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THE INVENTION OF "SUGARING" FOR MOTHS IN NINETEENTH-CENTURY ENGLAND

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Those who find enjoyment in the books of P. B. M. Allan have had at least an introduction to the history of our familiar method of using artificial bait to attract nocturnal Lepidoptera (Allan, 1937, 1943, 1947). While the present paper was in manuscript, D. E. Allen's welcome contribution on the origin of the method came to hand (Allen, 1965); several historians of science have since added their comments (Allan, 1965; Wilkinson, 1965). The discovery of additional material in the publications of the early nineteenth century has made desirable a summary of what we now know about the development of "sugaring."

It is certain that the practice as we know it began in Victorian England, but we must look to a somewhat earlier date for the circumstances which sent collectors to the forest paths with molasses-pail and brush. Allen (1965) suggests that "the earliest observation of the attraction of sweets for moths and the value of this as a means of capturing nocturnal species" was made in 1831, yet it seems that earlier notices may be found. The standard "textbook" in the period directly preceding the advent of sugaring, Kirby and Spence's *Introduction to Entomology* (1815-26) mentions the feeding habits of moths more than once; nearly every serious collector was familiar with the work. In his popular volume of collecting techniques, Samouelle (1826) noted that "the most successful places for mothing are the skirts of woods under the wind, where there is abundance of plants in blossom, as it is the nectar of flowers on which they feed." Perhaps such observations led Abel Inghen to suggest the first artificial bait. In a previously unnoticed passage of his *Instructions for Collecting, Rearing, and Preserving British Insects* he hinted that "sheets of paper smeared with honey water, beer, and sugar, or sugar sprinkled over them would answer the purpose" of attracting insects (Inghen, 1827).

The adventure of 1831 mentioned by Allen (1965) is, however, of interest as it added more observational data to the store of knowledge which was to result in a more sophisticated *modus operandi*. One John Walton, collecting in the company of two friends, noted that moths were attracted in swarms to the ripe "berries" of the yew. When the entomologists returned to London they provided themselves with "bull's eye lanterns, forceps, &c" and sallied forth to take advantage of the discovery. Armed with the forceps, an early form of net much resembling a large pair of scissors with gauze-covered rings attached to the points, they took numerous rare species on the local yews. Walton continued to visit these trees each autumn. In 1833 he took over two thousand moths at the fruits and noticed a fact that was to assume great importance when the technique of artificial

bait was fully developed: he was "more generally successful in capturing the rarer species when the nights were warm and rainy" (Walton, 1835). Part of the account is interesting enough to quote at length, as it details the "forceps technique" certainly used later at artificial baits.

I use a bull's-eye lantern, with a powerful lens, - the larger the better, a pair of forceps, such as are generally used by entomologists, having the sides and bottom covered with white gauze, and about six inches wide at the mouth when opened. Also I use a portable sliding rod, or one with two lengths, jointed like a fishing-rod, from six to nine feet long, and a small round net, made of white gauze or muslin, screwed or fixed on at the end, of about five to six inches diameter, and the same in depth. I then direct the rays of light upon the insect. If it is within reach I use the forceps, and take it very deliberately; if out of reach, but within the length of the rod, they are easily jarred into the small bag at the end of your rod, lowered down, and transferred into the forceps. In this way they are captured with certainty . . . principally in consequence of that singular instinctive faculty which many insects possess . . . of feigning death when alarmed If they happen to miss the net in the act of falling, they invariably drop lightly to the ground, and may be taken from the grass with the forceps.

Although made in 1831, Walton's discovery was not printed in the *Entomological Magazine* until 1835, two years after the appearance in the same journal of Edward Doubleday's famous account. Although Inghen had suggested the use of sugar, Doubleday (1811-49), the eminent lepidopterist who was later to collect widely in America and undertake the magnificent *Catalogue and Genera of Diurnal Lepidoptera*, was the first to give a detailed report of taking moths at that medium. He and his equally noted brother Henry (1808-75), who Edward Newman perhaps rightly called the most important lepidopterist England had produced, lived at Epping where their father operated a grocery and hardware business. Edward's note advised collectors to "lay a sugar-hogshead, which has just been emptied, and to which of course some small quantity of sugar will still adhere, in an open space near a garden or field." After a few nights it would be "visited by numbers of Noctuae, amongst which will not unfrequently be found some of the rarer species." The moths would continue to visit the barrel, "particularly on moist evenings, as long as it retains any saccharine matter" (Doubleday, 1833). A list of sixty-nine species followed which had been taken by the method, presumably in the season of 1832. Writing almost fifty years later, W. F. Kirby (1882) credited the discovery to both Edward and Henry, explaining that they had seen the moths coming to empty sugar casks thrown into the grocery yard.

The curious technique was seized upon by other entomologists. J. C. Dale (1833) recommended heating the barrels as they would then attract moths "much sooner than when cold." Gauze "should be so placed as to prevent the moths from injuring themselves [i. e., to keep them from covering themselves with sugar], and a person should stand near with a net ready." It is known that sugar casks were so used as

late as 1841, for in his *Familiar Introduction to the History of Insects* Edward Newman described the method, also explaining that "East India sugar-bags have been employed for the same purpose, with very great success, and on these the moths may be captured with far greater facility than on a sugar-hogshead, which from its shape is less accessible." (Newman, 1841). These early methods caused collectors to recall having seen moths attracted to the bottles of sugar and water which were commonly placed to attract wasps (Dale, 1833); in a later paper Samuel Stevens (1843) reported a specimen of *Catocala fraxini* trapped thus in 1838.

Several other modes of artificial sugaring seem to have been developed in the 1830's. Allen (1965) has called attention to the activities of Prideaux J. Selby, but something more may be said about him. Selby (1788-1867) was an eminent naturalist, author of the *Illustrations of British Ornithology* and numerous papers on botany, entomology, and ornithology. In a paper of 1839 he reported "the use of honey, smeared upon some receptacle which is placed in situations supposed to be favourable to the flight of the moths." After some experimenting he found that "an old bee-hive . . . is preferred to any other article, as it offers a larger surface, and from its circular form allows the moths when settled upon it to be easily captured by the flappers [forceps]" (Selby, 1839). It may be remembered that Ingpen had suggested the use of honey, but Selby developed the method to perfection, keeping careful records of such pertinent data as species visiting the hive, their seasons of appearance, times of flight and proportion of sexes. He noted that no Sphingidae or Bombycidae were taken, but "many of the *Geometridae* and *Tortricidae* had been captured, and among them some of our rarest species." Allen (1965) dates Selby's experiments to 1835, but the evidence is slim; Selby himself does not mention using the method before 1836 (Morris, 1837). The document in question is his letter to F.O. Morris dated 17 April 1837 and published by the latter in the *Naturalist*. It is of interest as he definitely mentions the idea of painting trees with honey, but seems to reject it as "it would require a much greater consumption . . . Wasps, Bees and other insects would devour every particle during the day." Selby's method was reported by James Duncan in the introduction to his *British Moths, Sphinxes &c* (1836) and must have gained wide publicity through that popular work. In the second edition of his *Instructions*, Ingpen (1839) explained that an "empty sugar cask, or a tub, or beehive smeared both inside and out with sugar and water, or honey and water, will attract the *Noctuidae*, and some beetles." The tub was to be "elevated three or four feet from the ground, and placed near the border of a wood, or in a garden." He also recommended an early "sugar trap," in which the moths were captured on a plate of sweet matter placed under a pane of glass.

Cumbrous as the sugaring methods of the 1830's seem to have been, much experimental data were obtained from them, which led to the introduction in 1841 of our present practice of painting the trunks of trees with various sugar mixtures. The first notice of the "break-through" seems to be in a letter of Henry Doubleday to T. C. Heysham of Carlisle, first printed in 1888. It is dated 11 August 1841 and explains that "by taking some sugar and water and brushing it on the

trunks of trees, or sprinkling it on the bushes, you attract an immense number of moths, and about an hour after sunset they remain quite quiet, and with a light you may select what you want" (Christy, 1888). Doubleday's practical discovery was reported by H. Noel Humphreys in his and J.O. Westwood's *British Moths and their Transformations*. The introduction, dated October, 1841, stated that "Mr. Doubleday has recently tried the experiment of brushing a mixture of sugar and water upon the bark of trees where moths are likely to abound, and found the plan perfectly successful, having captured immense numbers this season that way, many of them of the most rare and beautiful species" (Humphreys and Westwood, 1843-45). But the first number of *British Moths* was not published until 1843, and before then Doubleday had made his method known to other friends. The first report of it to actually appear in print was that of J.W. Douglas (1842), whose note dated 6 July 1842 was published in the rare first volume of Edward Newman's *Entomologist*. Douglas claimed that "the saccharine system of taking moths has proved very successful;" he had painted the posts in his garden every possible night, and "the moths came in droves." Strong sugar was suggested, and another step was taken towards the modern mixture: "treacle I find does equally well."

In August of the same year Henry Doubleday (1842) himself reported the capture of the rare *Polia occulta* "sucking sugar which I had placed on the trunks of some trees to attract moths." Samuel Stevens, a Hammersmith collector, described (1843) taking the magnificent *Catocala fraxini* in his garden, "feasting on the sweets that I had provided for him, on the trunk of an apple tree." Stevens apparently had some experience at the method, for he mentioned meeting *Catocala nupta* "frequently." Doubleday (1843) listed his numerous captures at Epping during the autumn of 1842, but it would seem that the exact nature of the mixture was revealed to only a small circle of friends. The dealer H.G. Harding (1883) reminisced that "there was a great desire among working entomologists to know how it was made, but the secret was retained by a few. All kinds of scents were tried, but were not found of much use. A man of the name of Courtney made some up, and sold it at one shilling and sixpence per pint"—a large sum in the mid-nineteenth century.

There is a curious footnote to the introduction of painting trees. For forty years there were no dissenters to Henry Doubleday's claim of priority to the method. Then in 1881 James English read a paper before the Epping Field Club in which he claimed to have originated the practice. English (1820-88), an Epping collector, had been hired by Henry Doubleday as an assistant naturalist in 1836; the two were fast friends until Doubleday's death in 1875 (Mays, 1961). In his paper, English explained that he had tried the sugar and water experiment in the summer of 1843 when Doubleday was in Paris. Henry's younger brother Edward was then at home in Epping, and English claimed to have received a compliment from him on the invention. When Henry returned "he was surprised in the extreme, and sent for me to learn the details. After a few nights' adventures with sugar he wrote to the late Edward Newman, telling of the utilization of sugar for the capture of moths. An article in the *Zoologist* sent the entomological world to the woods

with the sugar-can and lanthorn" (English, 1882).

After English's death Miller Christy (1888) vindicated Double-day's claim, pointing out that the latter had used the method two years before his trip to Paris in 1843, during which English claimed to have invented it. Moreover Doubleday's first paper on the subject was written long before the Paris voyage. Allan (1943) cast further doubt on English's reliability in this and other areas. Allen (1965) accepted English's claim, inferring that he had forgotten the actual date. His paper was followed by Allan's comment (1965) that it was "just as likely that it was the Doubledays who 'introduced' sugaring to English as it was the other way round." Although I agree with P. B. M. Allan, the matter will probably never be solved to everyone's satisfaction. It should, however, be noted that English's memory was poor indeed. His insistence on Henry Doubleday being in Paris throws doubt on the account. Doubleday did not write his account to Newman after only a few nights' sugaring; it was indeed a year before the note was transmitted. What is known of Doubleday's character makes it unlikely that he would take credit for the discovery of another collector. It is also strange that English should keep quiet until after the death of all those who could possibly testify to the truth of his claim.

By 1843 so many collectors had heard about the success of painting trees that there was a general demand for more details. J. W. Douglas remarked in a note dated 18 November 1843 that there had been no account of how to use sugar, so that it was "not generally understood by country entomologists." Douglas' explanation must be quoted *in extenso* as it shows that the sugar-water or treacle method had become more sophisticated:

The strongest brown sugar, known as 'Jamaica foots,' is mixed with hot water to the consistence of treacle, or somewhat thinner, and a small portion of rum added and stirred in; the composition is then laid on the trunks of trees in favorable situations with a painter's brush. I have found that it is better to make long and narrow streaks than broad patches. . . . The sugar should be put on the trees at dusk, before the moths fly; for I have repeatedly observed, that if used afterwards, there will not be nearly so many come. With a lantern, suspended from the neck, and thereby preserving an upright position during every movement, the collector may visit the trees several times during an evening. The greater number of moths will be found during the first hour, but some species are only taken late at night. . . . Some persons boil the sugar and water, and think it an advantage, but I have not yet tried it. Of the efficacy of the rum I am sure, having more than once seen one collector use it, and another at the same time sugar without it, when the former would obtain double the number of Noctuae.

The account (Douglas, 1844) is notable for the first mention of the now universal addition of rum to the mixture. The editor of the *Zoologist*, Edward Newman, received a number of replies to it, some claiming great success and others reporting none. Samuel Stevens

noted that he found beer to be more useful than water; Newman (1844) remarked that "not only moths, but woodlice, earwigs and slugs by night, and flies, bees, wasps and butterflies by day, are attracted to the sweets." The Rev. W. T. Bree (1844) was one of those who found sugar to be of little value, but it is no wonder, as his paper suggests that he visited the trees only after the sun was up. C. S. Gregson (1844) conducted a comparative test between fine white sugar and "some from the lower side of a West India hogshead; it was very dark brown, and smelled very strong of rum." He concluded that the reason "so many have not succeeded, has been, that they have used sugar without any smell." Gregson called attention once more to warm, moist nights as the best for sugaring, recommending a "mizzly rain" as beneficial.

Thus collectors had noticed the importance of temperature and humidity to the sugaring process at an early period; the journals of the 1840's contained a number of papers on the subject. Typical was that of J. Pemberton Bartlett (1845) who emphasized the role of the air in carrying the scent; he observed that "want of success more frequently arises from the state of the atmosphere, than from the mixture used." Periods just before or after rain were best, and windy, cold nights were to be avoided. Many substitutes were suggested for the rum, such as essential oils and vinegar, while paste, putrid soap suds and dried apples were put forth at various times as replacements for the entire mixture, but the concoction of beer, sugar, molasses, and rum held its own against all comers, so that by 1857 H. T. Stainton could write in his *Manual of British Butterflies and Moths* of "the revolution that has been caused in our cabinets, by rare *Noctuae* being taken in abundance at sugar." Revolution it was, for many insects thought rare were found to be quite common, and new species were constantly being discovered at sugar. The journals seem to indicate that Henry Doubleday continued as the leading exponent of bait at mid-century (Newman, 1875; Doubleday, 1875); W. F. Kirby (1882) reported that "the trunks of the trees along Mr. Doubleday's field are (or were lately) entirely blackened in many places with the sweet mixture daubed over them night after night for years." These were the seventeen limes Doubleday (1875) claimed to have sugared "for more than thirty years in every month, except the four winter ones."

Those English collectors who had not known of sugar before were introduced to it by the two most popular amateur's manuals of the nineteenth century, Joseph Greene's *The Insect-Hunter's Companion* (1863) and H. Guard Knaggs' *The Lepidopterist's Guide* (1869). Greene summarized the many papers in the *Zoologist*, *Entomologist*, and *Entomologist's Weekly Intelligencer*, averring that sugar was "the best way of obtaining *Noctuae*;" he used a simple mixture of treacle and rum himself. Knaggs praised sugar as "the great medium employed in this country;" equal parts of dark sugar and molasses were to be boiled with enough stale beer to facilitate brushing. Rum was to be added at the last moment. He described a "sugaring net" constructed in the form of a Y, the two extremities being connected with a string of catgut and the device being furnished with a bag "which will readily adapt itself to the shape of a tree or other object against which it may be pushed." Sugaring nets of the period had a short handle so that they

could be held with the stomach against the tree being worked. They effectively caught insects which fell during the bottling process. By the eighteen-sixties, naturalist shops stocked "sugaring tins" fitted with a brush in the cap, and many other devices were invented to facilitate the process as amateur entomology reached its height in the late nineteenth century.

No writer has described Victorian sugaring as superbly as Furneaux (1894). By that decade collectors were so numerous that the "card method" was used; he describes it in *Butterflies and Moths*: "I have sometimes seen cards, bearing the names of the collectors and the date of working, tacked on to baited trees and fences, thus establishing their temporary exclusive rights to the use of their runs." Furneaux cautioned that "each entomologist has a moral right to a run he has baited, and that it is considered ungentlemanly, if not unjust, to take insects from sugar laid by another." I well remember, as a youth, mixing my first pot of bait according to Furneaux's old directions that "odour rather than purity is to be the guide," and shuddering in anticipation when reading that "if there is such a person as a nervous entomologist, that individual should on no account go a sugaring in lonely spots on dark nights." That bit of English advice was just as applicable to American forests in the early 1940's.

Despite such warnings, Victorian sugaring had its lighter moments. A humorous note in an early number of the *Entomologist's Monthly Magazine* recounted the experience of one Edward Hopley, who upon examining his bait in South Devon found "at the foot of one of the trees a melancholy object for compassion and warning. The common bat (*Vespertilio pipestrellus*) lay in prostrate humiliation before me." On attempting to lift the inebriated bat, "a rollicking one-sidy flounder or two, accompanied by a hiccupy squeak, affirmed 'all right' so unmistakably, that, solemnly registering one more vow against the Circian cup," Hopley "lifted him carefully by the collar of his coat, and deposited him in the broad space made by the branches of a noble oak-tree." When he returned several hours later, his "jovial brother collector had departed" (Hopley, 1867).

Although there is little evidence to document its early progress, the practice of sugaring reached America in the first half of the nineteenth century. What is known of its arrival and use here during the pioneer days of American entomology will be recounted in a future issue of *The Michigan Entomologist*.

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