

# 10

## BLACK AND YELLOW MUD DAUBER

(*Sceliphron caementarium*)



**The black and yellow mud dauber has inhabited Philadelphia since the beginning of the wasp's recorded history in North America more than two and a half centuries ago.**

*Figure 10.1* Black and yellow mud dauber collecting tidal mud by the Schuylkill River Trail at Walnut Street.

On April 25, 1745, members of the Royal Society of London heard a description of a “very curious” nest of a previously unknown North American wasp: the black and yellow mud dauber from Philadelphia. John Bartram had made the observations, which his patron, Peter Collinson, presented on his behalf to the Society. The paper also included Bartram’s observations of the nest of a second mud dauber, the organ pipe mud dauber (*Trypoxylon politum*), also from Philadelphia.

Here is what the Royal Society heard, as published later in the *Philosophical Transactions* of the Royal Society of London:

An Account of some very curious Wasps Nests made of Clay in Pensilvania

By Mr. John Bartram: Communicated by Mr. Peter Collinson, F. R. S.

Read April 25 1745.

Mr. John Bartram a diligent Observer of natural Productions sent me, from Pensilvania, two Sorts of curious Wasps Nests made with Clay, which are commonly built against the Timber under the Roofs of Houses and Pales, to shelter them from the Weather. They feed as the Bees, on Flowers; but whether they sting like them I do not yet know.

The plain Clay-Nest is fabricated by a small black Wasp, of the same Species of that in Fig. 1. but less, that has a Speck or Stripe of Yellow in its Tail; and the Cells are made four or five together, joining Side by Side to each other. But the Clay-Nests that are so elegantly wrought are built by a purplish black Wasp such as is figured in Fig. 2.: After one Cell is formed, they stop it up, and join another to its End, and then add another to that; which makes these wrought Clay Fabrics longer than the plain ones.

Their Method of Working is much alike, and it is very diverting to see them at it: Their Art and Contrivance is wonderful; and, as if it was given to cheer them at their Labours, they make a very particular musical Noise, the Sound of which may be heard at ten Yards Distance.

Their Manner of Working is, to moisten Clay, and temper it up into a little Lump, of the Size of Swan-shot. This they carry to build with; they begin first at the upper End of the Cell, and work downwards, until it is long enough to contain the Nymph or Chrysalis: After they have spread out the little Lump in a proper Manner to form their little Fabric, they set up their musical Notes, and return to temper and work up more Clay for the next Course. Thus they continue alternately singing and working, until a Cell is finished; which is made delicately smooth withinside; then, at the further End of each cell, they lay an Egg; after this, by surprising Instinct, they go and catch Spiders, and cram the Cell full of them: But it is further wonderful to observe, that they only in some manner disable the Spiders, but not kill them; which is to answer two Purposes; first, that they should not crawl away before the Cell is finished; and next, that they may be preserved alive and fresh until the Egg hatches, which is soon.

The Spiders, by wonderful Instinct, are provided for the Embryo to feed on: Having stor’d up sufficient for its Support, she very securely closes up the Cell, and then proceeds to build the next in the same Manner.

The Maggot or Embryo, having eat up all its Provision, before October prepares for its Change, and spin itself up in a fine soft silken Case, in which it lies all the Winter in the Chrysalis-State, until the Spring, when it eats its Way out of its Clay Dwelling.

April 3, 1745

P. Collinson<sup>1</sup>



*Figure 10.2* John Bartram's house in Philadelphia. In 1745 he described the black and yellow mud dauber nesting under the eaves of this house. It still nests here.



*Figure 10.3* Arched entrance to Pennsylvania Hospital from 8th Street. A mud dauber is constructing her nest inside the archway.



*Figure 10.4* Mud dauber in archway to Pennsylvania Hospital just after she landed on her nest. She carries a ball of mud, which she probably collected in the hospital's garden.



*Figure 10.5* Close-up view of the ball of mud.



Figure 10.6 Daubing mud.

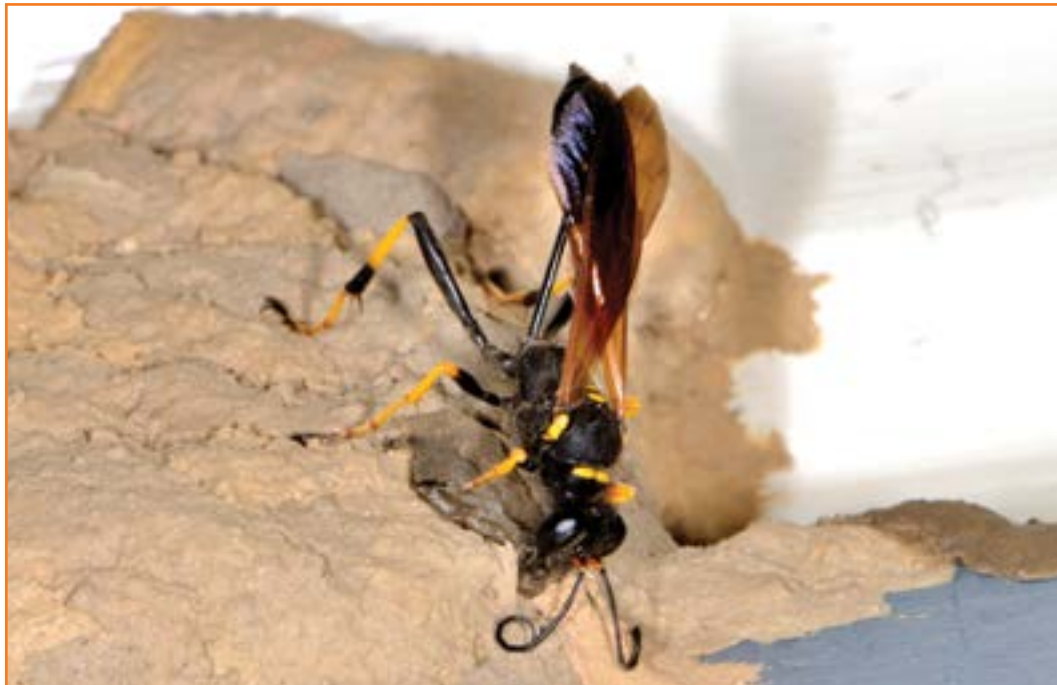


Figure 10.7 Tamping down.

## Powers of reasoning attributed to the black and yellow mud dauber

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In 1806 Benjamin Henry Latrobe— an architect and civil engineer who designed the Philadelphia Water Works (then located at the current site of City Hall<sup>2</sup>) and who was later appointed Architect of the United States Capitol<sup>3</sup>—added more observations and thoughts about the mud dauber. Latrobe weighed spiders in a series of cells in a mud dauber nest; he concluded that in each cell the wasp adjusted the number of spiders it stashed according to the size of the spiders in the stash.<sup>4</sup>

This examination proves that the wasp distributes with much judgment the quantity of food necessary for its progeny; in most of the cellules, for instance, I ought to have found twenty-two or twenty-three spiders, and yet sometimes there are only five or six, but in this case they are very large ones.<sup>5</sup>

Latrobe accidentally damaged a few of the cells of a nest while the wasp was away gathering mud to make a new cell. He recorded what happened when the wasp returned and discovered the disturbance:

In a short time the wasp arrived, loaded with a round lump of clay. It came merely for the purpose of making a new cellule; but seeing that its former works were deranged, it began to run rapidly over the cellules, apparently hesitating what to do. At last it deposited the clay upon the edge of one of the apertures, and began to spread it with its snout, pushing it before it, in the attitude of a sow digging in the ground. It emitted a shrill buzzing when at work. After having very properly replastered the work, it flew away. In four minutes it returned with a new load of clay which it deposited in the next aperture. It repeated its visits four times; and, after having finished the repairs and being convinced of the goodness of the workmanship by running over it several times, it flew off again and returned with a new load, with which it began to form a new cell.<sup>6</sup>

If the faculty of modifying the conduct of an individual according to circumstances is one of the characteristics of reason, the fact I have now mentioned is surely a proof of reasoning in an insect. The wasp had remarked the unexpected derangement which had been made during its absence; the clay which it brought was intended for a new cellule; but observing the mischief done to the old ones, it repaired them before building any more.<sup>7</sup>

## The black and yellow mud dauber as hunter

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In 1890, Henry C. McCook described how mud daubers hunt spiders:

On this errand she may be seen hawking over and near cobwebs of various sorts, venturing within the meshed and beaded snares that prove fatal to most incomers, and sometimes even to herself. She rarely fails in her errand. If the aranead occupant, expectant of prey, sallies forth to seize the intruder, it finds itself a captive, not a captor. For the wasp shakes the silken filaments from feet and wings, turns upon the spider, seizes and stings it, bears it to her cell, and thrusts it therein.

She does not limit her hawking to cobwebs, but flutters over flowers, burrows among leaves, creeps with nervous, twitching tread along branches of trees, wherever spiders dwell or hunt, and with relentless cunning, zeal, and ferocity snatches those creatures away to add to the growing store within her egg nest. At last the cavity is filled, the circular opening sealed up, and the spiders left literally entombed alive within that clay sarcophagus.

If one at this stage should break open the mud dauber's cell, he might dispute the statement that the imprisoned spiders are alive. To all appearances they are dead. In point of fact they are simply paralyzed. The effect of the poison injected by the wasp's sting within the tissues

of her victim is such that all activity is at once and completely suspended, without destroying life. Thus, when the larval waspkin awakes to the pangs of hunger, it finds itself in the midst of a generous supply of the very food which Nature intended for it. The mother whom it is never to know, and who already perhaps has paid the last debt to Nature, had consumed her closing days in providing for the offspring which she was never to see. I have found these larvae, fat, white grubs, in the midst of their “preserved meats,” feasting thereon, and have wondered at their enormous appetite and the greedy vigor with which it was satisfied.<sup>8</sup>

Today the black and yellow mud dauber still nests on John Bartram’s House. It also nests on the Walnut Street Bridge, Pennsylvania Hospital, the Academy of Natural Sciences, Fairmount Water Works, and Boathouse Row.



Figure 10.8 The Academy of Natural Sciences of Drexel University. A black and yellow mud dauber nest is just barely visible as a light brown dot beside the Ionic scroll capping the left column.



Figure 10.9 Close-up view of figure 10.8. Mud dauber nest is the brown structure on the right.

## Hunting around light

Urban lighting might support mud daubers just as it supports spiders. In 1847 when Nicholas Marcellus Hentz first reported finding the bridge spider, *Larinioides sclopetarius*, he reported finding it around the windows of houses; he considered the spider to be “domesticated.”<sup>9</sup> He suspected domestication protected bridge spiders from mud daubers.

In 1970 William Eberhard at Harvard found just the opposite. He observed the black and yellow mud dauber preying on a different but closely related spider (*Larinioides cornutus*) during the day at windows that had been illuminated during the night. The mud dauber learned to look for spiders at windows, where these spiders hid in their silken retreats during the day and where the night before they had caught prey. Eberhard observed that this spider’s daytime retreats around windows were conspicuous, whereas those in the field were impossible to find because they were hidden in curled-up leaves or under flakes of bark. Upon finding a silken retreat, the mud dauber would tear it apart and seize and sting the spider.<sup>10</sup> These observations suggest that mud daubers prey on spiders attracted to artificial lighting on buildings.

Mud daubers build nests near lamps that attract spiders. Eberhard noted that a black and yellow mud dauber foraging for spiders at a window had a nest only 5 meters away.<sup>11</sup> I found mud dauber nests on artificially illuminated ceilings and walls of buildings at Boathouse Row. At night these areas attract an abundance of spiders, and during the day the remains of their webs are conspicuous. In one instance, I noted a spider had constructed its retreat in an abandoned nest of a mud dauber.



## Sparing spiders near mud dauber nests

Martin S. Obin, at the University of Florida, noted that mud dauber nests and spider webs commonly coexist in close proximity, but that mud daubers paradoxically ignore spiders near their nests—even though the spiders they ignore are the very species they capture and stash in their nests. Obin offered two hypotheses to explain the local spiders' immunity to attack by mud daubers. First, he observed that flies that parasitize or consume larvae of mud daubers gain access to mud dauber nests by lurking near spiders and trailing prey-laden wasps back to their nests. By ignoring spiders near their nests and attacking only those farther away, mud daubers increase the distance over which flies must track the wasps. Wasps would presumably be more likely to escape flies that had to trail them for longer distances, particularly since mud daubers take circuitous routes back to their nests. His second hypothesis is that spiders near mud dauber nests intercept parasitic flies approaching the nests. Spiders have been observed capturing flies approaching mud dauber nests.<sup>12</sup>



*Figure 10.10* Hollenback House, fourth boathouse on Boathouse Row. Remnants of spider webs and their prey are distributed within the beam of the floodlight. In the rear is a clay nest of the black and yellow mud dauber, which provisions its nest exclusively with spiders.



*Figure 10.11* Close-up view of a black and yellow mud dauber's nest surrounded by remains of spider webs, as shown in figure 10.10. Although mud daubers prey on spiders, they are reported to spare spiders close to their nests.

### Longevity of populations of the black and yellow mud dauber

The black and yellow mud dauber has endured in Philadelphia's urban environment despite its dependence on water and mud for building material and on shelters protected from rain, which can ruin nests made of dried mud. The wasp is vulnerable to breaks in any of the links in its lengthy food chain. For example, an oil spill in the Schuylkill River could reduce populations of aquatic insects whose winged adults are food for spiders, which in turn are food for the larvae of mud daubers. Insecticides used to control mosquitoes and other urban pests could destroy black and yellow mud daubers by killing them or their larvae directly, or their spiders, or the prey of their spiders. Use of herbicides to destroy weeds destroys habitat for insects that support spiders consumed by larvae of black and yellow mud daubers. Herbicides also destroy wildflowers; black and yellow mud daubers feed on nectar and pollen of flowers rather than on spiders, which only their larvae eat.

The survival of black and yellow mud daubers despite such vulnerabilities in Philadelphia seems mysterious. In Center City, mud daubers have endured through the Industrial Revolution and dense urbanization. What might account for such resilience?

## Reasons for the longevity of populations of black and yellow mud daubers in Philadelphia

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Urban lighting is probably not responsible for the success of mud daubers in Center City. Although mud daubers build nests on walls and ceilings with lamps that attract spiders, they also build nests on walls far away from lamps. Mud daubers and spiders coexist probably because they both need structural support that is protected from sun and rain. An abundance of buildings with eaves and ledges suited to mud dauber nests, plus the availability of mud in gardens and riverbanks, are the most compelling reasons that mud daubers have endured centuries in Center City.

The harsh environment of downtown Philadelphia may work to the mud dauber's advantage. Not only do buildings provide mud daubers dry nesting sites rare in nature, but they also create habitats to which the mud dauber's numerous enemies may be poorly adapted. These enemies include flesh flies (*Sarcophagidae*), bee flies (*Bombyliidae*), velvet ants (*Mutillidae*), cuckoo wasps (*Chrysididae*), ichneumon wasps (*Ichneumonidae*), and chalcid wasps (*Melittobia*).<sup>13</sup>

## Reason for scarcity of organ pipe mud daubers in Philadelphia

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In Center City the black and yellow mud dauber has fared better than the organ pipe mud dauber, the other species of mud dauber that nested on John Bartram's house in Philadelphia in the eighteenth century. A study of urban wasp nests in Piscataway, central New Jersey, reported that people destroyed almost two thirds of nests that organ pipe mud daubers had built on apartment buildings. These wasps had built their nests on walls near doors of porches. However, people spared nests of black and yellow mud daubers, which had built their nests out of reach in eaves.<sup>14</sup> Organ pipe mud daubers guard their nests and buzz loudly—behavior considered musical by Bartram, but probably intimidating by today's homeowner. Although neither kind of mud dauber is aggressive, the organ pipe mud dauber's buzzing and guarding probably incites people to destroy its nests.

## Prehistoric links to human houses

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Mud daubers in North America have nested on buildings since the beginning of their recorded history. Recently, James J. Krakker at the National Museum of Natural History of the Smithsonian Institution reported finding black and yellow mud dauber nests associated with human habitation in Missouri in the middle Holocene. The age of the nests was radiocarbon-dated to 5,500 to 6,200 years. Krakker concluded that mud daubers built these nests on houses.<sup>15</sup> The success of mud daubers in Philadelphia over the past two and a half centuries may be an extension of an even longer association of the wasp with buildings.



Figure 10.12 Old nest of organ pipe mud dauber (*Trypoxylon politum*) near Fairmount Water Works. It is on a retaining wall inaccessible to people.

## Destructive impact of building maintenance on mud dauber nests

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I recently looked for mud dauber nests on buildings around the Water Works and Boathouse Row, where the nests had been particularly common. The whole area had been spruced up, with more landscaping, new walkways, and new and restored gazebos high on the cliff overlooking the river. The facades of most of the buildings looked scrubbed and freshly painted. The restaurant in the Water Works was busy. Black and yellow mud dauber nests hidden in ornamental nooks beneath the eaves survived, but nests in more exposed locations had disappeared. All traces of the organ pipe mud dauber on buildings were gone. I found the remains of an old nest of an organ pipe mud dauber on an inaccessible stone retaining wall remote from buildings.

Buildings, along with mud and spiders, have contributed to the surprising survival of populations of mud daubers in Philadelphia during the past two and a half centuries. But in Center City, only one of the two species of mud daubers that nested on John Bartram's house is thriving; the other had the misfortune of selecting nest sites vulnerable to people who do not admire them as did Bartram. The contrasting fates of these two species of mud daubers illustrate how persecution of animals in downtown Philadelphia may be narrowly focused, quirky, and, from the perspective of the persecutors, effective.