ca. 1 PM, at bend of stream. C.amata ovip. on Potamogeton in 6-8" water. dep[osition] area at outside of bend, with deep silty bottom (silt at least 6" deep, light col[ored] on surface, dark below).

area roughly 10 x 15' pretty uniformly covered with Potamogeton (crispus?). Plants nott reaching surface - only 4-6" high.

Ovip[osition] discovered when ♂ alighted on lin[ear] leaf of another [sp.of] plant ca. 4' from shore. Getting ready to phot[ograph] him I saw ♀'s beneath the surface, on the Potamogeton & on other plant reaching surf[ace] 4 ♀'s seen at this time. They were crawling about on the Potamogeton quite actively, their wings [and bodies] in a glassy envelope of air.

♂ appeared very interested in what ♀'s were doing. One ♀ popped up to surf[ace] and flew up into hemlocks. Shortly another ♀ appeared, alighted on the same leaf as the ♂ (which was flitting around most of the time) and quickly climbed down and joined the others underwater. Then another ♀ appeared (from where?) and did the same thing, making 5 below at same time. All this phot[ographed].

[went home & got movie camera, picking up AFB at Marchantia farm on way back.]

On return 5 ♀'s still underwater in area of about 3/4 ft.2 around base of lin[eal] leaf [leaf] plant with 4 lvs. floating on surface. This is only landing site on whole Potamogeton bed.

Make movies while AFB watches......ran out of film!

[home again to get more film]

light comes down through hemlocks like a spotlight on ovip. site; rest of Potamogeton area more or less in shade.

Sun moving so that bright light [making movies possible at f/1.9] will soon be off ovip. site.

c. 3.30 PM - sun off phot. area.....no more movies.

4 ♀'s still below....sev[eral] have left and sev[eral] have
arrived in last 1/2 hr. Difficult to see how ovip. operates.

c. 4 PM - ♂ not in sight for last 15 min....3 ♀'s still below. [went home]
EXACT TRANSCRIPT OF GHB'S NOTES DATED 20.VI.[1969].

11.30 AM -[returned to]same site.  sun not yet spotlighting it.
   a pr.in cop. [of C.amata] on small birch on bank.
disturbed, flew up into hemlock 8-9" above water - phot[ographed]
2 ♀'s ovipos. just like 19.VI.  ♂ sits on Rhod[odendron] lf. on
bank about 4' from ovip. site; sometimes a ♂ C.maculata sits
right beside him [phot[ographed]] about 4" away.

12.30-1.00 - sun on ovip. site.  2 more ♀'s have appeared.
one of the ♀'s 1st seen [at 11.30] still underwater but
[1] lost track of which one.  Total 3 ovip.

[aafter 1.00] - 1 ♀ watched for no less than 35 min. and she then crawled
up lf. and flew strongly to bank & hung from knob on tripod.[phot]
she doesn't seem wet.  Then up into tree.

"other plant" appears to be Sparganium—not Vallisneria or Sagittaria.

1.00 - 3.00 PM - always 3-5 ♀'s ovipositing.  at least 5 new arrivals

another ♀ "timed" saw her arrive and leave: 15-20 min,[underwater]
♂ all this time very busy, 1/2 [the] time perched on same
Rhod[odendron] leaf on bank ca. 4' from ovip.site, and other
1/2 sat on Sparg. lf. or flitted about, often close to
water [-surface] with wings in funny depressed pos[ition].

another ♀ "timed" did not see her arrive, but watched 20+ min.
until she popped up suddenly and flew straight vertically
up into hemlocks.

I think ♀'s sit up in hemlocks in sunshine.
♂ of C.maculata constantly around, often harrassing ♂ & ♀'s of amata.

Sometimes Sparg. lf. has 1 ♂ each of amata & mac[ulata] & 1 ♀ amata sitting
on it simultaneously.  No other way for ♀'s to get below surface unless
they have an emergent lf. to walk down.  On entire Potam[ogeton] bed of 100 ft.²
or more this is only way to go down.

♂ does not court ♀'s, but seems to lead them to ovip. site.

no copulation seen except as[above] at first arrival
above surface, reaching underneath with tip of tail.  ♀ maculata not in evidence.
pr. in cop. of maculata resting in birch over water - phot.

[added later] no sequence from copulation to oviposition observed.
♀'s appear from up in trees (where there is more sunlight)
and fly almost unerringly to ovip. site, which is "spotlighted" by sun coming through opening in hemlocks.

A few ♀'s seen sitting on bank veget[ation] before going to ovip. site. These the ♂ "leads" to site by funny downwing flight. ♂ of maculata very frequently flitting gressively very close to the newly-alighted ♀'s of amata, before they go below surface. No "fighting" between ♂'s of the two spp. [wing movements of amata ♂ in movie] Except for a couple of possible "moments" only one ♂ of each sp. in evidence. as many as 6 ♀'s of amata at one time: 5 underwater or part-way down, and 1 on bank vegetation.

They go down & up pretty fast but are quite languid underwater, moving about constantly but very slowly (to conserve air?).

Several ♀'s appeared to come up for air and go down again, but I can't be positive that the same ♀ went down again. [see film]

Obs[ervations] needed: pre-cop. behavior; post-cop. behavior.

how does ♂ approach ♀ to lead her to ovip. site ?

Does he really "lead" her with "down-wing" flight ?

How long from when she reaches site until she goes underwater. ?

Is gregariousness merely the result of having no emergent parts of the Potamogeton or other plants than the one leaf ?

Do females surely come up for air and go down again without flying ?

When ♂ sits on landing leaf is he guarding the ♀'s or "indicating" site to other ♀'s ? [territory ? ]

Why so few ♂'s in proportion to ♀'s ?

Why is C. maculata ♂ so interested ?

What would the picture be like if Potam[og]oton] bed had many landing places ? Would more ♂'s appear ?
22 JUNE, 1959:

Heavy rain since 20 June (when water was very clear)
Water now slightly turbid, though bottom easily seen.
No Calopteryx seen underwater.
Cloudy, so no sunshine "spotlights" ovip. site.
Water a little deeper, but "landing leaf" still floats on surface.
Because of cloudiness no Calopteryx seen.