

1 **Natural history and ecology of the New Zealand sheetweb spiders**

2 ***Cambridgea plagiata* and *C. foliata* (Araneae: Desidae)**

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8

9 **Abstract**

10 We investigate key ecological differences and track population dynamics in two
11 sympatric species of sheet-web spider, *Cambridgea plagiata* and *Cambridgea*
12 *foliata* throughout a single breeding season. We undertook a series of weekly
13 population surveys in plots that included both *C. plagiata* and *C. foliata*,
14 recording features of their web ecology and of each species' population dynamics
15 over a single breeding season. We found significant differences in the
16 distribution, web size and substrate, and predominant diet of *C. plagiata* and *C.*
17 *foliata* with the former feeding predominantly on amphipods, building smaller
18 webs, and associating with rock walls, resulting in areas of densely aggregated
19 webs. By contrast, moths were the predominant prey type found in *C. foliata*
20 webs which were larger and more common in open vegetation, resulting in a
21 more uniform distribution of webs within our plots. Additionally, both species
22 exhibit pre-copulatory guarding consistent with the expectations of a first-male
23 sperm priority pattern, suggesting male competition over virgin females. This is
24 despite a consistent female-biased sex ratio. This research not only provides the
25 first ecological data for *C. plagiata* and *C. foliata* but provides important context
26 for sexually selected behaviours performed by males in these species.

27 **Keywords:** web size; prey type; demography; sex ratio; residency

28

29 **Introduction**

30 New Zealand's sheet-web spiders (*Cambridgea* spp.) are an endemic group that has
31 received little research attention apart from taxonomic description. While previously
32 placed in the family Stiphidiidae (Blest et al. 2000), recent phylogenetic analysis has
33 reassigned them to the Desidae (Wheeler et al. 2016), a family with a distribution that
34 includes New Zealand, Australia and the Afrotropical region (Simó et al. 2015).

35 *Cambridgea* spp. occupy both old growth and regenerated native forest (Vink and
36 McQuillan 2015) but are also one of the few native spider groups that can additionally
37 occupy human-altered urban environments (Forster and Forster, 1999).

38 *Cambridgea plagiata* (Forster & Wilton, 1973) and *Cambridgea foliata* (L.
39 Koch, 1872) are both sympatric in the central North Island of New Zealand (Blest et al.
40 2000). This provides an opportunity to compare these congeners' natural history and
41 ecology. They are both nocturnal, arboreal web-building spiders whose webs comprise
42 of a large horizontal sheet with a network of vertical knockdown threads, acting to
43 intercept flying prey. Attached to the main sheet is the retreat, a silk funnel that extends
44 into cracks or tunnels in the substrate where the individual resides during the day
45 (Forster and Forster 1999).

46 Here, we explore the ecology of both *C. plagiata* and *C. foliata* as contrasting
47 species, focusing on three key aspects. Firstly we compare the demography and adult
48 sex ratio of the two species. Secondly, we compare web ecology, focusing on web size,
49 web distribution and substrate, and the predominant prey type captured in each species
50 web. Thirdly, we consider movement of spiders across the breeding season, comparing
51 both residency duration for spiders in webs and the movement of male individuals
52 between webs.

53

54 **Methods**55 *Field site*

56 We collected population data for both species from November 2015 through to June
57 2016, during the known summer breeding season of *C. foliata* (Walker et al. 2018). We
58 monitored plots in native forest at Stubbs Farm (38°15'42.1"S, 175°00'47.6"E),
59 Waitomo, New Zealand. While the farm spans 674 hectares and largely comprises
60 pasture for farm animals, it also contains over 300 hectares of native old-growth
61 podocarp-broadleaf forest which hosts a diverse invertebrate community. We marked
62 out two 20m x 20m plots in this forest, ensuring that both plots included a combination
63 of large trees, fallen logs and rock formations that were assumed to contain *Cambridgea*
64 spp. due to the presence of their characteristic sheet webs. *Cambridgea plagiata* were
65 distinguishable from *C. foliata* as *C. plagiata* had much smaller webs, were darker in
66 colouration and had mottled patterns on the legs. The two plots were 100m apart and
67 50m from the nearest forest edge.

68 *Marking and monitoring spiders*

69 In both plots, we identified webs <2m from the ground that contained resident spiders
70 (“active” webs) and marked the webs using flagging tape. We determined whether the
71 resident spiders were adults or juveniles and recorded the sex of any adults and
72 penultimate moult juveniles. Detection of these differences was based on body size and
73 the size and shape of pedipalps and chelicerae in males, and the presence and
74 appearance of the epigyne in females. We used Testor© enamel paint (Rockford,
75 Illinois), commonly utilized for a variety of other invertebrate species (Herzig 1995;
76 Overson et al. 2014; Ullmann et al. 2016) to give all adults a unique combination of

77 coloured marks on the back of their cephalothorax and foreleg tibia (Fig. 1), avoiding
78 the joints of the legs, as this can hinder locomotion (Evans and Gleeson 1998). Unique
79 markings and therefore identification allowed a record of both movement and the
80 duration for which a spider remained in the same web (“residency duration”). Juveniles
81 were not uniquely marked as the paint would be shed with the cuticle when the
82 individual moulted. If no spider was present on the horizontal sheet, we attempted to
83 lure any potential resident out of its retreat using a tuning fork. If unsuccessful, we
84 deemed the web to be inactive.

85 We monitored all *Cambridgea* within the plots from November 2015 to June
86 2016. We conducted weekly surveys, weather dependent, on clear nights between 2200
87 and 0200 hours. As spiders did not emerge during rain (*pers. obs.*), some surveys had to
88 be more widely spaced. On each night of monitoring, we recorded the presence and
89 identity of the resident spider at each web. If we found a new adult (i.e. unmarked), we
90 gave the individual a unique mark and recorded their presence. This method allowed us
91 to determine periods of adult residency and movement.

92 ***Variation in web size, substrate and prey types***

93 To produce a map of web locations for each plot, we recorded x and y co-ordinates
94 relative to the edges of the plot for each web. We noted the substrate that each web was
95 attached to (tree trunk, tree fern, fallen palm frond, log or rock). We then recorded the
96 dimensions of the horizontal lateral sheet and used these to estimate web area,
97 approximating a rectangle.

98 To compare predominant prey types for each species, we recorded and identified
99 to Order level any prey item caught in the web or spun in silk. Prey which was too
100 heavily damaged and could not be identified was categorized as ‘unknown’. We
101 recorded prey during every survey both on marked webs and any new webs that

102 appeared that week. Prey items that persisted in the web across multiple surveys were
103 only recorded once. The number of individual prey items over the survey period was
104 then pooled to obtain a total number of prey items in *C. plagiata* and *C. foliata* webs.

105 *Statistical analyses*

106 *Adult sex ratio*

107 We tested for deviations from a 1:1 sex ratio in adult *C. foliata* and *C. plagiata* for each
108 survey, using binomial exact tests. Over the sampling period, 27 *C. foliata* ($n_{\text{male}}=12$,
109 $n_{\text{female}}=15$) and 31 *C. plagiata* ($n_{\text{male}}=17$, $n_{\text{female}}=14$) adults were recorded.

110 *Web size and substrate*

111 As our data on web size were non-normal, we used Wilcoxon rank sum tests with
112 continuity correction to compare differences in web surface area between all adult *C.*
113 *foliata* ($n=16$) and *C. plagiata* ($n=22$).

114 We also explored if cephalothorax size had any correlation with web area for
115 both species. We tested this by first log-transforming web surface area, then creating a
116 linear regression model with log web surface area as the response variable and
117 cephalothorax size as the independent variable.

118 We identified five common substrates for *Cambridgea* webs in our plots:
119 standing trees, rock formations and walls, fallen logs, tree ferns and palm fronds. To
120 determine whether adult *C. foliata* and *C. plagiata* build their webs on different
121 substrates, we used a non-parametric, two-tailed, 2-sample test for equality of
122 proportions with continuity correction. We used proportions - as opposed to frequency -
123 as total sample sizes between the two species differed.

124 *Prey type*

125 To test differences in foraging success, we first applied a two-tailed Fishers test to
126 investigate if there was an overall difference in the abundance of prey captured between
127 each species. To further investigate if certain prey types were relatively more common
128 in one species' webs, we used a non-parametric, two-tailed, 2-sample test for equality of
129 proportions with continuity correction. We again used proportions - as opposed to
130 frequency - as total sample sizes between the two species differed.

131 *Residency duration*

132 We tested whether residency duration differed between (i) species and (ii) sexes.
133 Therefore, we used the non-parametric Wilcoxon signed-rank test to explore residency
134 both between species and between sexes.

135 **Results**

136 *Demography and sex ratio*

137 For both *C. foliata* and *C. plagiata* there were relatively large numbers of juveniles
138 compared to adults throughout the breeding season (Fig. 2). Both juvenile and adult
139 populations declined (but did not fully disappear) as the breeding season came to an end
140 in May.

141 The sex ratio of *C. plagiata* remained stable over the breeding season with a
142 consistently female-biased sex ratio with only mild fluctuations (Table 1; Fig. 3). The
143 sex ratio for *C. foliata* also remained relatively female-biased over the breeding season
144 (Table 2; Fig. 3).

145 **Web characteristics**

146 *Distribution and size*

147 The distribution of webs differed between the two plots. One plot was contained a
148 number of rock faces which provided substrate for *C. plagiata* webs. The other plot
149 dominated by vegetation, rather than rock faces, and provided habitat for more *C.*
150 *foliata*. We found that *C. foliata* produced webs with significantly larger horizontal
151 sheets ($W=108.5$, $P < 0.01$) than *C. plagiata* (Fig. 4; *C. foliata*: $850.2\text{cm}^2 \pm 182.41$,
152 $n=16$; *C. plagiata*: $465.52\text{cm}^2 \pm 79.82$, $n=22$). However, body size (cephalothorax
153 width) showed no influence on web surface area for either *C. foliata* ($\beta_1=5.79 \pm 1.55$,
154 $df=14$, $P=0.70$, $R^2=0.01$) or *C. plagiata* ($\beta_1=3.88 \pm 1.45$, $df=20$, $P=0.19$, $R^2=0.08$; Fig.
155 5).

156 *Substrate choice*

157 We found a difference between the substrates that adult *C. foliata* and *C. plagiata* in
158 built webs on. The proportion of adult *C. foliata* webs attached to trees was significantly
159 higher than for *C. plagiata* ($P < 0.01$, 95% CI = 0.161, 0.636; Table 3; Fig. 6).
160 Conversely, the proportion of adult *C. foliata* webs attached to rocks ($P < 0.01$, 95% CI
161 = -0.502, -0.082) and logs ($P < 0.05$, 95 CI = -0.557, -0.082) was significantly lower
162 than for *C. plagiata*. There was no significant difference in how these species utilised
163 other substrates ($P>0.05$).

164 *Prey type*

165 We found a significant difference in the predominance of different prey types found in
166 *C. foliata* and *C. plagiata* webs ($P < 0.0001$). The proportion of moths captured by *C.*
167 *foliata* was significantly higher than for *C. plagiata* ($P < 0.005$; 95% CI = 0.075, 0.343;
168 Fig. 7; Table 4). Additionally, the proportion of amphipods captured by *C. plagiata* was

169 significantly higher than for *C. foliata* ($P < 0.0001$, 95% CI = -0.470, -0.265). There
170 were no other significant differences between the two species in the prey types that they
171 fed on ($P > 0.05$).

172 ***Residency duration and mark-recapture***

173 The Wilcoxon signed-rank test showed no significant differences in residency duration
174 between *C. foliata* and *C. plagiata* ($W=610.5$, $P > 0.05$). However, females had
175 significantly longer residency durations than males in both *C. foliata* ($W=20$, $P < 0.001$)
176 and *C. plagiata* ($W=91.5$, $P < 0.01$) (Fig. 8).

177 Three out of four of the outlying long male residence times were instances in
178 which males cohabited with a subadult female, leaving after the final moult of the
179 female to sexual maturity. Additionally, we found that, at any given time during the
180 breeding season, 8% of females were cohabiting with a male.

181 We did not record any movement between webs by adult *C. plagiata* females.
182 While males had short residency times, we only recaptured marked males who had left
183 their webs in four instances. Two of the four recorded distances came from one male
184 (M1) within a population survey plot. M2 and M3 were found by chance outside of the
185 population survey plots and a larger distance from the original marking locations, over
186 40 days after first being marked.

187 **Discussion**

188 There were significant differences in the web characteristics of *C. plagiata* and *C.*
189 *foliata* including lateral sheet size, predominant prey captured, and spatial distribution.
190 Many differences may be attributed to characteristics of the substrate we most
191 commonly found each species' webs on. We also found that, across the breeding
192 season, both species exhibited a female-biased sex ratio. This is somewhat surprising

193 given that we observed fighting between conspecific males of both species, suggestive
194 of mate guarding and selection to maximise reproductive output with a small number of
195 females (Walker and Holwell, 2018; McCambridge et al., 2019). Based on the ratio we
196 calculated, we would expect selection on males to roam and mate with as many females
197 as possible rather than guard a single female for any length of time.

198 We found that *C. plagiata* create smaller webs in crevices, cracks and overhangs
199 on rock walls and have a diet consisting predominantly of amphipods. By contrast, *C.*
200 *foliata* build larger webs among vegetation, feeding primarily on moths. For the former,
201 the amphipods originate in the soil and vegetation that collect on the top of rock
202 formations, falling off the edges and into the *C. plagiata* webs built below. This
203 explains the prevalence of amphipods in *C. plagiata* webs but not the more arboreal *C.*
204 *foliata*. While some intertidal spiders have been documented to feed on amphipods
205 (*Durvillaea antarctica*, McLay and Hayward 1987), this is the first instance, as far as
206 we are aware, of amphipods being a significant part of a terrestrial spider's diet. By
207 contrast, *C. foliata* webs captured more moths, likely due to their preference for settling
208 on vegetation and tree trunks. By building their webs in areas with more open space, i.e.
209 not against rock walls, they are more likely to intercept flying insects than *C. plagiata*.

210 Despite being similar in size to *C. foliata*, *C. plagiata* build significantly smaller
211 webs. This again is likely the result of substrate choice with the rock walls frequented
212 by the former having fewer attachment points compared to the more complex arboreal
213 habitats that *C. foliata* build their webs in. With fewer available attachment points, *C.*
214 *plagiata* are more limited in the size of web they can build. However, if their primary
215 prey type are amphipods falling from above, intercepting flying insects may be less
216 important for this species. Meanwhile, the choice of substrate by *C. foliata* may further

217 facilitate prey capture by allowing spiders to build larger webs and therefore intercept
218 more insects (Chacón and Eberhard 1980; Herberstein et al. 2000).

219 This niche specialisation which facilitates the coexistence of two closely related,
220 similarly sized species may have been driven by or have resulted in species-specific
221 environmental optima for temperature (Almquist 1973; Riechert 1974; Riechert 1985),
222 humidity (Barth et al. 1988), and exposure (Eberhard 1971; Enders 1973). In addition to
223 being found on rock walls within our plots, we frequently found *C. plagiata* inside
224 limestone caves which are common in the Waikato region of New Zealand. This habitat
225 tends to be cooler, more humid, and less exposed to the elements than the forest where
226 *C. foliata* are common. It is difficult to determine whether species-specific
227 environmental optima have resulted from foraging specialisations or vice versa.
228 However, the specialisation of *C. plagiata* to rock and cave habitats has significant
229 implications for the biogeography of the genus.

230 Specialisation also has significant implications on the strength and types of
231 sexual selection on these species. Within our plots, because *C. plagiata* are limited to
232 rock walls, their webs were relatively concentrated compared to those of *C. foliata*
233 which were more uniformly distributed throughout vegetation. The costs and benefits of
234 mate searching in contrast to guarding will therefore differ for the males these two
235 closely related species as male *C. foliata* will have to travel, on average, greater
236 distances to find webs of receptive females. However, as a result, there may also be
237 implications for gene flow between populations of *C. plagiata* within different caves
238 and rock habitats.

239 The observed female-biased sex ratio was unexpected, as the increased
240 investment in exaggerated chelicerae used as weaponry, guarding of females and
241 aggressive fighting behaviour by males of both species (*pers. obs.*; Walker and Holwell

242 2018) are suggestive of intrasexual competition and mate guarding. These would be
243 expected under a male-biased sex ratio (Fairbairn 1997). By contrast, males in a
244 population with a female-biased sex ratio, as in both *C. plagiata* and *C. foliata*, are
245 likely to gain more mating opportunities not from mate guarding, but from mate
246 searching (Harts and Kokko 2013).

247 There are several possible reasons as to why we observed a female-biased sex
248 ratio for *C. foliata* and *C. plagiata* throughout our surveys. Firstly, some adult females
249 may not actually present viable mating opportunities for males. As a result, the actual
250 operational sex ratio (sexually competing males to sexually receptive females) may be
251 more equal (or even male-biased). Female spiders, who have mated once, may not be
252 receptive to further copulations (e.g. wolf spider, *Schizocosa malitiosa*, Aisenberg and
253 Costa 2005; Estramil and Costa 2007; González and Costa 2008) or may not be capable
254 of them due to the presence of mating plugs left by their first mate (e.g. funnel-web
255 spider, *Agelena limbata*, Masumoto 1993). Mating has not been studied in this genus
256 which makes it difficult to estimate an operational sex ratio.

257 Furthermore, our survey method involved checking webs during the night, a
258 time that some males will be wandering the forest floor in search for females. This is
259 shown by the residency times of female *C. plagiata* and *C. foliata*, which were
260 consistently long (5 to 156 days at the end date of the survey period, as such they may
261 be significantly longer) compared to the relatively short residency durations (5-29 days)
262 for males of both species. Consequently, we must assume that there is an unknown
263 number of males which are not accounted for in our survey.

264 Despite a female-biased sex ratio, a degree of mate guarding may still be
265 valuable for males provided that the female a male is currently guarding is unmated or
266 otherwise more valuable than other receptive females may be. As entelegyne spiders

267 (Coddington 2005), our focal species likely exhibit a first-male sperm priority pattern
268 due to the likely entelegyne (i.e. conduit spermethecae) structure of the female genitalia.
269 Males therefore may secure a greater share of paternity by mating with virgin females
270 (Austad 1984; Uhl 2000). This would also explain why the longest residency durations
271 we observed for males were when a male was co-habiting with a subadult female. While
272 factors such as sperm mixing (Uhl 2000) and morphological variation of female
273 genitalia (Bertani and da Silva 2002; Danielson-Francois 2002; Uhl and Vollrath 1998)
274 can complicate this simple explanation, numerous empirical studies describe male pre-
275 copulatory guarding behaviour in a variety of entelegyne spiders (e.g. crab spider,
276 *Misumenoides formosipes*, Dodson and Beck 1993; jumping spider, *Phiddipus clarus*,
277 Elias et al. 2014; golden orb-weaver, *Nephila clavipes*, Christenson and Cohn 1988;
278 sierra dome spider *Linyphia litigiosa*, Watson 1991).

279 That males roam in search of females may result in a greater attrition of adult
280 males across the breeding season as they are exposed to greater predation risk, a
281 phenomenon commonly found throughout a range of taxa (e.g. cicadas, Gwynne 1987;
282 amphipods, Cothran 2004; spiders, Gunnarsson 1998; Jackson and Smith 1978;
283 Kasumovic et al. 2007; lizards, Costantini et al. 2007; voles, Koivunen et al. 1996;
284 Korpimäki 1985). This may also explain why we so infrequently encountered marked
285 males more than once during the breeding season. The denser aggregations of *C.*
286 *plagiata* webs compared to the more uniform distributions of *C. foliata* webs should
287 however, have significant implications for the rate of predation for males.

288 This study is the first to quantify several aspects of the natural history and
289 ecology of both *C. foliata* and *C. plagiata*. There are marked differences in the ecology
290 of these two species, stemming from differences in habitat selection, which should have
291 significant implications for other aspects of their biology.

292

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Table 1. Binomial exact tests assessed the deviation for adult *C. plagiata* from the null hypothesis of a 1:1 sex ratio. Bold text indicates $p < 0.05$.

Date	N(female)	N(male)	N(total)	P
21/01/2016	7	5	12	0.774
26/01/2016	11	5	16	0.210
02/02/2016	12	3	15	0.035
09/02/2016	13	3	16	0.021
19/02/2016	14	6	20	0.115
24/02/2016	13	3	16	0.021
04/03/2016	11	2	13	0.023
12/03/2016	13	2	15	0.007
19/03/2016	13	2	15	0.007
23/03/2016	11	2	13	0.023
29/03/2016	12	2	14	0.013
04/04/2016	12	2	14	0.013
08/04/2016	12	2	14	0.013
13/04/2016	13	4	17	0.049
19/04/2016	11	4	15	0.119
25/04/2016	13	3	16	0.021
03/05/2016	8	1	9	0.039
11/05/2016	5	0	5	0.063
12/05/2016	4	0	4	0.125
19/05/2016	4	0	4	0.125

Table 2. Binomial exact tests assessed the deviation for adult *C. foliata* from the null hypothesis of a 1:1 sex ratio. Bold text indicates $p < 0.05$.

Date	N(female)	N(male)	N(total)	P
21/01/2016	12	4	16	0.076
26/01/2016	13	5	18	0.096
02/02/2016	10	2	12	0.039
09/02/2016	12	3	15	0.035
19/02/2016	12	1	13	0.003
24/02/2016	8	1	9	0.039
04/03/2016	6	1	7	0.125
12/03/2016	8	1	9	0.039
19/03/2016	8	1	9	0.039
23/03/2016	7	1	8	0.070
29/03/2016	8	2	10	0.109
04/04/2016	8	2	10	0.109
08/04/2016	7	1	8	0.070
13/04/2016	8	1	9	0.039
19/04/2016	8	1	9	0.039
25/04/2016	8	1	9	0.039
03/05/2016	7	0	7	0.016
11/05/2016	2	0	2	0.016
12/05/2016	2	0	2	0.016
19/05/2016	2	0	2	0.500

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414 Table 3. Summary of the test of equal proportions performed on web substrates between
 415 adult *C. foliata* (n=33) and *C. plagiata* (n=34). χ^2 value omitted for entries which did
 416 not fulfil assumption of an expected value > 5. For all tests, df=1.

Substrate	χ^2	95% CI	P-value
Tree	10.09	0.161, 0.636	<0.0001
Rock	7.03	-0.502, -0.082	<0.0001
Log	6.98	-0.557, -0.082	0.011
Tree fern	-	-0.021, 0.325	0.101
Palm frond	-	-0.051 0.172	0.460

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Table 4. Summary of the test of equal proportions performed on the occurrence of different prey types in the webs of adult *C. foliata* (n=102) and *C. plagiata* (n=132). χ^2 value omitted for prey types which did not fulfil assumption of an expected value > 5. For all tests, df=1.

Prey type	χ^2	95% CI	P-value
Amphipod	38.88	-0.470, - 0.265	<0.0001
Ant	-	-0.025, 0.097	0.28
Beetle	0.09	-0.071, 0.113	0.763
Cicada	2.66	-0.013, 0.129	0.103
Moth	9.61	0.075, 0.343	<0.0001
Stick Insect	-	-0.059, 0.038	0.923
Weta	-	-0.057, 0.011	0.344
Worm	-	-0.046, 0.044	1
Unknown	-	-0.034, 0.129	0.284

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422 **Figure captions**

423 Figure 1. A *Cambridgea plagiata* female with a unique set of coloured markings on
424 both foreleg tibia for individual identification. Photo by J. E. McCambridge.

425 Figure 2. Results of population surveys including number of a) juvenile *Cambridgea*
426 spp., b) adult *Cambridgea foliata* and c) adult *Cambridgea plagiata*. Total adult
427 counts include male (black bars) and females (white bars).

428 Figure 3. Sex ratio of adult a) *Cambridgea foliata* and b) *Cambridgea plagiata* between
429 January and May of 2016. Sex ratio is displayed as the percentage of males
430 observed during each population survey.

431 Figure 4. Approximate surface area of the lateral sheet for the webs of adult
432 *Cambridgea foliata* and *Cambridgea plagiata* measured between December
433 2015 and June 2016. Web surface area was calculated by multiplying the widest
434 linear measurement with a perpendicular measurement at the midway point of
435 the first measurement on the horizontal lateral main sheet of the web.

436 Figure 5. Correlation between web surface area and body size in adult *Cambridgea*
437 *foliata* (open circles) and *Cambridgea plagiata* (closed circles). Web surface
438 area was calculated by multiplying the widest linear measurement with a
439 perpendicular measurement at the midway point of the first measurement

440 Figure 6. Different substrates that adult *Cambridgea foliata* (n=33) and *Cambridgea*
441 *plagiata* (n=34) build their webs on between November 2015 to June 2016.
442 Frequencies have been converted into proportions to compensate for unequal
443 sample sizes between species. Stars (*) indicate significant ($P < 0.05$) results.

444 Figure 7. Predominant prey types found from November 2015 to June 2016 on the webs
445 of adult *Cambridgea foliata* (n=102) and *Cambridgea plagiata* (n=132). Stars
446 (*) indicate significant ($P < 0.05$) differences between the species.

447 Figure 8. Residency times of adult *C. foliata* and *C. plagiata* from December 2015 to
448 June 2016, sorted by sex. Individuals who were identified on the first population
449 survey were not included, as it was uncertain on how long individuals had been
450 on the web prior to identification.
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