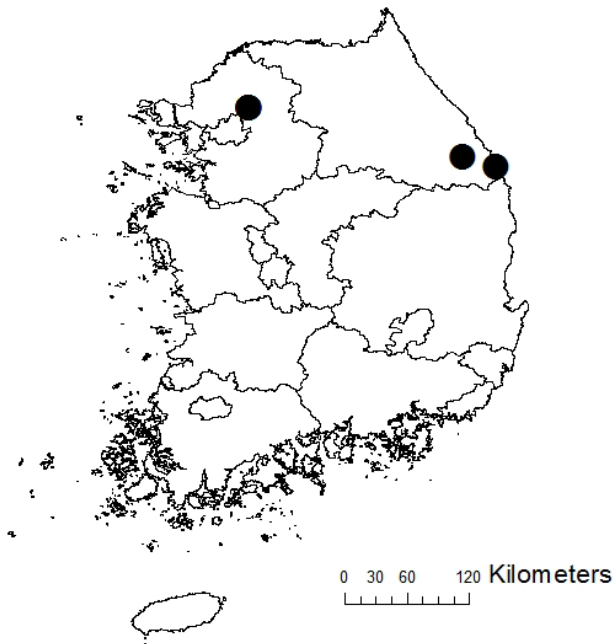
*Orienticius vulpes* 여우강총거미



15 (2019.4.5.)



6 (2019.4.24.)



Recorded sites: 6, 15, 17

Distribution: Russia, China, Korea, Japan

Notes: Female: 5–6 mm. Male: 4–5 mm.

This species has white dots on a black background. It can be found on branches and leaves in mountainous areas and in the plains. They overwinter in the bark.



*Phintella abnormis* 갈색눈강충거미



29 (2018.6.20.)



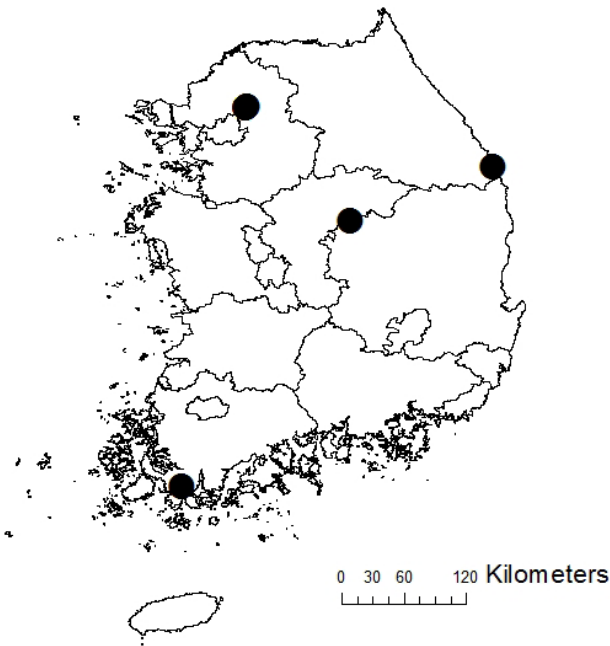
15 (2016.6.23.)

Recorded sites: 6, 7, 15, 27, 29

Distribution: Russia, China, Korea, Japan

Notes: Female: 5–6 mm. Male: 4–5 mm.

The females and males look very different. The females have two wide black vertical lines on a white background. The males have long black legs, and the body is yellowish brown. It can be found on leaves in mountainous areas and in meadows. This species has been collected at sites (157, 264, and 274) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 10.7–14.1°C with an average of 12.1°C.

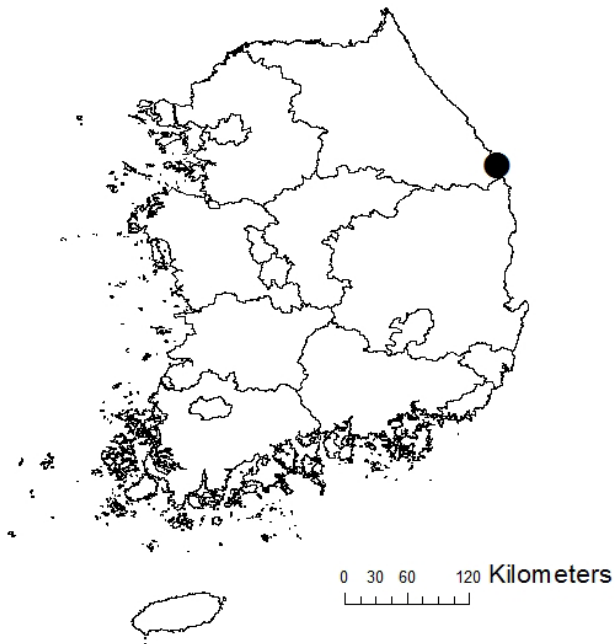




*Plexippoides annulipedis* 큰줄무늬강충거미



16 (2016.6.23.)



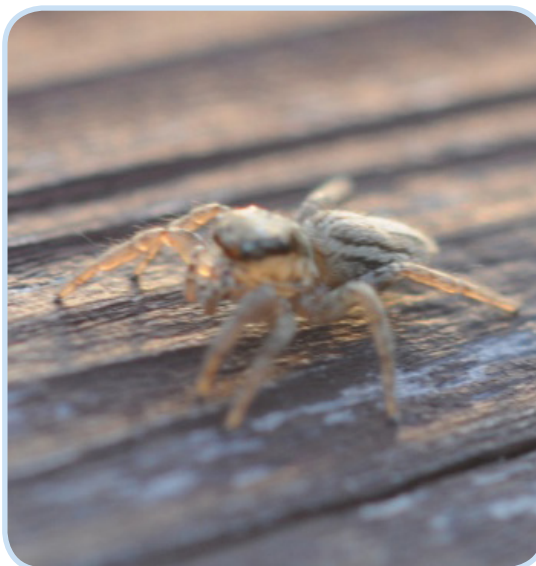
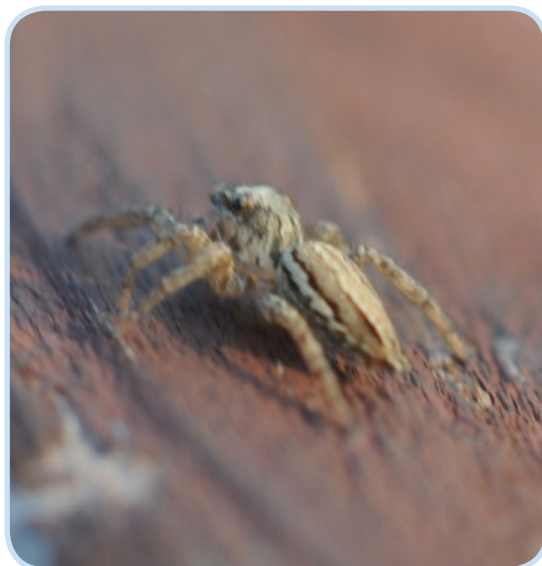
Recorded sites: 16

Distribution: China, Korea, Japan

Notes: Male 8–9 mm. This species has black and white coloration on both edges. They are found on branches and leaves in mountainous areas. They overwinter in the bark. This species has been collected at a site (52) with an annual mean temperature of 10.9°C by the national survey using pitfall traps (Kwon et al. 2013).

Salticidae 강충거미과

*Plexippoides* sp.



57 (2016.10.8.)

Recorded sites: 57

Salticidae sp. 1



1 (2017.8.24.)

Recorded sites: 1

Salticidae 강총거미과

**Salticidae sp. 2**



6 (2017.5.31.)

Recorded sites: 6

**Salticidae sp. 3**



17 (2018.5.10.)

Recorded sites: 17



Salticidae 강총거미과

**Salticidae sp. 4**



58 (2017.4.22.)

Recorded sites: 58

**Salticidae sp. 5**



20 (2019.5.28.)

Recorded sites: 20

Salticidae 강충거미과

**Salticidae sp. 6**



11 (2016.6.21.)

Recorded sites: 11

**Salticidae sp. 7**



3 (2018.6.4.)

Recorded sites: 3



Salticidae 강총거미과

**Salticidae sp. 8**



15 (2018.5.11.)

Recorded sites: 15

**Salticidae sp. 9**



19 (2019.5.29.)

Recorded sites: 19

Salticidae 강충거미과

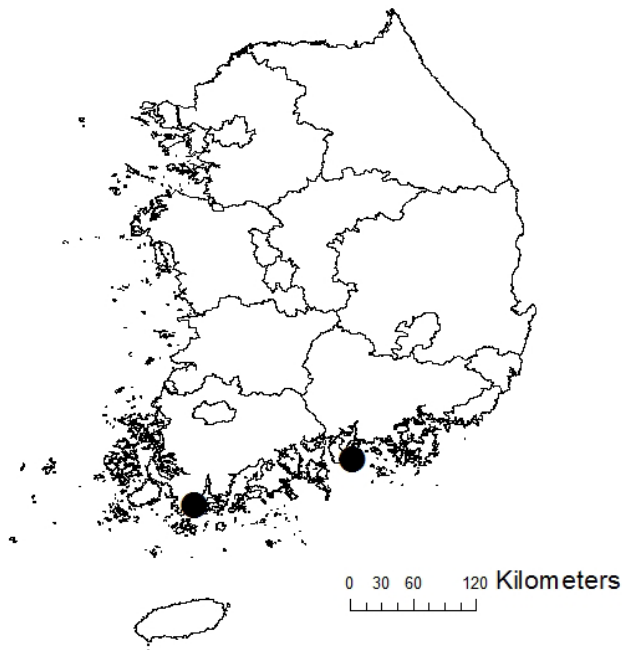
*Siler cupreus* 청띠깡충거미



35 (2018.5.31.)



26 (2019.5.24.)



Recorded sites: 26, 35

Distribution: China, Korea, Taiwan, Japan

Notes: Female: 5–7 mm. Male: 5–6 mm.

This species has cyanic green color in a black background. It can be found among vegetation and on the ground in mountainous regions. This species has been collected at two sites (146, 223) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 11.1–13.2°C with an average of 12.1°C.

Salticidae 강총거미과

*Sitticus fasciger* 고리무늬마른강총거미

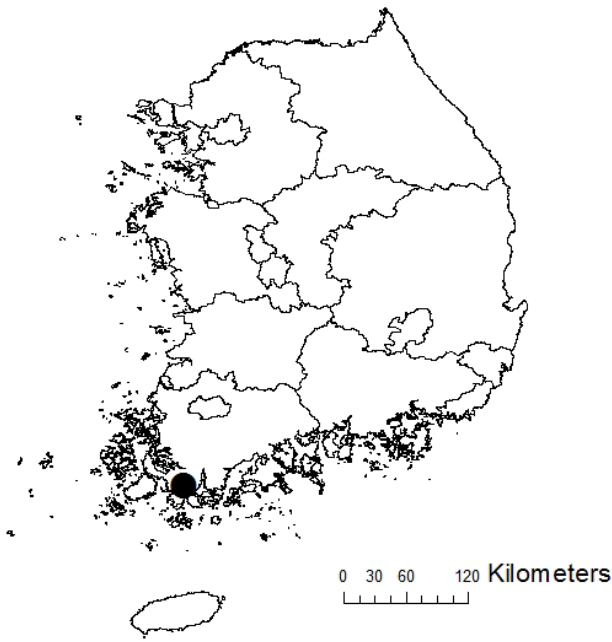


27 (2019.5.25.)

Recorded sites: 27

Distribution: Russia, China, Korea, Japan, USA

Notes: Female: 4–5.5 mm, Male: 3.5–4.5 mm. They are black in color and are covered with grayish yellow hairs. The male is blacker. They are often found around the walls of buildings, and overwinter in gaps in walls.





Salticidae 강충거미과

*Sitticus* sp. 1



6 (2019.8.20.)

Recorded sites: 6, 7

*Sitticus* sp. 2



43 (2017.9.20.)

Recorded sites: 43

Salticidae 강총거미과

*Synagelides* sp. (*agoriformis*?)



25 (2019.5.24.)

Recorded sites: 25

*Synagelides* sp.



3 (2018.5.22.)



38 (2019.5.23.)

Recorded sites: 3, 21, 38



Salticidae 강총거미과

*Telamonia vijimi* 검은날개무늬강총거미



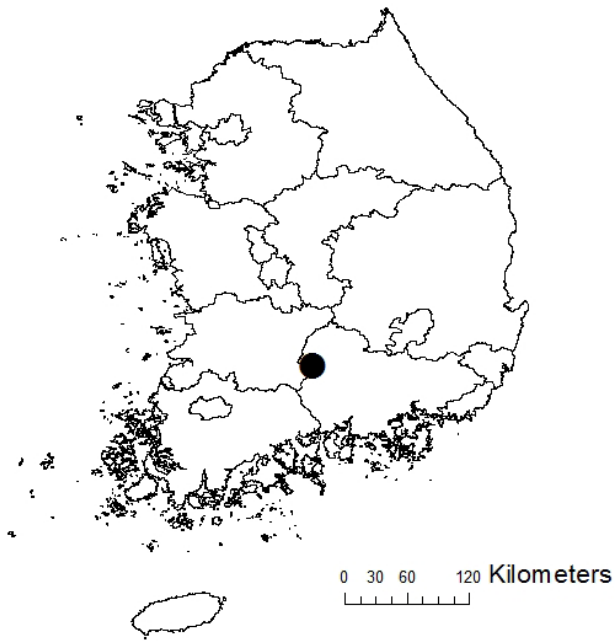
39 (2019.5.23.)

Recorded sites: 39

Distribution: China, Korea, Japan

Notes: Female: 9–11 mm. Male: 8–10 mm.

Males and females look very different. The female is white and has two vertical black stripes on the abdomen. Males have brown and yellow bodies and black legs. It is common in vegetation in mountainous areas. This species has been collected at sites (28, 33, 157, 263, 269, 274, and 282) by the national survey using pitfall traps (Kwon et al. 2013). Temperature range: 8.1–14.1°C with an average of 11.1°C.



Unidentified

**Araneae sp.**



7 (2018.5.18.)

Recorded sites: 7

## 04

## Conclusions and abstract

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Investigation of arthropods such as insects and spiders, except butterflies, depends mostly on collection. However, collection inadvertently kills the target creatures. Hence, in this study we examined whether spiders can be studied only with photographs recorded outdoors. Surveys were conducted at 68 sites nationwide over 12 years from 2007. A total of 147 species were recorded. Of these, 68 species were identified. Species identification was high for large and/or diurnal taxa (e.g., Araneidae, Salticidae, etc.), but low for taxa nocturnal or for those that inhabited dark places (eg, Pholcidae, Gnaphosidae, etc.). The species identification from photographs is low because many spider species are identified using genital structures of adults. However, analysis of the correspondence analysis on spider fauna resulted in significant results (significantly different from randomized data). The spider community on Jeju Island was separated from the inland area, and the Gwangneung area was separated from the inland area. Our results also indicated that temperature influence spider assemblage. Therefore, in surveys where the identification of species is the primary objective, such as the creation of a species list, surveys using photographs alone is inadequate. However, it is considered that it can be used to some extent for studying distribution patterns of species diversity and of spider fauna. The results of this survey, together with recent unpublished spider collection data, were compiled to create the first species list for the Gwangneung region, a biodiversity hot spot area.

05

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## 06

## Appendix

Appendix 1. Spider species recorded by photographic survey in South Korea. Details of sites are shown in Table 1.

Family	Species	Site	Latitude	Longitude	Altitude (m)	Date
Pholcidae	<i>Pholcus</i> sp. 1	13	35.299903	127.175050	105	2019-07-10
Pholcidae	<i>Pholcus</i> sp. 2	4	37.593091	127.043656	34	2018-09-27
Pholcidae	<i>Pholcus</i> sp. 2	4	37.593091	127.043656	34	2018-10-22
Pholcidae	<i>Pholcus</i> sp. 3	24	35.488627	126.905068	217	2019-07-11
Theridiidae	<i>Chikunia albipes</i>	15	37.238190	129.301022	147	2016-06-23
Theridiidae	<i>Episinus nubilus</i>	23	35.502875	127.113889	452	2019-07-11
Theridiidae	<i>Nihonhimea japonica</i>	6	37.754571	127.165946	107	2019-08-20
Theridiidae	<i>Parasteatoda kompirensis</i>	16	37.249708	129.309230	125	2012-09-22
Theridiidae	<i>Parasteatoda</i> sp. ( <i>culicivora</i> ?)	6	37.754571	127.165946	107	2019-07-24
Theridiidae	<i>Parasteatoda</i> sp. ( <i>japonica</i> or <i>kompirensis</i> ?)	6	37.754571	127.165946	107	2019-07-24
Theridiidae	<i>Parasteatoda</i> sp. ( <i>japonica</i> or <i>kompirensis</i> ?)	24	35.488627	126.905068	217	2019-07-11
Theridiidae	<i>Parasteatoda</i> sp. ( <i>kompirensis</i> or <i>asiatica</i> ?)	6	37.754571	127.165946	107	2019-07-24
Theridiidae	<i>Parasteatoda</i> sp. 1	3	37.593082	127.069533	17	2018-07-30
Theridiidae	<i>Parasteatoda</i> sp. 1	12	38.332274	128.512515	9	2014-06-04
Theridiidae	<i>Parasteatoda</i> sp. 1	40	35.566263	127.768310	173	2019-05-23
Theridiidae	<i>Parasteatoda</i> sp. 2	24	35.488627	126.905068	217	2019-07-11
Theridiidae	<i>Parasteatoda</i> sp. 2	27	34.478938	126.613812	128	2019-05-25
Theridiidae	<i>Parasteatoda</i> sp. 3	6	37.754571	127.165946	107	2019-06-05
Theridiidae	<i>Parasteatoda</i> sp. 4	6	37.754571	127.165946	107	2019-06-05
Theridiidae	<i>Parasteatoda</i> sp. 5	6	37.754571	127.165946	107	2019-07-24
Theridiidae	<i>Parasteatoda</i> sp. 5	24	35.488627	126.905068	217	2019-07-11
Theridiidae	<i>Parasteatoda</i> sp. 5	31	36.866767	129.392691	345	2007-05-04
Theridiidae	<i>Parasteatoda tabulata</i>	2	37.647719	127.069823	34	2019-05-17
Theridiidae	<i>Parasteatoda tepidariorum</i>	4	37.593091	127.043656	34	2016-05-17
Theridiidae	<i>Parasteatoda tepidariorum</i>	6	37.754571	127.165946	107	2019-09-17
Theridiidae	<i>Parasteatoda tepidariorum</i>	22	37.031839	128.480060	488	2018-06-21
Theridiidae	<i>Parasteatoda tepidariorum</i>	25	34.360100	126.675200	270	2019-05-24
Theridiidae	<i>Steatoda</i> sp.	7	37.766168	127.178755	186	2018-06-15



## Appendix 1. Continued.

Family	Species	Site	Latitude	Longitude	Altitude (m)	Date
Theridiidae	Theridiidae sp. 1	6	37.754571	127.165946	107	2019-07-24
Theridiidae	Theridiidae sp. 2	27	34.478938	126.613812	128	2019-05-25
Linyphiidae	<i>Eskovina clava</i>	20	37.655554	128.720398	856	2019-05-28
Linyphiidae	Linyphiidae sp. 1	17	37.323722	129.014710	354	2018-05-10
Linyphiidae	Linyphiidae sp. 1	59	33.346792	126.500834	1314	2017-04-19
Linyphiidae	Linyphiidae sp. 2	19	37.685483	128.761003	852	2019-05-29
Linyphiidae	Linyphiidae sp. 2	41	35.346714	127.642857	618	2019-05-23
Linyphiidae	<i>Neriene longipedella</i>	6	37.754571	127.165946	107	2019-09-17
Linyphiidae	<i>Neriene</i> sp. 1	62	33.439803	126.625770	550	2017-05-26
Linyphiidae	<i>Neriene</i> sp. 2	23	35.502875	127.113889	452	2019-07-11
Linyphiidae	<i>Neriene</i> sp. 2	24	35.488627	126.905068	217	2019-07-11
Linyphiidae	<i>Neriene?</i> sp.	3	37.593082	127.069533	17	2018-10-27
Linyphiidae	<i>Strandella pargongensis</i>	20	37.655554	128.720398	856	2019-05-28
Tetragnathidae	<i>Leucauge blanda</i>	25	34.360100	126.675200	270	2019-05-24
Tetragnathidae	<i>Leucauge</i> sp. 1	11	38.313816	128.489751	91	2016-06-21
Tetragnathidae	<i>Leucauge</i> sp. 1	23	35.502875	127.113889	452	2019-07-11
Tetragnathidae	<i>Leucauge</i> sp. 1	24	35.488627	126.905068	217	2019-07-11
Tetragnathidae	<i>Leucauge</i> sp. 2	63	33.342033	126.329376	362	2016-10-03
Tetragnathidae	<i>Leucauge subblanda</i>	24	35.488627	126.905068	217	2019-07-11
Tetragnathidae	<i>Leucauge subblanda</i>	36	35.055226	129.088549	144	2019-07-09
Tetragnathidae	<i>Tetragnatha?</i> sp.	37	35.547236	128.411312	9	2018-04-03
Araneidae	Araneidae sp. 1	41	35.346714	127.642857	618	2019-05-23
Araneidae	Araneidae sp. 2	42	33.323469	126.263668	133	2017-09-19
Araneidae	Araneidae sp. 3	47	33.512365	126.721831	144	2018-10-07
Araneidae	Araneidae sp. 4	35	34.751835	128.017684	131	2018-05-31
Araneidae	<i>Araneus ejusmodi</i>	11	38.313816	128.489751	91	2016-06-21
Araneidae	<i>Araneus</i> sp. ( <i>ventricosus?</i> )	23	35.502875	127.113889	452	2019-07-11
Araneidae	<i>Araneus</i> sp. ( <i>ventricosus?</i> )	66	33.461609	126.310521	4	2018-10-02
Araneidae	<i>Araneus</i> sp. 1	24	35.488627	126.905068	217	2019-07-11
Araneidae	<i>Araneus</i> sp. 2	63	33.342033	126.329376	362	2018-10-09
Araneidae	<i>Araneus ventricosus</i>	6	37.754571	127.165946	107	2018-10-15
Araneidae	<i>Araneus ventricosus</i>	10	37.652265	129.049819	8	2018-09-18
Araneidae	<i>Araneus ventricosus</i>	14	37.561743	129.120012	8	2018-09-17

## Appendix 1. Continued.

Family	Species	Site	Latitude	Longitude	Altitude (m)	Date
Araneidae	<i>Araneus ventricosus</i>	14	37.561743	129.120012	8	2018-09-18
Araneidae	<i>Araneus ventricosus</i>	15	37.238190	129.301022	147	2018-10-25
Araneidae	<i>Araneus ventricosus</i>	16	37.249708	129.309230	125	2007-09-12
Araneidae	<i>Araneus ventricosus</i>	24	35.488627	126.905068	217	2019-07-11
Araneidae	<i>Araneus ventricosus</i>	32	36.743709	129.468295	10	2018-08-03
Araneidae	<i>Araneus ventricosus</i>	46	33.300210	126.583583	263	2016-10-02
Araneidae	<i>Araneus ventricosus</i>	57	33.203732	126.289685	31	2018-10-08
Araneidae	<i>Araneus ventricosus</i>	58	33.225459	126.300238	3	2018-10-09
Araneidae	<i>Araneus ventricosus</i>	64	33.250603	126.422779	96	2018-10-08
Araneidae	<i>Araneus ventricosus</i>	68	33.389438	126.239504	14	2018-10-09
Araneidae	<i>Araniella</i> sp.	7	37.766168	127.178755	186	2018-05-18
Araneidae	<i>Argiope bruennichi</i>	1	37.746135	127.185471	91	2017-06-29
Araneidae	<i>Argiope bruennichi</i>	1	37.746135	127.185471	91	2017-07-20
Araneidae	<i>Argiope bruennichi</i>	1	37.746135	127.185471	91	2017-08-07
Araneidae	<i>Argiope bruennichi</i>	1	37.746135	127.185471	91	2017-08-24
Araneidae	<i>Argiope bruennichi</i>	1	37.746135	127.185471	91	2017-09-29
Araneidae	<i>Argiope bruennichi</i>	6	37.754571	127.165946	107	2018-09-10
Araneidae	<i>Argiope bruennichi</i>	6	37.754571	127.165946	107	2019-09-17
Araneidae	<i>Argiope bruennichi</i>	7	37.766168	127.178755	186	2018-06-29
Araneidae	<i>Argiope bruennichi</i>	7	37.766168	127.178755	186	2018-07-06
Araneidae	<i>Argiope bruennichi</i>	7	37.766168	127.178755	186	2018-07-20
Araneidae	<i>Argiope bruennichi</i>	7	37.766168	127.178755	186	2018-07-27
Araneidae	<i>Argiope bruennichi</i>	7	37.766168	127.178755	186	2018-08-13
Araneidae	<i>Argiope bruennichi</i>	12	38.332274	128.512515	9	2013-07-19
Araneidae	<i>Argiope bruennichi</i>	43	33.559680	126.762443	3	2017-09-20
Araneidae	<i>Argiope bruennichi</i>	43	33.559680	126.762443	3	2017-09-20
Araneidae	<i>Argiope bruennichi</i>	43	33.559680	126.762443	3	2018-10-11
Araneidae	<i>Argiope bruennichi</i>	49	33.120637	126.267120	12	2018-10-03
Araneidae	<i>Argiope bruennichi</i>	54	33.462893	126.937011	22	2018-10-07
Araneidae	<i>Argiope bruennichi</i>	63	33.342033	126.329376	362	2018-10-09
Araneidae	<i>Argiope minuta</i>	16	37.249708	129.309230	125	2007-09-12
Araneidae	<i>Argiope minuta</i>	6	37.754571	127.165946	107	2019-08-20
Araneidae	<i>Argiope</i> sp.	24	35.488627	126.905068	217	2019-07-11

## Appendix 1. Continued.

Family	Species	Site	Latitude	Longitude	Altitude (m)	Date
Araneidae	<i>Cyclosa japonica</i>	6	37.754571	127.165946	107	2019-10-04
Araneidae	<i>Cyclosa omonaga</i>	48	33.387163	126.755947	275	2018-10-07
Araneidae	<i>Gasteracantha kuhli</i>	6	37.754571	127.165946	107	2018-09-10
Araneidae	<i>Larinioides cornutus</i>	60	33.503369	126.942671	4	2017-04-20
Araneidae	<i>Mangora cretospicta</i>	6	37.754571	127.165946	107	2019-04-24
Araneidae	<i>Neoscona multiplicans</i>	15	37.238190	129.301022	147	2016-06-23
Araneidae	<i>Neoscona scylla</i>	6	37.754571	127.165946	107	2018-06-18
Araneidae	<i>Neoscona scylla</i>	6	37.754571	127.165946	107	2019-08-20
Araneidae	<i>Neoscona scylla</i>	7	37.766168	127.178755	186	2018-06-08
Araneidae	<i>Neoscona scylla</i>	24	35.488627	126.905068	217	2019-07-11
Araneidae	<i>Neoscona scylla</i>	39	35.523745	127.719782	172	2019-05-23
Araneidae	<i>Neoscona scylloides</i>	3	37.593082	127.069533	17	2018-08-26
Araneidae	<i>Neoscona scylloides</i>	12	38.332274	128.512515	9	2013-07-19
Araneidae	<i>Neoscona scylloides</i>	24	35.488627	126.905068	217	2019-07-11
Araneidae	<i>Neoscona</i> sp. 1	7	37.766168	127.178755	186	2018-08-13
Araneidae	<i>Neoscona</i> sp. 2	24	35.488627	126.905068	217	2019-07-11
Araneidae	<i>Neoscona</i> sp. 2	24	35.488627	126.905068	217	2019-07-11
Araneidae	<i>Neoscona</i> sp. 3	45	33.331912	126.333898	385	2018-10-04
Araneidae	<i>Neoscona</i> sp. 4	16	37.249708	129.309230	125	2016-06-23
Araneidae	<i>Neoscona</i> sp. 4	23	35.502875	127.113889	452	2019-07-11
Araneidae	<i>Nephila clavata</i>	1	37.746135	127.185471	91	2017-06-29
Araneidae	<i>Nephila clavata</i>	1	37.746135	127.185471	91	2017-07-20
Araneidae	<i>Nephila clavata</i>	1	37.746135	127.185471	91	2017-07-27
Araneidae	<i>Nephila clavata</i>	1	37.746135	127.185471	91	2017-08-07
Araneidae	<i>Nephila clavata</i>	1	37.746135	127.185471	91	2017-08-17
Araneidae	<i>Nephila clavata</i>	1	37.746135	127.185471	91	2017-08-24
Araneidae	<i>Nephila clavata</i>	1	37.746135	127.185471	91	2017-09-15
Araneidae	<i>Nephila clavata</i>	1	37.746135	127.185471	91	2017-09-29
Araneidae	<i>Nephila clavata</i>	1	37.746135	127.185471	91	2017-10-02
Araneidae	<i>Nephila clavata</i>	1	37.746135	127.185471	91	2017-10-13
Araneidae	<i>Nephila clavata</i>	1	37.746135	127.185471	91	2018-08-27
Araneidae	<i>Nephila clavata</i>	3	37.593082	127.069533	17	2017-10-14
Araneidae	<i>Nephila clavata</i>	3	37.593082	127.069533	17	2018-07-30

## Appendix 1. Continued.

Family	Species	Site	Latitude	Longitude	Altitude (m)	Date
Araneidae	<i>Nephila clavata</i>	3	37.593082	127.069533	17	2018-08-10
Araneidae	<i>Nephila clavata</i>	3	37.593082	127.069533	17	2018-08-17
Araneidae	<i>Nephila clavata</i>	3	37.593082	127.069533	17	2018-09-28
Araneidae	<i>Nephila clavata</i>	4	37.593091	127.043656	34	2018-09-27
Araneidae	<i>Nephila clavata</i>	4	37.593091	127.043656	34	2018-10-22
Araneidae	<i>Nephila clavata</i>	5	37.532186	127.311388	29	2019-06-24
Araneidae	<i>Nephila clavata</i>	6	37.754571	127.165946	107	2018-09-10
Araneidae	<i>Nephila clavata</i>	6	37.754571	127.165946	107	2019-07-24
Araneidae	<i>Nephila clavata</i>	6	37.754571	127.165946	107	2019-08-20
Araneidae	<i>Nephila clavata</i>	6	37.754571	127.165946	107	2019-09-17
Araneidae	<i>Nephila clavata</i>	6	37.754571	127.165946	107	2019-10-04
Araneidae	<i>Nephila clavata</i>	7	37.766168	127.178755	186	2018-06-08
Araneidae	<i>Nephila clavata</i>	7	37.766168	127.178755	186	2018-06-29
Araneidae	<i>Nephila clavata</i>	7	37.766168	127.178755	186	2018-07-20
Araneidae	<i>Nephila clavata</i>	7	37.766168	127.178755	186	2018-07-27
Araneidae	<i>Nephila clavata</i>	7	37.766168	127.178755	186	2018-08-06
Araneidae	<i>Nephila clavata</i>	7	37.766168	127.178755	186	2018-08-13
Araneidae	<i>Nephila clavata</i>	7	37.766168	127.178755	186	2018-09-22
Araneidae	<i>Nephila clavata</i>	7	37.766168	127.178755	186	2018-10-01
Araneidae	<i>Nephila clavata</i>	7	37.766168	127.178755	186	2018-10-20
Araneidae	<i>Nephila clavata</i>	7	37.766168	127.178755	186	2018-10-29
Araneidae	<i>Nephila clavata</i>	10	37.652265	129.049819	8	2018-09-18
Araneidae	<i>Nephila clavata</i>	12	38.332274	128.512515	9	2013-07-19
Araneidae	<i>Nephila clavata</i>	12	38.332274	128.512515	9	2015-10-10
Araneidae	<i>Nephila clavata</i>	15	37.238190	129.301022	147	2018-10-25
Araneidae	<i>Nephila clavata</i>	16	37.249708	129.309230	125	2011-08-18
Araneidae	<i>Nephila clavata</i>	16	37.249708	129.309230	125	2012-09-22
Araneidae	<i>Nephila clavata</i>	18	37.230745	128.933410	911	2018-07-31
Araneidae	<i>Nephila clavata</i>	24	35.488627	126.905068	217	2019-07-11
Araneidae	<i>Nephila clavata</i>	24	35.488627	126.905068	217	2019-07-11
Araneidae	<i>Nephila clavata</i>	30	36.829500	129.268742	304	2018-08-01
Araneidae	<i>Nephila clavata</i>	32	36.743709	129.468295	10	2018-08-03
Araneidae	<i>Nephila clavata</i>	33	36.383857	129.135613	272	2018-08-02

## Appendix 1. Continued.

Family	Species	Site	Latitude	Longitude	Altitude (m)	Date
Araneidae	<i>Nephila clavata</i>	36	35.055226	129.088549	144	2019-07-09
Araneidae	<i>Nephila clavata</i>	42	33.323469	126.263668	133	2017-09-19
Araneidae	<i>Nephila clavata</i>	44	33.475250	126.825336	211	2018-10-04
Araneidae	<i>Nephila clavata</i>	45	33.331912	126.333898	385	2018-10-04
Araneidae	<i>Nephila clavata</i>	47	33.512365	126.721831	144	2018-10-07
Araneidae	<i>Nephila clavata</i>	48	33.387163	126.755947	275	2018-10-07
Araneidae	<i>Nephila clavata</i>	50	33.438546	126.791841	318	2018-10-10
Araneidae	<i>Nephila clavata</i>	52	33.244787	126.414031	18	2018-10-08
Araneidae	<i>Nephila clavata</i>	54	33.462893	126.937011	22	2018-10-07
Araneidae	<i>Nephila clavata</i>	57	33.203732	126.289685	31	2018-10-08
Araneidae	<i>Nephila clavata</i>	61	33.429668	126.615892	635	2017-09-21
Araneidae	<i>Nephila clavata</i>	63	33.342033	126.329376	362	2016-10-03
Araneidae	<i>Nephila clavata</i>	63	33.342033	126.329376	362	2018-10-09
Araneidae	<i>Nephila clavata</i>	64	33.250603	126.422779	96	2018-10-08
Araneidae	<i>Nephila clavata</i>	66	33.461609	126.310521	4	2018-10-02
Araneidae	<i>Plebs sachalinensis</i>	20	37.655554	128.720398	856	2019-05-28
Lycosidae	<i>Alopecosa moriutii</i>	19	37.685483	128.761003	852	2019-05-29
Lycosidae	<i>Arctosa kwangreungensis</i>	6	37.754571	127.165946	107	2017-04-12
Lycosidae	<i>Arctosa kwangreungensis</i>	6	37.754571	127.165946	107	2019-04-24
Lycosidae	<i>Arctosa kwangreungensis</i>	6	37.754571	127.165946	107	2019-09-17
Lycosidae	<i>Arctosa</i> sp. 1	20	37.655554	128.720398	856	2019-05-28
Lycosidae	<i>Arctosa</i> sp. 2	8	37.601511	129.011227	72	2018-09-17
Lycosidae	<i>Arctosa</i> sp. 3	11	38.313816	128.489751	91	2016-06-21
Lycosidae	<i>Arctosa subamylacea</i>	7	37.766168	127.178755	186	2017-05-04
Lycosidae	<i>Arctosa subamylacea</i>	6	37.754571	127.165946	107	2019-04-24
Lycosidae	<i>Arctosa subamylacea</i>	7	37.766168	127.178755	186	2017-05-04
Lycosidae	<i>Lycosa coelestis</i>	51	33.401622	126.675078	455	2017-04-19
Lycosidae	<i>Lycosa coelestis</i>	61	33.429668	126.615892	635	2017-09-21
Lycosidae	Lycosidae sp.	41	35.346714	127.642857	618	2019-05-23
Lycosidae	<i>Pardosa astrigera</i>	1	37.746135	127.185471	91	2017-07-20
Lycosidae	<i>Pardosa astrigera</i>	1	37.746135	127.185471	91	2017-10-13
Lycosidae	<i>Pardosa astrigera</i>	7	37.766168	127.178755	186	2018-04-13
Lycosidae	<i>Pardosa astrigera</i>	7	37.766168	127.178755	186	2018-04-20



## Appendix 1. Continued.

Family	Species	Site	Latitude	Longitude	Altitude (m)	Date
Lycosidae	<i>Pardosa astrigera</i>	7	37.766168	127.178755	186	2018-05-18
Lycosidae	<i>Pardosa astrigera</i>	7	37.766168	127.178755	186	2018-06-08
Lycosidae	<i>Pardosa astrigera</i>	7	37.766168	127.178755	186	2018-06-15
Lycosidae	<i>Pardosa astrigera</i>	7	37.766168	127.178755	186	2018-06-29
Lycosidae	<i>Pardosa astrigera</i>	7	37.766168	127.178755	186	2018-07-06
Lycosidae	<i>Pardosa astrigera</i>	7	37.766168	127.178755	186	2018-07-20
Lycosidae	<i>Pardosa astrigera</i>	7	37.766168	127.178755	186	2018-10-01
Lycosidae	<i>Pardosa astrigera</i>	7	37.766168	127.178755	186	2018-10-20
Lycosidae	<i>Pardosa astrigera</i>	15	37.238190	129.301022	147	2019-04-04
Lycosidae	<i>Pardosa hedini</i>	16	37.249708	129.309230	125	2015-05-03
Lycosidae	<i>Pardosa koponeni</i>	18	37.230745	128.933410	911	2018-07-31
Lycosidae	<i>Pardosa koponeni</i>	19	37.685483	128.761003	852	2019-05-29
Lycosidae	<i>Pardosa laura</i>	4	37.593091	127.043656	34	2019-05-07
Lycosidae	<i>Pardosa laura</i>	28	36.116023	128.007262	193	2018-04-03
Lycosidae	<i>Pardosa</i> sp.	49	33.120637	126.267120	12	2018-10-03
Lycosidae	<i>Pardosa</i> sp.	51	33.401622	126.675078	455	2016-10-06
Lycosidae	<i>Pirata</i> sp.	9	37.792697	128.905760	0	2019-05-19
Lycosidae	<i>Pirata subpiraticus</i>	1	37.746135	127.185471	91	2017-08-24
Pisauridae	<i>Dolomedes sulfureus</i>	6	37.754571	127.165946	107	2018-06-18
Pisauridae	<i>Dolomedes sulfureus</i>	7	37.766168	127.178755	186	2018-06-15
Pisauridae	<i>Pisaura lama</i>	1	37.746135	127.185471	91	2017-08-24
Pisauridae	<i>Pisaura lama</i>	7	37.766168	127.178755	186	2018-10-01
Pisauridae	<i>Pisaura lama</i>	12	38.332274	128.512515	9	2014-06-04
Pisauridae	<i>Pisaura lama</i>	15	37.238190	129.301022	147	2016-06-23
Pisauridae	<i>Pisaura</i> sp.	8	37.601511	129.011227	72	2016-06-22
Oxyopidae	<i>Oxyopes sertatus</i>	48	33.387163	126.755947	275	2018-10-07
Oxyopidae	<i>Oxyopes</i> sp.	7	37.766168	127.178755	186	2018-05-18
Ctenidae	<i>Anahita fauna</i>	3	37.593082	127.069533	17	2018-04-02
Agelenidae	<i>Agelena limbata</i>	1	37.746135	127.185471	91	2017-06-29
Agelenidae	<i>Agelena limbata</i>	6	37.754571	127.165946	107	2019-07-24
Agelenidae	<i>Agelena limbata</i>	24	35.488627	126.905068	217	2019-07-11
Agelenidae	<i>Agelena limbata</i>	24	35.488627	126.905068	217	2019-07-11
Agelenidae	<i>Agelena limbata</i>	36	35.055226	129.088549	144	2019-07-09

## Appendix 1. Continued.

Family	Species	Site	Latitude	Longitude	Altitude (m)	Date
Agelenidae	<i>Agelena</i> sp. 1	43	33.559680	126.762443	3	2018-10-11
Agelenidae	<i>Agelena</i> sp. 1	58	33.225459	126.300238	3	2018-10-09
Agelenidae	<i>Agelena</i> sp. 1	64	33.250603	126.422779	96	2018-10-08
Agelenidae	<i>Agelena</i> sp. 2	27	34.478938	126.613812	128	2019-05-25
Agelenidae	<i>Alloclubionoides</i> sp.	2	37.647719	127.069823	34	2019-05-17
Agelenidae	<i>Pireneitega spinivulva</i>	36	35.055226	129.088549	144	2019-07-09
Titanoecidae	<i>Nurscia albofasciata</i>	17	37.323722	129.014710	354	2018-05-10
Titanoecidae	<i>Nurscia albofasciata</i>	18	37.230745	128.933410	911	2018-07-31
Titanoecidae	<i>Nurscia albofasciata</i>	27	34.478938	126.613812	128	2019-05-25
Phrurolithidae	<i>Phrurolithus pennatus</i>	1	37.746135	127.185471	91	2017-05-27
Phrurolithidae	<i>Phrurolithus</i> sp.	6	37.754571	127.165946	107	2019-06-05
Gnaphosidae	<i>Drassodes</i> sp.	7	37.766168	127.178755	186	2018-06-08
Gnaphosidae	<i>Drassyllus</i> sp.	21	36.960791	127.922450	95	2018-06-19
Gnaphosidae	<i>Gnaphosa</i> sp.	37	35.547236	128.411312	9	2018-05-29
Gnaphosidae	Gnaphosidae spp.	6	37.754571	127.165946	107	2017-06-09
Gnaphosidae	Gnaphosidae spp.	6	37.754571	127.165946	107	2019-05-15
Gnaphosidae	Gnaphosidae spp.	6	37.754571	127.165946	107	2019-10-04
Gnaphosidae	Gnaphosidae spp.	15	37.238190	129.301022	147	2018-10-25
Gnaphosidae	Gnaphosidae spp.	24	35.488627	126.905068	217	2019-07-11
Gnaphosidae	Gnaphosidae spp.	33	36.383857	129.135613	272	2018-08-02
Gnaphosidae	Gnaphosidae spp.	39	35.523745	127.719782	172	2019-05-23
Gnaphosidae	<i>Urozelotes rusticus</i>	17	37.323722	129.014710	354	2018-05-10
Gnaphosidae	<i>Zelotes</i> sp.	37	35.547236	128.411312	9	2018-04-03
Sparassidae	<i>Sinopoda</i> sp.	6	37.754571	127.165946	107	2017-06-09
Philodromidae	<i>Philodromus rufus</i>	20	37.655554	128.720398	856	2019-05-28
Philodromidae	<i>Philodromus</i> sp. 1	15	37.238190	129.301022	147	2016-06-23
Philodromidae	<i>Philodromus</i> sp. 1	24	35.488627	126.905068	217	2019-07-11
Philodromidae	<i>Philodromus</i> sp. 1	28	36.116023	128.007262	193	2018-05-08
Philodromidae	<i>Philodromus</i> sp. 2	23	35.502875	127.113889	452	2019-07-11
Philodromidae	<i>Philodromus</i> sp. 2	36	35.055226	129.088549	144	2019-07-09
Philodromidae	<i>Philodromus spinitarsis</i>	12	38.332274	128.512515	9	2013-07-19
Philodromidae	<i>Thanatus coreanus</i>	21	36.960791	127.922450	95	2018-06-19
Philodromidae	<i>Thanatus miniaceus</i>	16	37.249708	129.309230	125	2015-05-03

## Appendix 1. Continued.

Family	Species	Site	Latitude	Longitude	Altitude (m)	Date
Philodromidae	<i>Thanatus</i> sp.	1	37.746135	127.185471	91	2017-09-08
Thomisidae	<i>Diaea subdola</i>	6	37.754571	127.165946	107	2017-06-09
Thomisidae	<i>Ebrechtella tricuspidata</i>	3	37.593082	127.069533	17	2018-07-08
Thomisidae	<i>Ebrechtella tricuspidata</i>	37	35.547236	128.411312	9	2018-05-29
Thomisidae	<i>Ebrechtella tricuspidata</i>	43	33.559680	126.762443	3	2018-10-11
Thomisidae	<i>Lysiteles coronatus</i>	15	37.238190	129.301022	147	2019-04-05
Thomisidae	<i>Lysiteles coronatus</i>	67	33.431880	126.597079	573	2018-10-10
Thomisidae	<i>Lysiteles</i> sp.	6	37.754571	127.165946	107	2019-04-24
Thomisidae	<i>Oxytate parallela</i>	6	37.754571	127.165946	107	2018-10-05
Thomisidae	<i>Oxytate</i> sp. 1	51	33.401622	126.675078	455	2016-10-06
Thomisidae	<i>Oxytate</i> sp. 2	12	38.332274	128.512515	9	2015-10-10
Thomisidae	<i>Oxytate striatipes</i>	6	37.754571	127.165946	107	2019-06-05
Thomisidae	<i>Ozyptila nongae</i>	12	38.332274	128.512515	9	2014-06-04
Thomisidae	<i>Xysticus</i> spp.	6	37.754571	127.165946	107	2019-09-17
Thomisidae	<i>Xysticus</i> spp.	8	37.601511	129.011227	72	2011-06-14
Thomisidae	<i>Xysticus</i> spp.	12	38.332274	128.512515	9	2012-05-12
Thomisidae	<i>Xysticus</i> spp.	12	38.332274	128.512515	9	2014-06-04
Thomisidae	<i>Xysticus</i> spp.	16	37.249708	129.309230	125	2014-10-20
Thomisidae	<i>Xysticus</i> spp.	22	37.031839	128.480060	488	2018-06-21
Salticidae	<i>Asianellus festivus</i>	7	37.766168	127.178755	186	2018-05-18
Salticidae	<i>Asianellus festivus</i>	15	37.238190	129.301022	147	2019-04-04
Salticidae	<i>Asianellus</i> sp.	53	33.244003	126.559768	14	2017-04-23
Salticidae	<i>Attulus avocator</i>	3	37.593082	127.069533	17	2018-06-04
Salticidae	<i>Carrhotus xanthogramma</i>	3	37.593082	127.069533	17	2016-04-23
Salticidae	<i>Carrhotus xanthogramma</i>	8	37.601511	129.011227	72	2016-06-22
Salticidae	<i>Carrhotus xanthogramma</i>	11	38.313816	128.489751	91	2012-05-11
Salticidae	<i>Carrhotus xanthogramma</i>	15	37.238190	129.301022	147	2019-04-04
Salticidae	<i>Carrhotus xanthogramma</i>	28	36.116023	128.007262	193	2018-04-03
Salticidae	<i>Carrhotus xanthogramma</i>	37	35.547236	128.411312	9	2018-04-03
Salticidae	<i>Evarcha albaria</i>	3	37.593082	127.069533	17	2018-07-30
Salticidae	<i>Evarcha albaria</i>	6	37.754571	127.165946	107	2016-04-25
Salticidae	<i>Evarcha albaria</i>	6	37.754571	127.165946	107	2017-06-09
Salticidae	<i>Evarcha albaria</i>	15	37.238190	129.301022	147	2019-04-04

## Appendix 1. Continued.

Family	Species	Site	Latitude	Longitude	Altitude (m)	Date
Salticidae	<i>Evarcha albaria</i>	15	37.238190	129.301022	147	2019-04-05
Salticidae	<i>Evarcha albaria</i>	31	36.866767	129.392691	345	2007-05-04
Salticidae	<i>Evarcha albaria</i>	46	33.300210	126.583583	263	2016-10-02
Salticidae	<i>Evarcha albaria</i>	53	33.244003	126.559768	14	2017-04-24
Salticidae	<i>Evarcha albaria</i>	63	33.342033	126.329376	362	2016-10-03
Salticidae	<i>Evarcha</i> sp.	16	37.249708	129.309230	125	2012-09-22
Salticidae	<i>Hakka himeshimensis</i>	6	37.754571	127.165946	107	2019-04-24
Salticidae	<i>Hakka himeshimensis</i>	56	33.529580	126.855214	1	2018-10-04
Salticidae	<i>Hakka himeshimensis</i>	56	33.529580	126.855214	1	2018-10-11
Salticidae	<i>Hakka himeshimensis</i>	65	33.517032	126.524004	8	2017-09-19
Salticidae	<i>Hakka himeshimensis</i>	66	33.461609	126.310521	4	2018-10-02
Salticidae	<i>Helicius</i> sp.	57	33.203732	126.289685	31	2017-04-22
Salticidae	<i>Heliophanus lineiventris</i>	3	37.593082	127.069533	17	2018-04-02
Salticidae	<i>Heliophanus ussuricus</i>	7	37.766168	127.178755	186	2018-06-08
Salticidae	<i>Marpissa milleri</i>	6	37.754571	127.165946	107	2016-04-25
Salticidae	<i>Myrmarachne</i> spp.	6	37.754571	127.165946	107	2017-06-09
Salticidae	<i>Myrmarachne</i> spp.	6	37.754571	127.165946	107	2018-10-15
Salticidae	<i>Myrmarachne</i> spp.	8	37.601511	129.011227	72	2013-06-04
Salticidae	<i>Myrmarachne</i> spp.	16	37.249708	129.309230	125	2015-05-03
Salticidae	<i>Myrmarachne</i> spp.	17	37.323722	129.014710	354	2018-05-10
Salticidae	<i>Myrmarachne</i> spp.	39	35.523745	127.719782	172	2019-05-23
Salticidae	<i>Neon reticulatus</i>	7	37.766168	127.178755	186	2018-07-27
Salticidae	<i>Orienticius vulpes</i>	6	37.754571	127.165946	107	2016-04-25
Salticidae	<i>Orienticius vulpes</i>	6	37.754571	127.165946	107	2017-05-31
Salticidae	<i>Orienticius vulpes</i>	6	37.754571	127.165946	107	2019-04-24
Salticidae	<i>Orienticius vulpes</i>	6	37.754571	127.165946	107	2019-06-05
Salticidae	<i>Orienticius vulpes</i>	15	37.238190	129.301022	147	2019-04-05
Salticidae	<i>Orienticius vulpes</i>	17	37.323722	129.014710	354	2018-05-10
Salticidae	<i>Phintella abnormis</i>	6	37.754571	127.165946	107	2018-06-18
Salticidae	<i>Phintella abnormis</i>	6	37.754571	127.165946	107	2018-10-15
Salticidae	<i>Phintella abnormis</i>	6	37.754571	127.165946	107	2019-04-24
Salticidae	<i>Phintella abnormis</i>	6	37.754571	127.165946	107	2019-10-04
Salticidae	<i>Phintella abnormis</i>	15	37.238190	129.301022	147	2016-06-23

## Appendix 1. Continued.

Family	Species	Site	Latitude	Longitude	Altitude (m)	Date
Salticidae	<i>Phintella abnormis</i>	7	37.766168	127.178755	186	2018-06-08
Salticidae	<i>Phintella abnormis</i>	7	37.766168	127.178755	186	2018-06-15
Salticidae	<i>Phintella abnormis</i>	27	34.478938	126.613812	128	2019-05-25
Salticidae	<i>Phintella abnormis</i>	29	36.775598	128.067847	290	2018-06-20
Salticidae	<i>Phintella</i> sp.	12	38.332274	128.512515	9	2016-06-21
Salticidae	<i>Plexippoides annulipedis</i>	16	37.249708	129.309230	125	2016-06-23
Salticidae	<i>Plexippoides</i> sp.	57	33.203732	126.289685	31	2018-10-08
Salticidae	Salticidae sp. 1	1	37.746135	127.185471	91	2017-08-24
Salticidae	Salticidae sp. 2	6	37.754571	127.165946	107	2017-05-31
Salticidae	Salticidae sp. 3	17	37.323722	129.014710	354	2018-05-10
Salticidae	Salticidae sp. 4	58	33.225459	126.300238	3	2018-10-09
Salticidae	Salticidae sp. 5	20	37.655554	128.720398	856	2019-05-28
Salticidae	Salticidae sp. 6	11	38.313816	128.489751	91	2016-06-21
Salticidae	Salticidae sp. 7	3	37.593082	127.069533	17	2018-06-04
Salticidae	Salticidae sp. 8	15	37.238190	129.301022	147	2018-05-11
Salticidae	Salticidae sp. 9	19	37.685483	128.761003	852	2019-05-29
Salticidae	<i>Siler cupreus</i>	26	34.360140	126.664380	77	2019-05-24
Salticidae	<i>Siler cupreus</i>	35	34.751835	128.017684	131	2018-05-31
Salticidae	<i>Sitticus fasciger</i>	27	34.478938	126.613812	128	2019-05-25
Salticidae	<i>Sitticus</i> sp. 1	6	37.754571	127.165946	107	2016-04-25
Salticidae	<i>Sitticus</i> sp. 1	6	37.754571	127.165946	107	2019-05-15
Salticidae	<i>Sitticus</i> sp. 1	6	37.754571	127.165946	107	2019-08-20
Salticidae	<i>Sitticus</i> sp. 1	7	37.766168	127.178755	186	2018-06-08
Salticidae	<i>Sitticus</i> sp. 2	43	33.559680	126.762443	3	2017-09-20
Salticidae	<i>Synagelides</i> sp.	3	37.593082	127.069533	17	2018-05-14
Salticidae	<i>Synagelides</i> sp.	3	37.593082	127.069533	17	2018-05-22
Salticidae	<i>Synagelides</i> sp.	21	36.960791	127.922450	95	2018-06-19
Salticidae	<i>Synagelides</i> sp.	38	35.549015	127.783670	155	2019-05-23
Salticidae	<i>Synagelides</i> sp. ( <i>agoriformis?</i> )	25	34.360100	126.675200	270	2019-05-24
Salticidae	<i>Telamonia vlijmi</i>	39	35.523745	127.719782	172	2019-05-23
Unidentified	Aranea sp.	7	37.766168	127.178755	186	2018-05-18



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## Field Photography of Korean Spiders: Diversity and Distribution

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