

THE BIOLOGY OF *OCTONOBA OCTONARIUS* (MUMA) (ARANEAE, ULOBORIDAE)

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ABSTRACT

The biology of *Octonoba octonarius* (Muma) was studied over a two year period of laboratory rearing and field observations. Under laboratory conditions the spider matured as a fifth or sixth instar. First nymphal instars still in the egg sac fed upon uneclosed eggs and second prelarvae. Web construction and nutritive behaviors followed patterns recorded in the Uloboridae. Courtship and mating patterns differed from others of the family in that typically two serial copulations were followed by immediate sperm induction and two additional brief copulations. A chalcid, *Arachnopteromalus dasys* Gordh, newly described from specimens found in this study, whose larva is an egg predator, *Achaearanea tepidariorum* (C. L. Koch), and man's activities were the principal ecological pressures on *O. octonarius* populations.

INTRODUCTION

Although there is an abundance of information concerning the habits of the various Uloboridae (Kaston 1948, Gertsch 1949, Bristowe 1939, 1958, Millot 1949, Savory 1952, Marples 1962, Szlep 1961, Eberhard, 1970, 1971, 1972, 1973, 1976), specific studies of *Octonoba octonarius* (Muma) (sub *Uloborus octonarius*) have not been reported other than when it was described by Muma in 1945, in the revision of the Uloboridae by Muma and Gertsch (1964), and by Opell (1979). Wilson (1969) considered *O. octonarius* in his study of the spinning apparatus of spiders, and Eberhard (1971) mentioned that this spider is unsuitable for laboratory experiments in web building because the species seems to be unable to produce normal webs consistently under laboratory conditions. This study, then, is an attempt to deal with the biology and life history of *Octonoba octonarius* as observed in a large population inhabiting a grain elevator in Johnson County, Missouri, and in the laboratory.

MATERIALS AND METHODS

Specimens were initially collected in a grain elevator in Warrensburg, Missouri, during the months of June and July and observed in the laboratory for two years. Field observations of the spider and an egg predator associated with it were conducted in the elevator, in a barn, and in a basement.

Dixie cups of about 90 ml capacity were used as rearing containers, inverted on convenient-sized plywood pieces which could be stacked. The cups provided an effective attachment surface for web building by the young spiders and were suitable for microscopic examination of the specimens and the web. For observations of web construction and maintenance, of feeding, and of interactions between adults and between the adult female and young, various containers were used.

The spiders were fed principally on *Drosophila melanogaster* three to five times a week. Individual spiders were fed by dropping live prey onto the web. To reduce web damage by the prey, injured flies were fed to young spiders. Young spiders were offered one injured fly per feeding, and the adults received one or more flies depending on the availability of prey and its acceptance. Insects of suitable size other than *Drosophila* were offered to the adults when available. Prey remains were removed at the following feeding.

Penultimate or younger males and females from field and laboratory stock were isolated prior to their final molt in preparation for courtship, mating, and sperm induction studies. Virgin females were placed in an observation chamber and allowed time to construct a web before a male was introduced. The male was placed either in the bottom of the container and allowed to find his way upward or was placed on the web as far away from the female as possible in order that he might adjust to new surroundings before interacting with the female. The courtship, mating, and sperm induction sequences were observed with and without the microscope and were also recorded on film.

Embryonal development was studied in field-collected egg cases and those constructed in the laboratory. Eleven egg cases 4-24 hours old were teased open and the eggs counted and measured with a micrometer. Some of the eggs were placed in Stender dishes and immersed in oil, a technique developed by Holm (1940), which renders the chorion transparent and allows for the observation of the developing embryo. Another group of eggs was placed in a Stender dish and allowed to develop in a high humidity incubator. Laboratory conditions of temperature and light were variable. The development of the embryos was observed daily except during the periods of most rapid change when observations were made every six hours.

Observations of stadial development were made on 113 individuals obtained from two egg cases made by a field-collected female which had matured and mated in the laboratory, and nine individuals obtained from two cases made in the field and hatched in the laboratory. The dates of molting, width of the carapace at the time of molting (Dondale 1961), chaetotaxy, and any changes in pigmentation were observed and recorded for each individual. Exuvia were removed after each molt.

Feeding and courtship behaviors were filmed thus enabling us to analyze the rapid movements of the spider which could not be followed by the eye. Transparent acrylic plastic cubes 8 cm x 8 cm with removable ends were constructed for filming these activities (Figure 1). The acrylic plastic allowed filming through the container from various angles with minimum glare. Masking tape 2 mm wide was placed in the cube as shown to provide a better attachment surface for the silk and to influence a more uniform placement of the webs within the cube.

RESULTS AND DISCUSSION

Although the genus *Octonoba* is principally tropical (Opell 1979), *O. octonarius* has been recorded in the United States from Maryland and South Carolina to north-central Texas and eastern Kansas. As is typical in all of its range, the spider has been found in barns, other buildings, and in basements in west-central Missouri: Warrensburg, Johnson County, 1968 (W. B. Peck); Centerview, Johnson County, June 1973 (J. Peaslee); June 1974 (Jani and Gary Colster); Holden, Johnson County, September 1974 (Jason Behm); Stockton, Cedar County, September 1975 (J. Peaslee). New records include Massachusetts, Middleboro, Plymouth County, July 1977 (J. Peaslee); and Indiana, St. Meinrad Abby, Spencer County, July 1978 (J. Peaslee).

Developmental Biology.—The study of the life history of a spider must consider the embryonal development for a complete picture of the stages in its life cycle. However,

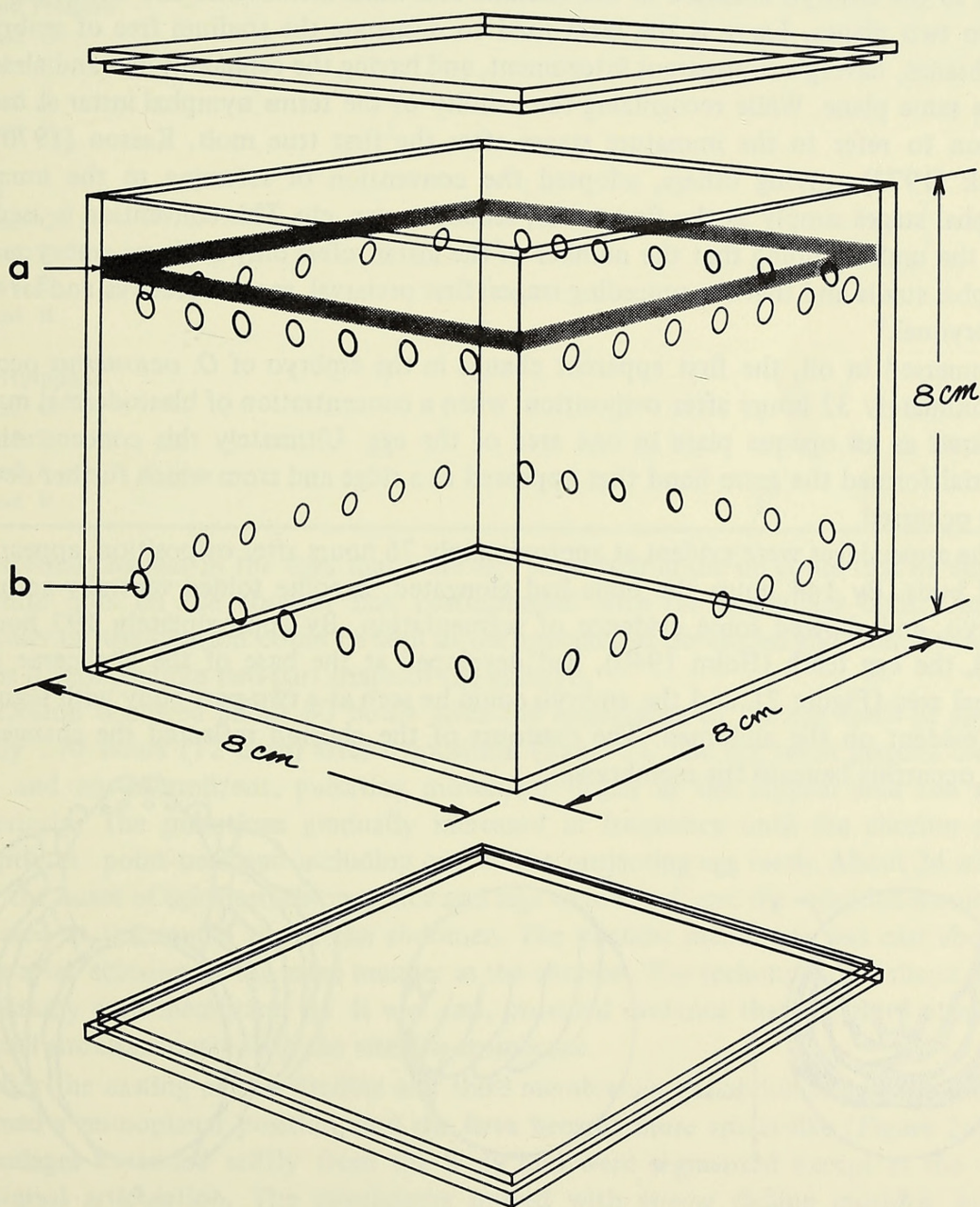


Fig. 1.—Container for viewing and filming courtship and feeding behaviors: a, tape for control of web placement; b, holes for ventilation.

confusion of terminology in the literature has impaired facile discussion of the developmental stages. Recent comparisons and clarifications of the various systems of nomenclature of the developmental stages were made by Galiano (1969), Peck and Whitcomb (1970), Valerio (1974), Hydorn (1977), and Whitcomb (1978).

In this discussion, the outer egg membrane is called the chorion, the inner egg membrane carrying the egg teeth is termed the vitelline membrane, and the interior embryonic membrane, the third membrane (Galiano 1969). Eclosion refers to the rupture and sloughing of the chorion. Ecdysis designates a true molt, that is, the shedding of an integument that is not an egg membrane. Ecdysis occurs as the larva molts to the first active instar and in all the succeeding molts. Vachon's terminology (1957), which designates the developing stadia before the first true molt as first prelarva, second prelarva, and larva, is utilized. The first prelarva refers to the embryo enclosed in the chorion with cephalothorax and abdomen in planes at right angles to each other. The second prelarva refers to the embryo enclosed in the vitelline and third membranes and with body parts still in two planes. Larva is the term used to designate the stadium free of embryonic membranes, having a transparent integument, and having the cephalothorax and abdomen in the same plane. While recognizing the validity of the terms nymphal instar as used by Vachon to refer to the immature stages after the first true molt, Kaston (1970) and Schick (1972), among others, adopted the convention of referring to the immature nymphal stages simply as the first instar, second instar, etc. This convention is used here with the understanding that the number of the instar refers only to "post-embryonal" or nymphal stadia and that the preceding stages, first prelarval, second prelarva and larva, are "embryonal."

Immersed in oil, the first apparent change in the embryo of *O. octonarius* occurred approximately 32 hours after oviposition, when a concentration of blastodermal material appeared as an opaque plate in one area of the egg. Ultimately this concentration of material formed the germ band that appeared as a ridge and from which further development occurred.

The appendages were evident at approximately 76 hours after oviposition, appearing as small buds. By 144 hours the buds had elongated, become folded ventrally across the embryo, and showed some evidence of segmentation. By approximately 192 hours (8 days), the egg teeth (Holm 1940), had developed at the base of the chelicerae in the clypeal area (Figure 2), and the embryo could be seen as a two-part body with segmentation evident on the abdomen. The contours of the chorion reflected the changes that were occurring beneath the membrane.

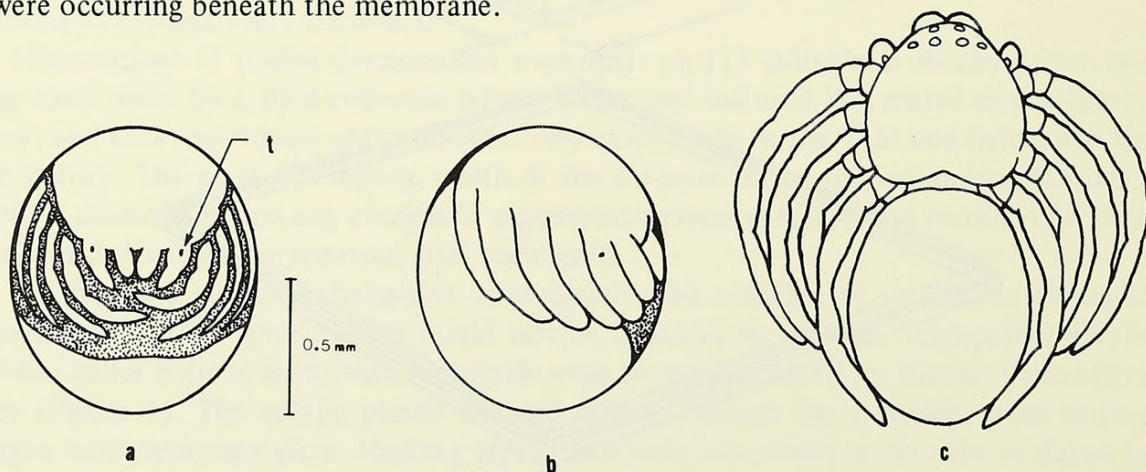


Fig. 2.—Embryo and larva of *O. octonarius*: a, first prelarva showing egg teeth (arrow); b, lateral view, first prelarva; c, larva after casting embryonic membranes.

Table I.—Mean time in days from oviposition to: Eclosion, Second Prelarva, Larva, and First Nymphal stadium of four broods of *O. octonarius* collected from field sites. Numerals in columns refer to numbers of individuals.

Stage of Development	Days									
	10	11	12	13	14	15	16	17	18	Mean
Eclosion										
Brood G	7	2								
Brood E		2	19							
Brood S		4								
Brood R		1								11.3
Second Prelarva										
Brood G		6								
Brood E			20							
Brood S			4							
Brood R			1							11.8
Larva										
Brood G		5	1							
Brood E			1	20						
Brood S				4						
Brood R				1						12.6
First Nymphal										
Brood G							6			
Brood E								8	13	
Brood S										
Brood R							1			17.2

External changes in the eggs that were not immersed in the oil could first be detected as white dots on the chorion that corresponded with the appendage buds. Changing contours on the chorion could be seen as the appendages developed and folded ventrally, and as it reflected the two-part shape of the embryo.

Eclosion occurred about 80 hours after the appearance of the egg teeth or approximately 270 hours (12 days) after oviposition (Table 1). The egg teeth pierced the chorion, and an intermittent, pulsating movement began in the clypeal area and spread posteriorly. The pulsations gradually increased in frequency until the chorion parted abruptly at point near and including one of the projecting egg teeth. About 24 minutes after the onset of eclosion, the carapace and legs were freed, and the wrinkled membranes collected at the caudal tip of the abdomen. The vitelline membrane was cast about 10 hours after eclosion in the same manner as the chorion. The technique of Galiano (1969) of marking each membrane as it was cast, provided evidence that the third membrane was cast simultaneously with the vitelline membrane.

After the casting of the vitelline and third membranes, the abdomen and the prosoma assumed a monoplanar position, and the larva became more spider-like (Figure 2c). The appendages extended stiffly from the body and were segmented except at the tarsal-metatarsal articulation. The appendages moved with strong flailing motions, but the organism was not ambulatory. It could not right itself when on its back and was unable to grasp anything. The caudal mass of embryonal membranes was cast completely. The only pigmentation was that of the red, rudimentary eye spots.

The larval stage lasted from 24-36 hours, during which period the flailing activity continued. Segmentation of the appendages progressed, and the spinnerets became better defined. Setae developing under the larval integument gave the appearance of cuticular pigmentation first on the sternum and later on the cephalothorax and abdomen. Ultimately a longitudinal black striping on the appendages, resulting from the appression of setae by the integument, signaled the imminence of ecdysis.

Ecdysis occurred about 17 days after oviposition. The nymphal cuticle was transparent with numerous black setae, but within 24 hours the body had become black except for white spots on the abdomen (Figure 3a). The legs, except for leg IV which had dark bands on the patellae, tibiae, and metatarsi (Figure 3e), remained pale. The first instar spiderlings were ambulatory and very active; and those that were removed from the egg sac were capable of spinning a simple (not hackle-band) type of silk. Some of them constructed an irregular web. They emerged from the egg sac 2-3 days after ecdysis. They lacked a calamistrum (Figure 3b) and cribellum, but within 24-36 hours after emergence from the egg sac, they were able to construct a "primary type" web. (See Webs)

While still in the egg sac, the first instar spiderlings were observed to feed on uncloded eggs and on prelarvae, a phenomenon that has been recorded in *Phidippus* (Taylor and Peck 1975), *Latrodectus* (Kaston 1970), *Achaeearanea* (Valerio 1974), *Misumenops* (Schick 1972), and *Chiracanthium* (Peck and Whitcomb 1970, Mansour et al. 1980). Cannibalism was not observed inside the cocoon, but when the young spiders were kept from dispersing, within 12 hours after their emergence they would attack, capture and wrap siblings.

Unaided by the female, spiderlings emerged from cocoons made in the laboratory by field-collected females 20 days after oviposition. The web of the adult served as a substrate for the young spiders as they emerged, as avenues for traveling, or as attachment spots for their own webs. Before they constructed their own web, the first instar spiders in the adult's web fed on prey that was not attacked by the female.

Octonoba octonarius molted to the second instar from 20-55 days after the first ecdysis (Figure 4). This contrasted with *Uloborus walckenaerius* Latreille and *Uloborus plumipes* Emerton that molted four and six days respectively after emergence from the egg sac (Szlep 1961). The second instar *O. octonarius* had a cribellum and a calamistrum of widely spaced setae (Figure 3d), and constructed an orb web of hackle-band silk. It also acquired a row of five or six setae retrolaterally placed on tarsus IV (Figure 3d), which increased to 12 to 16 in succeeding instars. This comb-like row of setae appears to function in spreading silk in prey wrapping or other silk-spinning activities not associated with web construction.

Maturity was usually reached in the fifth or sixth stadium. The duration of the stadia varied greatly among individuals, as noted by Szlep (1961), especially after the second instar. The first and second stadia ranged in time from 7-55 days and the later stadia from about 15 to as many as 215 days. Color changed from black to shades of brown, the dorsum and venter acquired the irregular dark brown pattern characteristic of the species (Figure 5), and the dark bands on tibiae I gradually darkened and enlarged. Changes in chaetotaxy were principally evident in the number and refinement of the setae of the calamistrum and the comb-like row of macrosetae on tarsi IV. At the final molt, the female, and especially the male, acquired several macrosetae (Figure 6).

Mortality was high in the laboratory especially in the first three stadia. About 13% of the young survived to the fourth instar and about 4% to maturity. Szlep (1961) and Turnbull (1965) believed lack of food to be a factor in the high mortality in the early

instars. In the laboratory, inability to construct adequate webs, a prerequisite to prey capture, seemed largely responsible for food deprivation in early stadia. Incomplete ecdysis, or deformed appendages were also major causes of death in later stadia.

Courtship and Mating.—After initial recognition signals and responses of web vibration and tarsal contacts, a courtship pattern begins and may be repeated as many as fifty times before copulation is accomplished. The male advances toward the female, typically in her orb web, and touches her with his first tarsi (Figure 7a). Then usually both, but invariably the male, turn and move away from each other. The male, as he turns, attaches a strand of silk below the orb and retreats 3-4 cm (Figure 7b). This strand corresponds to the "mating thread" referred to by Platnick (1971) as typical of orb-building species and by Whitcomb and Eason (1965) in their study of *Peucetia viridans* (Hentz). The male then turns back toward the female, attaches the newly spun strand again, and moves toward her, spinning a dragline as he goes. About mid-distance on his return he cuts the mating thread he has just made (Figure 7d). The portion of the mating thread that is behind him is held with his fourth pair of legs and the portion ahead of him is held with the second and third pairs of legs (Figures 7e). Holding both portions of the severed thread, he makes

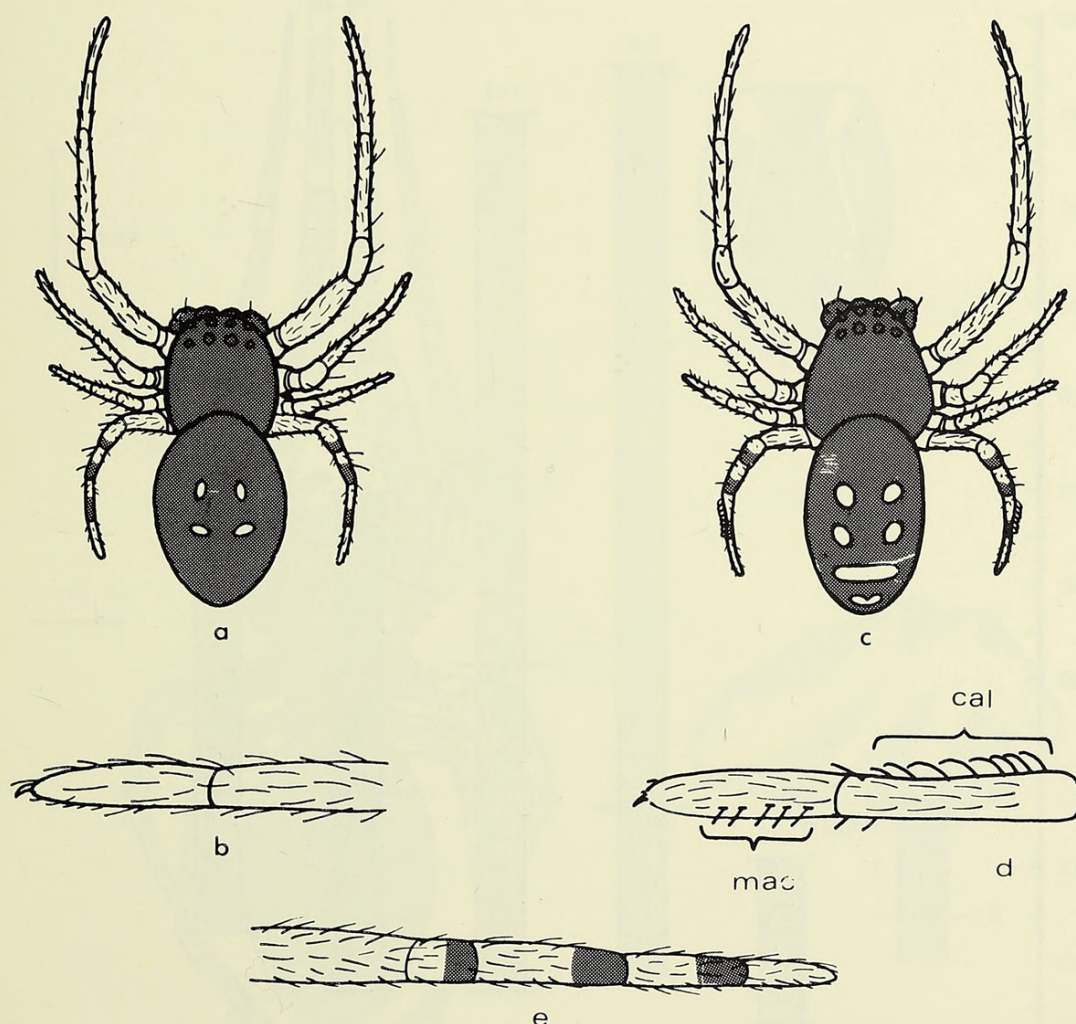


Fig. 3.—First and second instar *O. octonarius*. The body of the spider in both instars is black with white spots: a, first instar; b, first instar metatarsus and tibia IV without calamistrum or row of macrosetae; c, second instar; d, second instar metatarsus and tibia IV with calamistrum and macrosetae; e, leg IV pattern, first and second instar.

10-12 rapid strokes on the forward portion. The female, who is typically positioned with her abdomen toward the male, responds by turning quickly, attaching a dragline, and grasping the thread held by the male with her legs II and III. With a series of stroking motions initiated by the male, first on the mating thread, then on the fore legs of the female, the two move closer together.

In close contact they begin to lower themselves below the orb, venter to venter, on separate strands of dragline silk, grappling with their legs as they descend. During these actions, the thread originally held by the male was released and the pair maintained physical contact with their legs (Figure 7f). Abruptly the female retracts legs II, III, and IV upward and flattens them posteriorly against her abdomen. The male grasps the anterior surfaces of the female's first femora and maintains a brief, stable contact (Figure 7g). He then extends a palp and, using his hold on the female's front legs as a lever, springs forward, clasps the legs of the female to her body with his legs II, III, and IV, and applies a palp to the female's epigynum. The pair remains *in copula* about 1-1.5 minutes. A movement of the legs of the female is a signal for the two to spring apart, each then

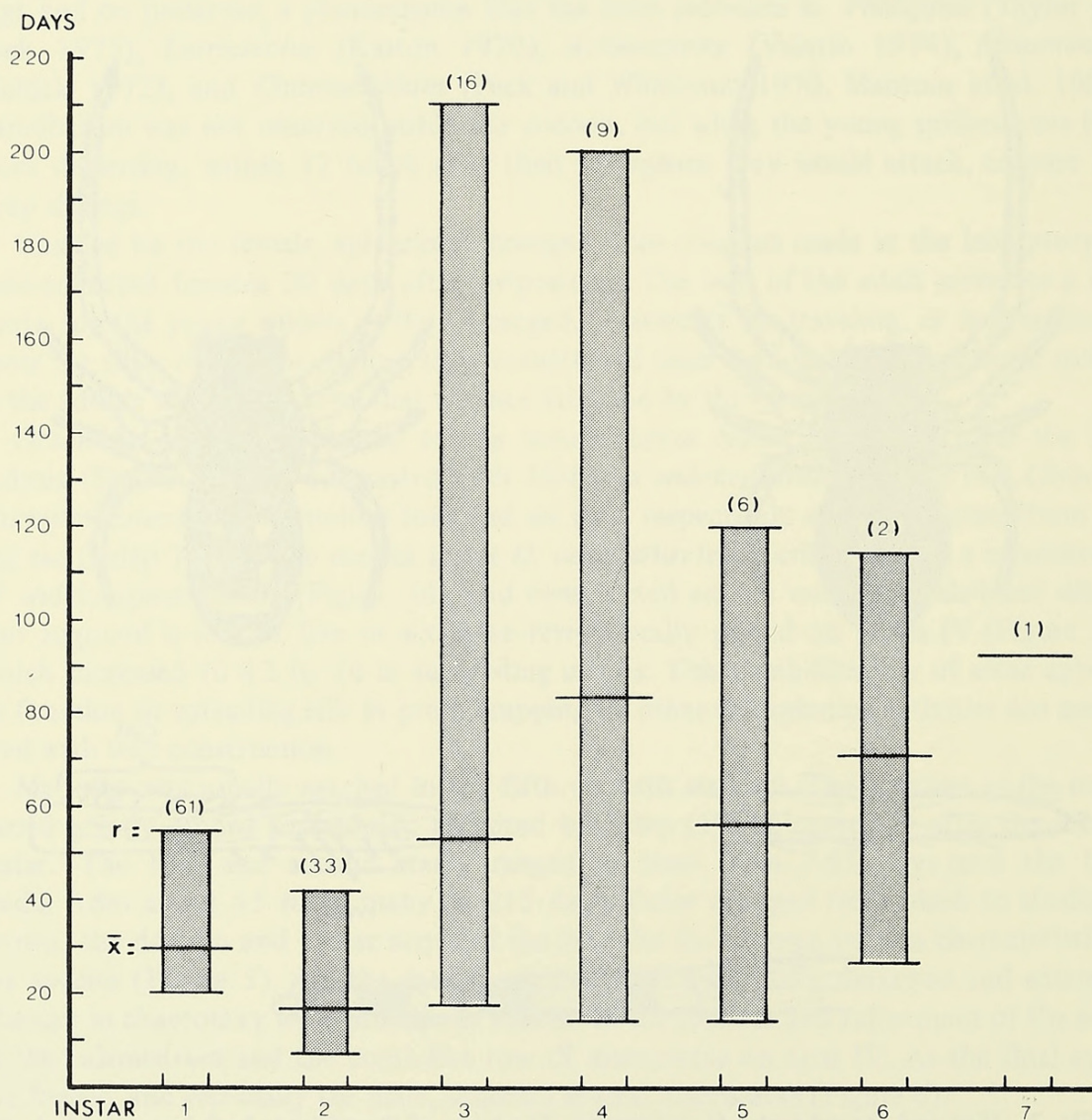


Fig. 4.—Range and mean duration in days of stadia of *O. octonarius*. Numbers in parentheses are numbers of individuals.

hanging from its respective silk line. Each then typically grooms plapi and legs while hanging from the lines or after moving to separate parts of the web.

The preliminary approach may occur many times before a successful clasp is achieved. One pair, both of which were collected in the penultimate stadium and matured in the laboratory, accomplished a successful clasp only after 45-50 pre-clasp patterns. The critical time in the pattern seems to be during the sparring and lowering sequence. If responses are not correct at this time, the sequence is broken and the male typically starts

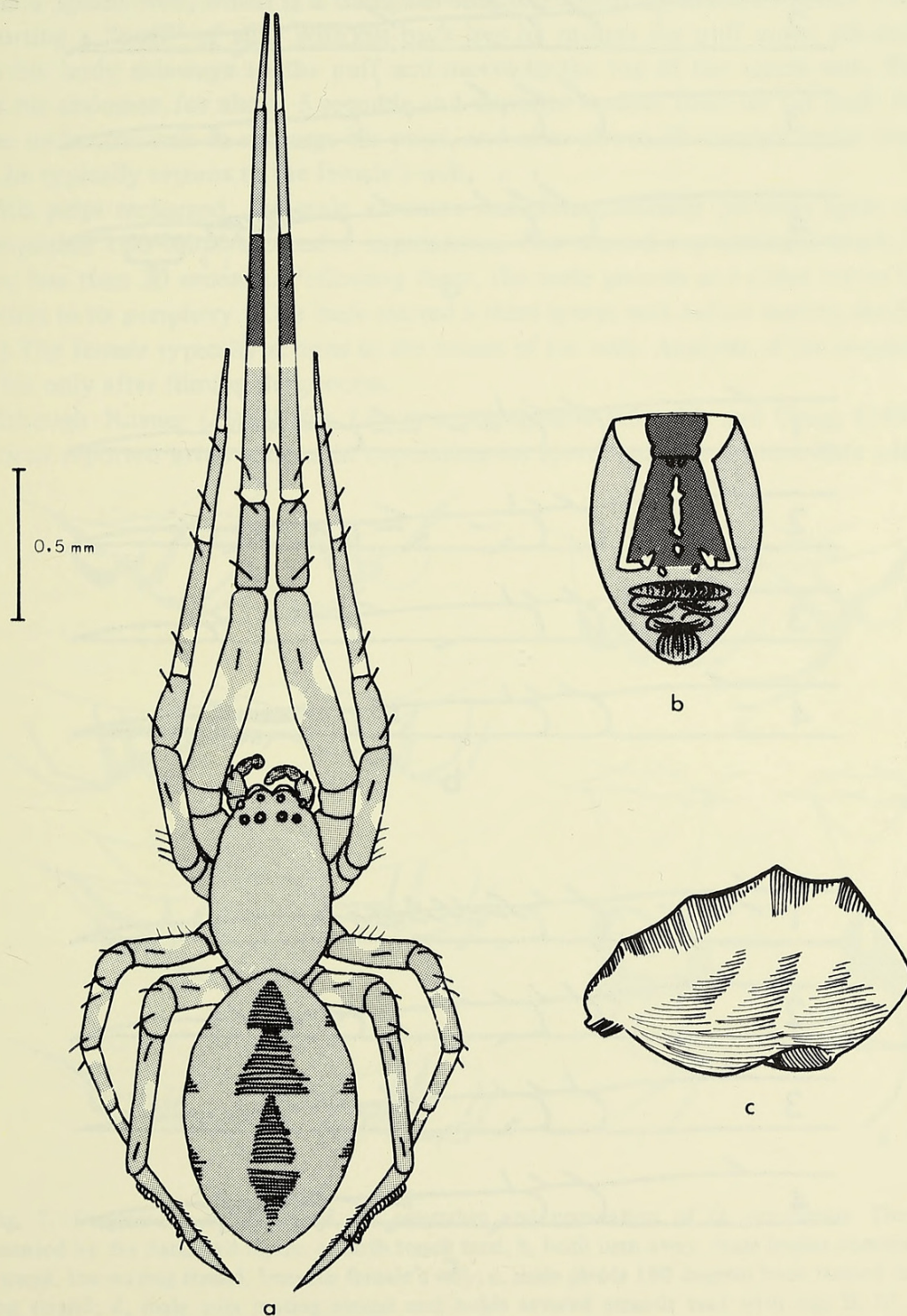


Fig. 5.—*Octonoba octonarius*: a, color pattern of adult female; b, color pattern of venter of adult female; c, lateral view of dorsum of adult female showing diagnostic humps.

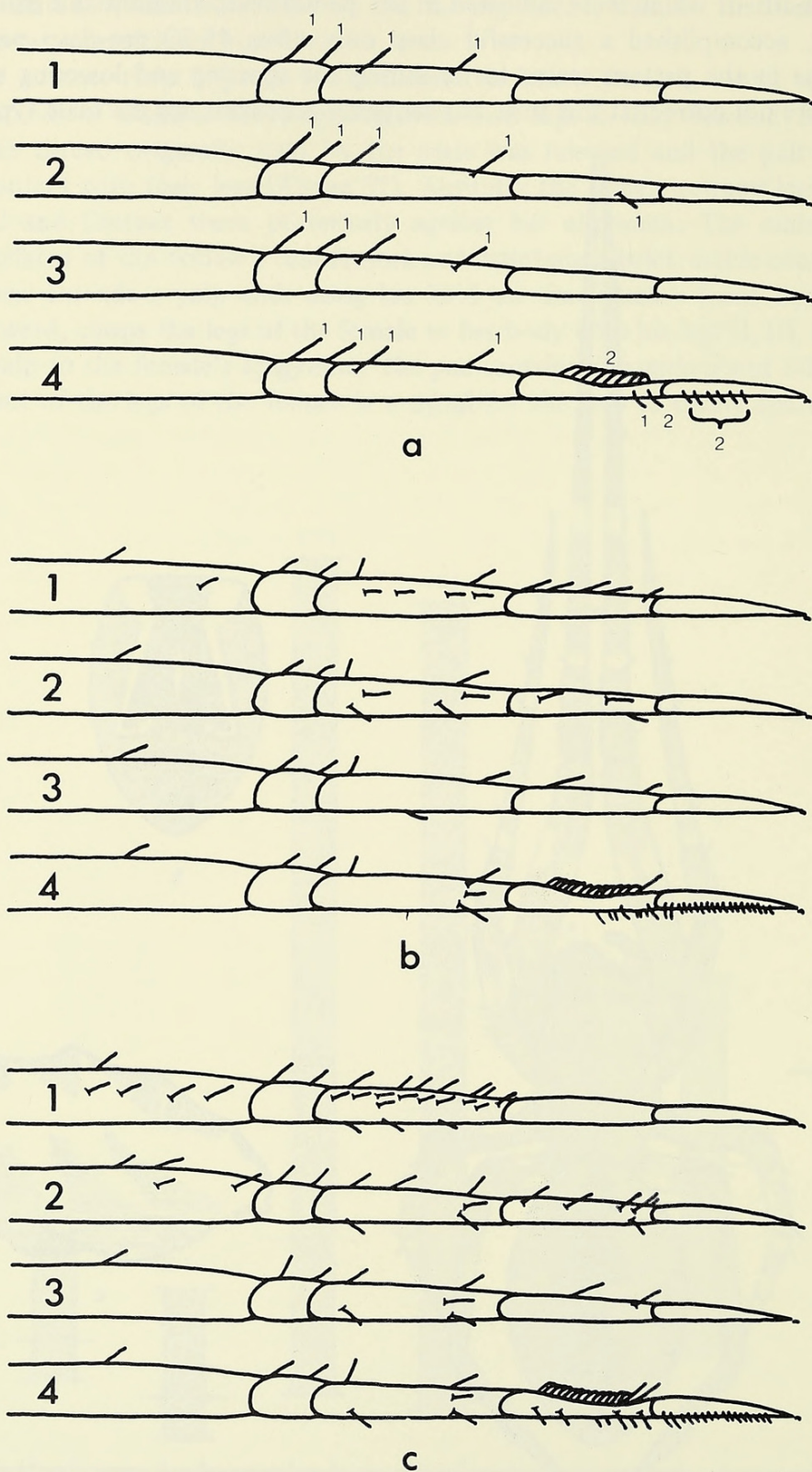


Fig. 6.—Changes in macrosetae on legs of *O. octonarius*. (1 and 2, prolatral views of legs I and II; 3 and 4, retrolateral views of legs III and IV); a, first and second instars (small numerals designate instar); b, adult female; c, adult male.

the entire pattern again. Although nine of the ten pairs observed required several attempts to attain the clasp, one pair, a female that had matured in the laboratory about a month before and a newly collected, mature male, completed the entire courtship and mating sequence without repeating any of the pre-clasp pattern. After a successful copulation, the courtship pattern is usually repeated until a second sequence of successfully completed.

After a second copulation, the male typically retires to the side of the orb and constructs a sperm web, which is a triangular-shaped supporting structure about 1 cm long supporting a "puff" of silk. With his back legs he gathers the puff under his abdomen, turns his body sideways to the puff and moves to the top of the sperm web. There he raises his abdomen for about 5 seconds and deposits seminal fluid on the puff. He then moves under the web to recharge his palpi, and after about 30 seconds under the sperm web, he typically returns to the female's web.

With palpi recharged, the male executes complete courtship patterns again until he accomplishes two more successful copulations. The second copulation is much briefer, lasting less than 30 seconds. Following them, the male grooms and either leaves the web or retires to its periphery. (One male started a third sperm web before leaving the female's web.) The female typically returns to the center of her web. Analysis of the sequence was possible only after filming the process.

Although Rovner (1967), for *Linyphia triangularis* (Clerck), and Gregg (1967), for *Ixeuticus* reported interruptions in copulation for sperm induction, immediate additional

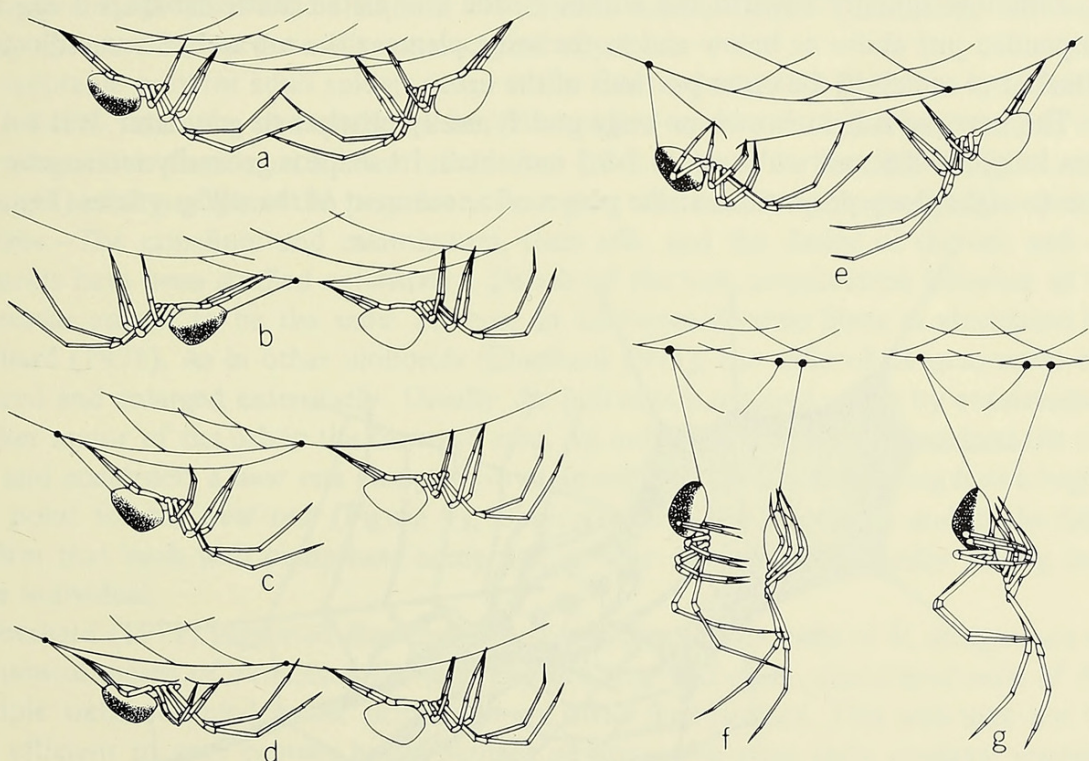


Fig. 7.—Diagrammatic sequence of the courtship and copulation of *O. octonarius*. The male is represented by the darkened figure. a, both touch tarsi; b, both turn away, male begins construction of silk strand, the mating strand, beneath female's web; c, male pivots 180 degrees back toward female on mating strand; d, male cuts mating strand and holds severed strands taut with legs II, III, and IV, strokes taut strand nearest female with legs I; e, female turns, exchanges strokes, and both advance toward each other; f, both descend on separate lines, female retracts legs, male holds legs I of female with his legs I; g, using his grip on female's legs as leverage, the male springs forward to clasp female.

copulations were not reported in uloborids. Bristowe (1958) reported that the male of *U. walckenaerius* inserted each palp once for about 5 minutes each before the pair parted, which differs considerably from the much briefer, interrupted pattern observed in *O. octonarius*.

Females seldom attack the males before or after courtship. On one occasion after mating, a male caught and began to wrap a fly, which was confiscated by the female; and the male backed off unharmed.

In the laboratory, females were receptive to mating only once. Males would mate with several females.

Egg Sacs.—Egg sac construction and oviposition occur at night and require approximately 3 hours. The upper covering of the egg sac is constructed first with the female holding on to the web with her two anterior pairs of legs and moving her abdomen back and forth attaching essentially parallel strands of silk. The tarsi of the posterior legs are used to press the silk strands more firmly together, giving the forming fabric a smoother and more compact texture than is evident in the fluffly, newly extruded silk. Silk is deposited and compressed on both the upper and lower surfaces of the fabric as the spider changes position, adding layers to the disc. The upper covering is completed in about 15 minutes and eggs are extruded onto its under surface upon its completion. Eggs are laid in a viscid matrix that adheres to the upper cover as described by Gertsch (1949) in *Argiope* and by Whitcomb et al. (1967) in *Oxyopes*. The bottom cover is woven in the same way as the upper one and the two are joined.

Although initially constructed within it, the completed lenticular-shaped egg sac is suspended just above or below and in the same plane as the orb web. Strong silk strands attach it to radials in the outer portions of the orb.

The new sac is light brown or beige and typically changes to gray later. It is 8.4-10.6 mm long, 5.2-8.8 mm wide, and 3.5-5.3 mm thick. Its shape is generally rectangular with five to eight sharp projections at the points of attachment of the silk guy lines (Figure 8).

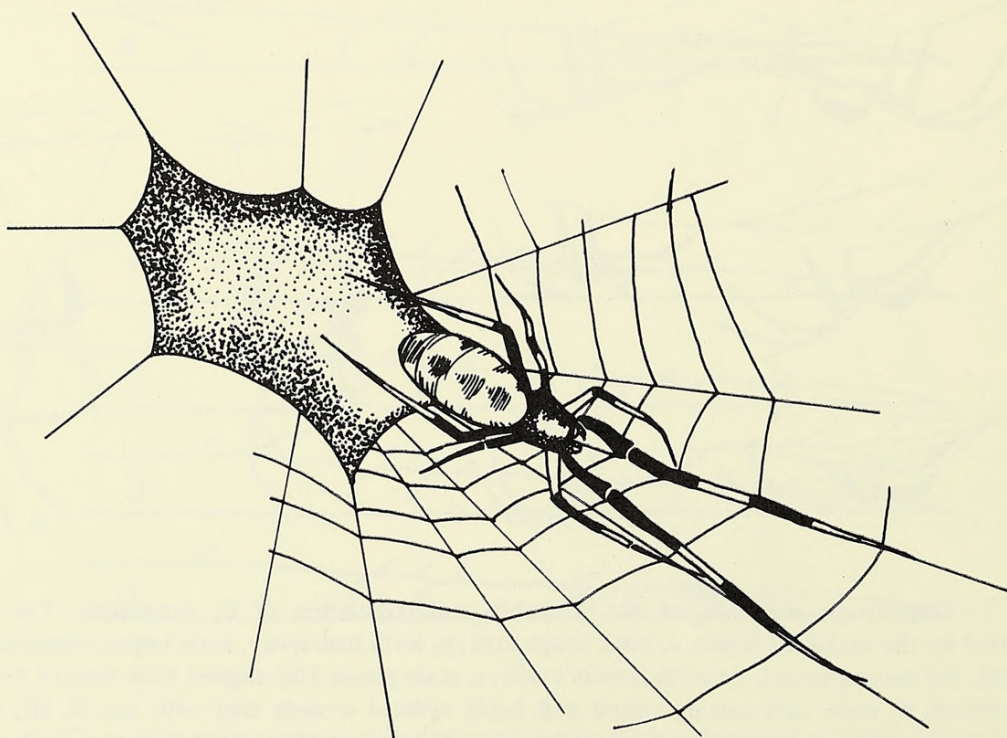


Fig. 8.—Female *O. octonarius* guarding egg sac. The female remains with her legs touching the sac for approximately 24 hours and then moves to a position near it.

After oviposition the female usually remains near the egg sac for about a day with her fourth legs touching it (Figure 8). Hentz (1850) reported this same behavior in *Uloborus glomosus* (Walckenaer) (sub *Phillyra* spp. Hentz). She withdraws gradually and after several days returns to her more typical resting location in the center of her web. Her withdrawal is so consistent that a rough estimate of the age of the egg sac can be made from this behavior.

In the laboratory, females constructed one to five cocoons ($\bar{X} = 3$). The spherical eggs were cream colored and averaged 0.7 mm in diameter. Fourteen sacs collected from field sites had 45-107 eggs per sac with a mean of 78.

Field observations indicate that oviposition occurs at two peak times, mid-June through early July and mid-August through early September. However, cocoons were found in the field as early as May 10 and as late as November 30.

Feeding Habits.—Feeding habits of the uloborids are discussed by Marples (1962), Gertsch (1949), and Opell (1979). Glatz (1970) described the manipulation of the swathed prey by the mouthparts and ingestion. *Octonoba octonarius* does not vary in significant detail from those described behavior patterns.

In the laboratory a spider often accepted a second prey while it was ingesting a previously captured one. It typically carried the wrapped prey in its palpi to the site of new activity, quickly immobilized the new prey, and then wrapped both together. Partially wrapped prey was sometimes left, and the spider returned later to consume it.

Field and laboratory observations indicated that acceptable prey include various Coleoptera, Isoptera, muscid flies, and *Drosophila*. Adult *Tribolium confusum*, although of appropriate size, was generally not accepted as prey.

Acceptable prey for adult spiders range in size from 1-2 mm to 1-2 cm, the latter being two to three times the size of the spider. The spiders tend to consume large prey at the spot where it is first immobilized rather than carry it back to the center of the web. Vigorous activity of potential prey more than prey size seems to discourage its capture.

Webs.—The cribellum and calamistrum, their silk, and the design of the orb web of uloborids have been studied extensively. Details of the web construction behavior of *O. octonarius* appear to be the same as those in *Uloborus diversus* Marx as elucidated by Eberhard (1971). As in other uloborids (Eberhard 1971), the webs of *O. octonarius* are repaired and enlarged extensively. Usually the hub area is repaired, often by constructing another sector of the orb in the damaged area. An individual frequently abandons the old web and constructs a new one alongside or at an angle to the old web, using it as a beginning point for the new one (Figure 9). Observations in the laboratory and in the field confirm that such web complexes composed of four to five webs usually belong to a single individual.

Eberhard (1971) suggested that the repaired sections in the webs of *U. diversus* are an economical means of extending the prey capture area. The older, abandoned units of the multiple webs occupied by *O. octonarius* are often dust-covered. This web may not be very efficient in prey capture but is perhaps advantageous as an early predator warning system since disturbances in any part of the web complex can be detected by the spider.

Adult females are found in three types of webs: 1) a single orb occupied by a single individual which usually represents a new web at a new site, 2) a three-dimensional web occupied by a single individual, as discussed previously, that results from patching, extending, and appending new webs to the old ones, and 3) a three-dimensional complex that results from several spiders constructing webs in close proximity with anchor lines attached to neighboring webs. On such web complexes a disturbance at one area is transmitted to other parts of the web.

In the grain elevator where most field observations were conducted, webs were concentrated around windows, in a three-story stairwell, and around machinery. Turnbull (1964) in his study of site preference by *Achaearanea* and Yoshida (1977) for *Tetragnatha* found that those spiders remained in one location as long as prey was available, and that they abandoned sites that yielded inadequate prey. Light had no bearing on site selection by *Achaearanea*, but air currents did seem to have some influence. Prey insects were more abundant near windows where *O. octonarius* webs were found. There was also better air circulation there, a factor pertinent to web construction. A combination of air currents and light probably accounted for the concentration of webs in the stairwell.

The young *O. octonarius* are capable of spinning the primary web in the first instar. A primary web, as described by Szlep (1961) and Eberhard (1971), is a web without cribellate silk or "sticky" spiral but with many additional radii. The first instar of *U. plumipes* and *U. walckenaerius* laid down additional radii over the temporary spiral instead of cribellate silk, giving the web a sheet-like appearance (Szlep 1961).

We observed primary webs constructed in the occupied webs of older spiders, presumably the maternal web. Primary webs were also found singly and in groups of 3-12 webs in different planes placed one above the other.

Immature males construct typical uloborid webs, and mature males were collected in the field in typical orb webs, but it was not determined if they were of their own making. Males never constructed orb webs in the laboratory, but they did spin irregular webs containing patches of heavy, "non-sticky" silk.

Frequently, but not consistently, a stabilimentum is added to the web of a young or adult *O. octonarius*. Stabilimenta are of three basic types: 1) a zigzag, similar to the one constructed by *Argiope*, which passes through the hub, 2) a zigzag spiraling around the hub, and 3) one with extra silk added to the hub (Figure 10). Field observations failed to

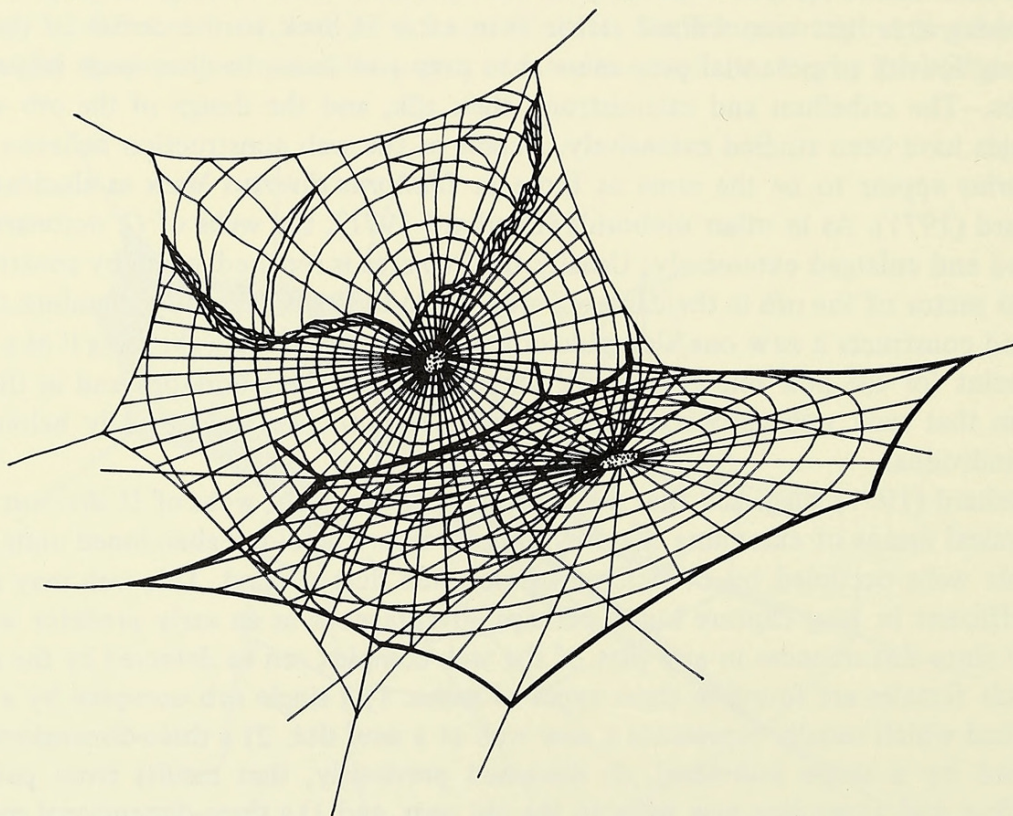


Fig. 9.—Web complex of a single *O. octonarius* female illustrating the spider's habit of repairing the web and joining another web to the original in another plane.

disclose any behavioral or abiotic factors that influenced the presence or type of structure. On some occasions few or no stabilimenta were found, and on other occasions there was a virtual "bloom" of them.

Enemies.—Except for predation by *Achaearanea tepidariorum*, a hitherto unknown chalcid, and activities of man, no other enemies of *O. octonarius* were encountered. Man's cleaning activity and his destruction of the webs that clutter the buildings they are probably the principal pressure on expanding populations. *A. tepidariorum*, which is frequently found in the same habitat, commonly feeds on adults and later instars.

Bradoo (1972) recorded an egg parasite, *Idris* sp. (Scelionidae, Hymenoptera) in an unidentified species of *Uloborus* which lives as a commensal in the webs of *Stegodyphus sarasinorum* Karsch, but no other parasites or egg predators have been reported in the Uloboridae (Auten 1925, Eason et al. 1967). Our finding of an egg predator that attacks a spider in a family which is apparently rarely "parasitized" is of some interest. *Arachnopteromalus dasys* Gordh which was described as a new genus (Gordh 1976) parasitized 78% of the egg sacs of *O. octonarius* at one field site.

A. dasys was first found in late June from the basement, and other infested egg sacs were later collected from other sites. Between 6 June and 10 September, 58% of the egg sacs collected from all field sites contained the predators. The two periods of active infestation coincide with the most active egg-laying cycles of the spider.

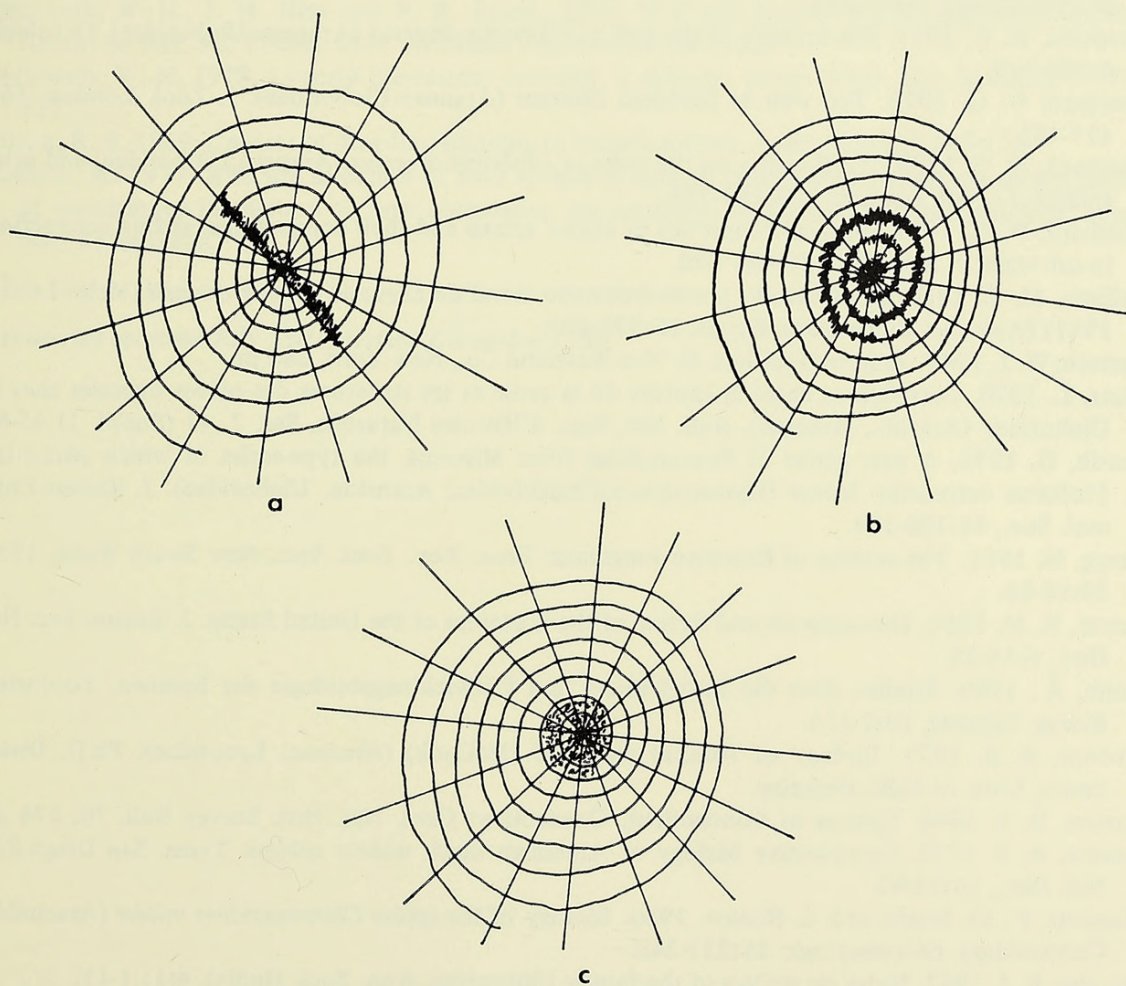


Fig. 10.—Stabilimenta constructed by immature and adult *O. octonarius*: a, zigzag strip through center; b, zigzag spiral around center; c, filled-in center.

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