North America Update, July 2019

The **Hebeloma** Project Progresses: Citizen Science at Work

By Henry Beker, Ursula Eberhardt, Nicole Schütz, and Linda Davies

For the last two decades we have been studying the genus **Hebeloma**. Our European monograph put to bed (published in 2016 as *Fungi Europaei Volume 14: Hebeloma*; see reviews in the reference list), we began to extend this work to the rest of the world. The next major area we chose to address was North America. As well as understanding the North American taxonomy, we wanted to understand the species overlap between North America and Europe.

This genus has long been regarded as difficult and consequently **Hebeloma** are rarely recorded. Within Europe there are some 300 published names and in molecular analysis with the functionality provided by a powerful database, allowing the comparison of numerous morphological characters (macroscopic and microscopic) and molecular characters from several loci.

Our monograph describes in detail the 84 species of **Hebeloma** that we recognized within Europe at the time of publication; it provides keys based on morphological characters and also extensive molecular data as well as more than 500 pages of color photographs, both macroscopic and microscopic, plus a commentary on all the existing European names, their synonymies and their various interpretations. We were certain that there were still more new species to be described from North America there are over 200 additional published names. In Europe the list of published names boiled down to 54 species, and, during the course of our studies, 30 species new to science were discovered. In order to unravel the taxonomy and phylogeny of this difficult group, we developed a methodology combining

Hebeloma excedens from Royalton, MA. Image ©Noah Siegel

Hebeloma australe from Cape Cod. Image ©Henry Beker

Hebeloma velutipes from Cape Cod. Image ©Henry Beker

Europe and we hoped that our monograph would act as a catalyst for such discoveries. Since publication,
we are delighted to have received many more collections of some of the rarer (fewer recorded collections) species described in the monograph, as well as four additional species that were not included in our monograph.

![Hebeloma brunneifolium from Warwick, MA. Image ©Noah Siegel](image)

As of today (July 2019), our database has details of more than 9300 collections, of which over 5200 are European and already over 3000 are from North America. The database also contains details of all the European holotypes, isotypes, lectotypes, epitypes and neotypes that we have been able to locate. We are also working on the North American types, although the analysis of many of these is still incomplete.

At the last count, the collections from Northern America represent 98 taxa (this is up from 82 at the previous count in May 2018). Of these, 37 are already known from Europe (and included in our monograph) and we can give names to a further 28 of these taxa, 26 of which are not currently recorded from Europe (the other two have been recorded in Europe since publication of the monograph). This means we still have 33 taxa, only known from North America, for which we do not yet have names. As a caveat, there may be a small overestimate here as further study may reveal that some of these “taxa” are genetic variation within a species rather than being distinct species.

When we first began our North American study, many people told us that *Hebeloma* were very rare in North America. And indeed when we looked at foray reports they were rarely recorded. Having collected *Hebeloma* in North America for the last five years, we now know that they are in fact common throughout the region. We believe the lack of recording (and probably collecting) is more down to the difficulty of determination. We hope our study will make this important mycorhizal genus more accessible to a wide mycological community. In order to make this study meaningful we needed (and continue to need) collections from throughout North America.

We are grateful to all who have already submitted collections. But we need further help to assemble a more representative sample, across the whole continent. To date, we have only 18 collections from Massachusetts, so we would greatly appreciate your help in finding more. This will be Citizen Science at its best! Ideally we need good collections, carefully dried and with good photographs; also good macroscopic descriptions particularly of any characters that may disappear with drying, such as odor. We can attend to the microscopic descriptions. We have developed a recording sheet for the macroscopic description (see next page).

Our goal is a future monograph on the *Hebeloma* of North America, although this is probably still several years away. However, we will of course send information regarding our determinations to contributors of material, and all such contributions will be fully acknowledged. In due course we will establish a website so that all contributors will be able to see their collections on a map of North America.

Joel Horman of the Long Island Mycological Club kindly acts as receiver for North American collections which he then packages together to send on to us. We have set up a FedEx system so that the sender should incur no cost and as little inconvenience as we can manage. Contact Joel at jhornman@optonline.net and he will provide delivery instructions. Please include a copy of the completed form with your specimens.

We appreciate any help we can get with this project! Henry Bekker (henry@hjbeker.com) & Ursula Eberhardt (ursula.eberhardt@smns-bw.de)

### Further Resources

Reviews of Fungi Europaei Volume 14: Hebeloma:


## Hebeloma Recording Sheet

<table>
<thead>
<tr>
<th>Species</th>
<th>Section</th>
<th>Subsection</th>
<th>Collector</th>
<th>Record ID</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Place Name</th>
<th>County/Region</th>
<th>GPS</th>
<th>Altitude</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Habitat Descriptor</th>
<th>Habitat Qualifier</th>
<th>Special Habitat</th>
<th>Special Soil Conditions</th>
<th>Growth Habit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Associated Organism</th>
<th>Substrate Descriptor</th>
<th>Substrate Qualifier</th>
<th>Smell</th>
<th>Taste (if recorded)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pileus

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>With remains of Universal Veil?</th>
<th>Colour at Margin?</th>
<th>Rugulose?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Lamellae

<table>
<thead>
<tr>
<th>Tears?</th>
<th>Attachment?</th>
<th>Depth of Lamella?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>White Fimbriate Edge?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Stipe

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Basidiome Dimensions

<table>
<thead>
<tr>
<th>Pileus Width</th>
<th>Length of Stipe</th>
<th>Stipe Width Mid</th>
<th>Stipe Width Base</th>
<th>L: # of Full Length Lamellae</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Add further description, sketches or notes on reverse*