# MYRMECOLOGICAL TECHNIQUE

## I. The Use of Ether in Collecting Ants

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Some years ago while collecting with Professor Fred Hitchcock, physiologist at Ohio State University, a nest of *Camponotus caryae* Var. (?) the limb containing the nest was wrapped up in the ground cloth carried by collectors, brought back to the Put-in-Bay laboratory where it was opened up in an unoccupied room on a hard flat floor and the attempt was made to capture all of the ants for a careful count. The species of this group are so extremely active that it was difficult for the two of us with tweezers and vials of alcohol to keep many of the ants from escaping from off the cloth. Professor Hitchcock suggested, "Would it hurt the specimens to etherize them?" As ether was handy it was used on the nest. Immediately the operation changed from one of desperation to one of placid comfort as we picked up the sleeping ants. Ever since that time the writer has carried in his collecting bag at least a half pound of ether. Where collecting has been from an automobile or motor boat, among accessories is another half pound or pound of ether.

I wish to point out that our knowledge of many species of ants is extraordinarily imperfect because the collector too frequently picks a half dozen specimens out of the nest into a small vial of 70 per cent alcohol, then when he returns to the laboratory and checks his material carefully he finds that he would like a much greater series of that particular species. Too frequently the species runs from minute minores through a long series of sizes of mediae into a few very active majores. The temptation is always to collect the large ants which are usually brighter colored and more conspicuous. The other possibility comes up that the few majores may escape in active species before the tweezers can be gotten into action and the collector may even wind up with simply a small number of minores which in the hands of a taxonomist not widely familiar with the group, could easily be described as a new species. Probably in the literature on North American ants a number of such have been described on either majores alone or minores alone. In certain species we suspect the work of some of our most eminent myrmecologists especially European workers on American material. The museum material just does not agree with our own field experience with related species in the same group.

Ether involves a small expense which to the majority of students of ants can be charged back to laboratory funds. For those who have to pay for it out of their own personal funds I would suggest that the cheap, impure ether which, before the war could be purchased in almost any sporting goods store, be used instead of the medical grade which is found about scientific laboratories. This cheaper grade of ether is used by out-board motor boat enthusiasts who pour it into the gasoline tank in order to get the boat up into the level of dangerous speeds. All racing boats use it. It usually costs about half as much as medical ether and comes in cans of one pound each. A comfortable amount to carry is one-half pound which quantity can be transferred to a medical ether can from the larger can of crude ether.

Some provision has to be made in the bag that the ether is carried upright as it tends to flow past the best of corks if it lies on its side. A leak of ether in the bag could produce serious results when the collector lights a cigarette. It can burn the collector badly when it seeps on to areas of thin tender skin.

The use of ether is especially desirable in collecting timber ants which from their environment are all active, fast climbers. In the capture of these, as soon as an opening is suspected of containing an ant's nest, a few drops or a teaspoonful

of ether is poured about the opening and into it. This stops any sudden egress of ants while the opening is being enlarged. During the process of cutting into the nest more ether is applied as needed when pockets of ants are discovered which are not fully asleep. The chunks of wood or other material can then be transferred to the ground cloth where the entire nest is collected almost at one's leisure.

In the case of the forms of *Camponotus caryae* it is very essential that the collecting be done in the late summer or fall or any time from then until the flight in early spring, and that the collection from the nest contain all forms from the minute minores to the largest majores. We have nests in this group where we are positive we have collected all individuals during cool weather in late summer and have succeeded in such nests in finding only one or two giant majores among a total population of several hundred individuals. These majores are nearly the size of the queen and give an entirely different picture of the species than one in which the two or three giant majores have escaped. Such careful collecting of entire nests of *caryae* in Ohio during the last several years has given us an entirely different picture of the local species from that obtained before ether was used, when frequently nine-tenths of the individuals of a nest would escape during the collection. Thus the use of ether has eliminated two or three suppositions from the Ohio list.

We find ether equally valuable in collecting ground *Formica*. Here usually much more is required; when we find that we have the nest of an unusual ant, particularly in the difficult *rufa* group, we pour into the opening of the nest several tablespoonfuls of ether and then with a long handled shovel which we always carry, proceed to dig the nest to the bottom, carefully etherizing all new parts invaded, at least until we find the queen. The soil from the nest can be shoveled onto the ground cloth (3 ft. square or more) and sorted very carefully. The error in such collecting is then reduced to the field workers which do not arrive during the operation. These usually come in just often enough that they can be picked up individually especially if the collector knocks them into the dug pit where they have difficulty in scrambling out. In such nests the majores, if any, are usually in the top of the nest and otherwise would escape very rapidly, as in the case of *caryae*. In many nests the majores are rather few, and very active. Too frequently the minores are a foot or more beneath the surface and are only in the top of the nest by accident. We could cite various museum series of type material where apparently the collector merely used a hand trowel and collected a dozen or so specimens out of the top galleries. From what we know of related species there were probably minores of an entirely different size and color in the deeper layers of the nest. Etherization permits the collector to take his time and dig to the bottom of the nest or until he is sure he has all possible forms and enough material to pass specimens to other workers.

In various species during the pre-swarming period the males will be found about the nest opening or, in timber ants, frequently a foot or two above it, and may escape the collector because of their extremely nervous activity and their location high up instead of below the entrance.

In ants which inhabit acorns or snail shells we have available in the car or boat a basket of hospital urine sample bottles with appropriate round, tight corks—at least fifty such bottles. We usually have a student or other helper who carries in his pocket several of these bottles and who collects by placing any suspicious acorn with wormhole in a bottle which he corks tightly. He delivers the tightly corked bottle to the ground cloth where the acorn is removed from the bottle and is etherized through the hole before it is opened enough to determine whether it contains a nest or not. If it contains no ants it is discarded. If ants are seen it is replaced in the bottle and tightly corked and taken back to the laboratory for further study. In this manner instead of getting a few partial nests under one acorn tree we have found as many as a half dozen species of ants and are fairly certain that we have the entire nest in each case except for the field ants not at home.

At the laboratory, knowing that we have ants in each bottle brought in, we put a few drops of ether in each bottle before examination and then empty the bottle onto the laboratory table.

Ether has had less usefulness in large nests and in nests so placed that it is difficult to explore them. In large nests the ether would have to be used by the quart to control the whole nest. I am thinking of the great mounds of raw dirt built by the tree ant, *Formica exsectoides* Forel, frequently called the Allegheny mound building ant. Under favorable conditions, particularly in groves of yellow poplar (*Liriodendron tulipifera* L.) whose branches harbor vast numbers of honey dew producing insects, the mounds will be over forty inches high and six to eight feet in diameter. Ether is of little value in such vast colonies. The other type of large nest is that made by various varieties of *Formica rufa* across southern Canada in the talus slopes of limestone slabs under the cliffs of the geologists' Niagra Formation. In such a nest both hands have to be used to turn a slab three inches thick and two to three feet in diameter. Before the ether contained can be picked up the ants have dived into the crevices between even larger stones. One is lucky to capture a few dozen out of hundreds in the top chamber under the covering slab. This is where we wonder how soon inventive genius will produce a pocket sized steam shovel. Only a strip miner has a technique that could open such a nest to the bottom. A third type where ether has little usefulness is in the large flat nest areas produced in Ohio south of the glaciated area by what we class as *Formica fusa subsericea* Say. These nests are areas of raw dirt frequently ten feet in diameter with dozens or even a hundred or so openings. What appears to be the same species builds similar nest areas along the sandy shores of Mackinac Straits, Mich. In these large nests the transporting powers of the collector do not fit the amount of ether needed nor does the staying powers of the ether fit the collecting speed of the forceps wielding ant student. So far only rough estimates on thoroughly etherized fractions of such a nest have to be used in population estimates.

Ether has lessened value in collecting very minute species where the nest is a series of thread sized galleries in substrate of a color almost matching that of the ant. I think of Stenamma, Brachymyrmex, Proceratium, Ponera and many species of Strumigenys. These are so small that they can escape detection when they are not moving. They are usually more easily collected when shovelled onto a cloth. Here they are so slow and nest numbers are so low that few escape. If in an acorn or well defined chamber in wood sometimes a drop or two of three helps hold them until collected. Leptothorax only slightly larger is so active that ether is usually needed, and the same for the very fast species of *Iridomyrmex*.

Our experience with ether is that it does not injure the ant. On Canadian trips we have opened up nests of rare forms of *rufa* and when we found that they were within a few days of the emergence of the winged brood from the cocoon, have thoroughly etherized the nest, picking out samples of the various castes available, and have closed the nest to come back two weeks later to find it as active and contented as if it had not experienced a fairly complete etherization. Probably ants that ether actually struck were killed, but care can be taken not to pour the ether directly on masses of ants. We used it also in such preflight broods brought into the laboratory for emergence. We cannot find that etherization injures either the workers brought along to care for the brood or the brood itself, providing that ether is not poured directly onto the living ants. This gives one complete control of living laboratory samples.

We might observe in closing that studying ants in the field is work and not a holiday or picnic. More and more rarely do we merely sample nests and only where we feel fairly certain that we can return within a few days. The ant sampler merely makes trouble for the taxonomist and the museum man. Science from its nature is thoughtful of others and cooperative in its better techniques.