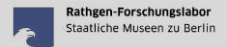


Genetic variability of Gray Silverfish *Ctenolepisma longicaudata* and
Ghost Silverfish *C. calva* in infested collections worldwide (GEVAFISH)

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The aim of this contribution is to provide information on a current joint research project of the Rathgen Research Laboratory, National Museums in Berlin and the Natural History Museum Berlin, to investigate how the Gray Silverfish *Ctenolepisma longicaudata* and the Ghost Silverfish *Ctenolepisma calva* are spread and where the natural areas of distribution are. For this purpose, samples from many different sites are to be analyzed regarding their genetic variability.



Common Silverfish *Lepisma saccharina*
Linneus, 1758



Gray Silverfish *Ctenolepisma longicaudata*
Escherich, 1905

Images: BayHStA



Of about 500 species in the Order Zygentoma worldwide, almost not more than four can cause a serious threat to museum collections, the Common Silverfish *Lepisma saccharina*, the Gray Silverfish *Ctenolepisma longicaudata*, the Four-lined Silverfish *Ctenolepisma lineata*

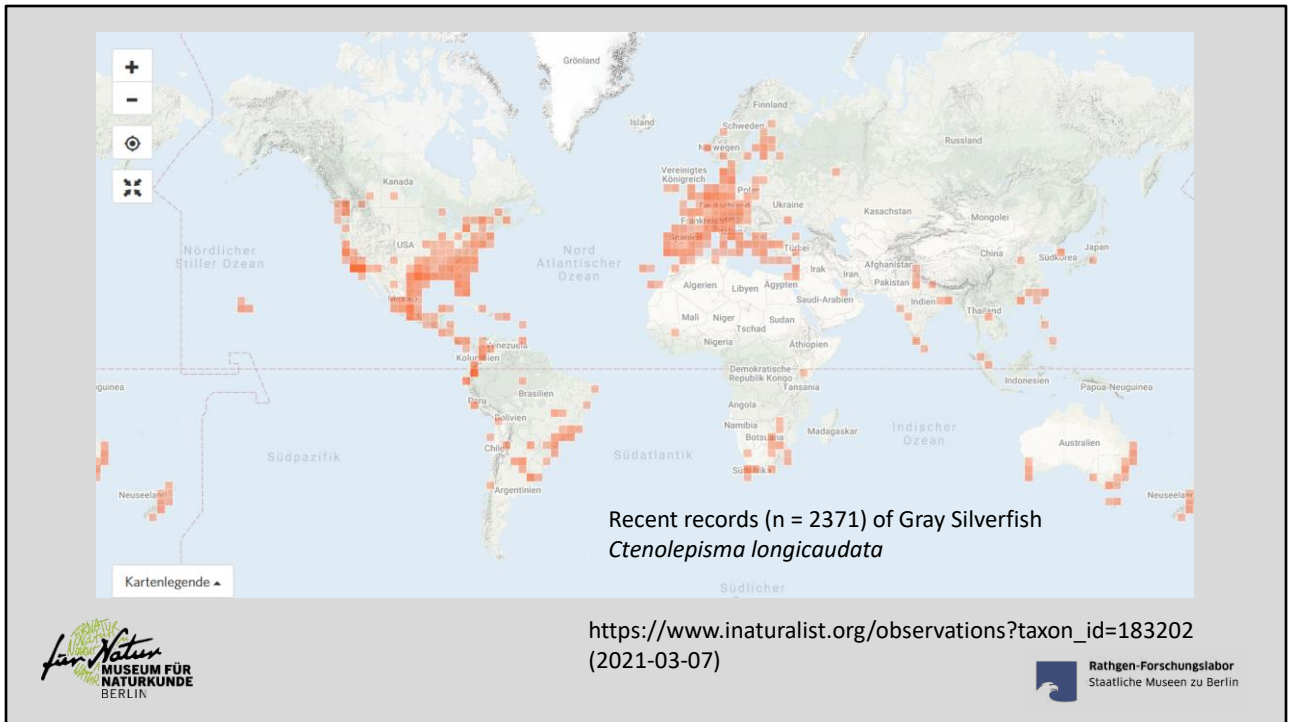


Ghost Silverfish *Ctenolepisma calva*
(Ritter, 1910)

and the Ghost Silverfish *Ctenolepisma calva*. Now, however, the Gray Silverfish seems to be the most important and invasive. At temperate climates in the middle latitudes, the Gray Silverfish is cosmopolitan and synanthropic, dependent on indoor conditions. Its natural origin and habitats are still unknown.



The internet data collection inaturalist.org has just 10 entries of observations of Gray Silverfish until 2011.



So far, there are currently already 2371 records, which probably does not only reflect a strong increase in distribution but a much greater awareness and better attention to Gray Silverfish.

THE SILVERFISH AS A PEST OF THE HOUSEHOLD

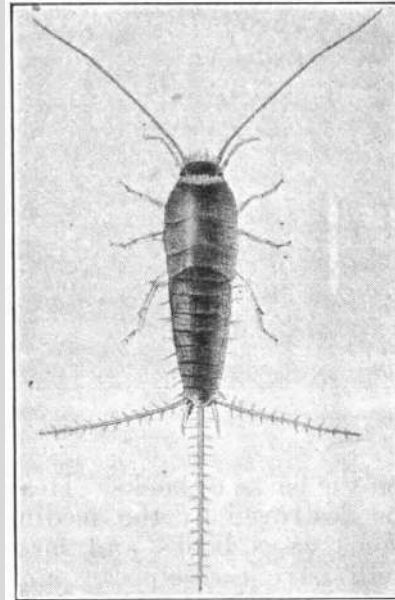
By E. A. BACK, *Principal Entomologist, in Charge, Division of Stored-Product Insects, Bureau of Entomology*

THE SILVERFISH (*Lepisma saccharina* L.) is that glistening, silver or pearl-gray insect with three long tail-like appendages (fig. 1) that is often seen when books, papers, clothing, or similar articles are suddenly moved. From the dark recesses thus exposed to light the silverfish glides quickly out of sight, often thwarting all attempts to catch it. In fact, this insect is an adept at dodging, and when actually in contact with the fingers, the slick, shiny body easily slips from the grasp. Because of its glistening body, its quick, gliding movements, and its ability to appear and as quickly and mysteriously disappear, it has received a number of popular names, among which are silverfish, slicker, silver louse, silver witch, sugarfish, woodfish, paper moth, and bristle-tail. It is well-nigh cosmopolitan in its distribution.

There are a number of different kinds of silverfish, perhaps the most common, aside from the subject of this bulletin, being the fire brat (*Thermobia domestica* (Pack.)). This is a heat-loving species that is to be found in greatest numbers about fireplaces and bake ovens and may be distinguished from the common silverfish by the dusky markings on its back.



FIGURE 1.—Adult silverfish, about two and one-fourth times natural size. (Marlatt)



Gray Silverfish has probably been widespread for much longer but has often been overlooked or confused. For example, a publication of the U. S. Department of Agriculture in 1931 on the Common Silverfish *Lepisma saccharina* shows a Gray Silverfish in the illustration to the text.

The Distribution of *Ctenolepisma urbana* Slabaugh and Certain Other Lepismatidae

HARVEY L. SWEETMAN, *Massachusetts State College, Amherst*
and

WALTER M. KULASH, *North Carolina State College, Raleigh*

The gray silverfish, *Ctenolepisma urbana*, was described by Slabaugh (1940) from specimens collected in buildings in Urbana, Illinois. Mallis (1941), under the name of *C. urbani* Slabaugh, discussed the species as a household pest in southern California. Unfortunately Mallis misspelled the specific name in his paper.

The gray silverfish was found widespread and common in Raleigh, North Carolina by the junior author in 1942. Dr. C. S. Brimley of the North Carolina Department of Agriculture in Raleigh loaned their collection of *Thysanura* from which the senior author has identified specimens collected in Raleigh in 1922, 1926, 1927, and 1937 as *C. urbana*. Mrs. R. E. Stone (Slabaugh) has just found the species in Columbia, Missouri (Correspondence, November 1949). The senior author collected a single specimen in Houma, La., in 1939.

These records of *Ctenolepisma urbana* from the Coast, Midwest, and from the eastern, western and southern coastal states from 1922 to date suggest that this fourth household pest thysanuran is widespread in this country, at least in regions where long, warm summers prevail.

The Introduction and Establishment of *Habrolepis rouxi* in California

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The late W. K. Roux, when chief entomologist of the Letaba Estate, Zebediela, Transvaal, Union of South Africa, sent in June 1935 a small lot of reared parasitic insects to the University of California Citrus Experiment Station for identification. Among them were specimens reared from red scale, *Aonidiella aurantii* (Mask.). These specimens were subsequently described by Compere (1936) as *Habrolepis rouxi*. The discovery that there existed in South Africa a parasite of red scale resulted in the University of California sending Harold Compere to Africa to collect and rear specimens for shipment to the Citrus Experiment Station. On the recommendation of Harry S. Smith, in charge of the Division of Beneficial Insect Investigations, the trip was financed in part by the unused portion of a fund provided by the citrus growers of California for exploring South America for red scale parasites.

Compere arrived in Cape Town in the fall of 1936. During February, March and April, 1937, he sent 15 shipments of parasitized red scale to California. Most of the shipments were en route from 3 to 4 weeks. Live material was obtained from only 6 of these shipments. The shipments for the most part consisted of gourds and squashes infested with parasitized red scale in all stages of development.

J. Eco. Ent. 37(5) (1944)

1944 it was published in the Journal of Economic Entomology that *Ctenolepisma urbana* (*urbana* not because of urban conditions of occurrence, but after a sample from the city of Urbana, Illinois) appears as a household pest in southern California, in Columbia, Missouri and as early as 1922 in Raleigh, North Carolina. Later research showed that *Ctenolepisma urbana* is synonymous with *Ctenolepisma longicaudata*.



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MEMBERSHIP OF THE SOCIETY AND FOR THE MEMBERSHIP OF THE
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ROYAL SOCIETY'S HALL,
VICTORIA STREET, MELBOURNE, C.T.

1940.

Registered at the General Post Office, Melbourne, for transmission by post as a periodical.

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Art. III.—*The Biology of the Silverfish, Ctenolepisma longicauda* Esch. with Particular Reference to its Feeding Habits.
By EDER LINDSAY, B.Agr.Sc.

(Read 11th April 1939; issued separately, 1st March, 1940.)

Contents.

I. INTRODUCTION.

II. EXPERIMENTAL METHODS.

III. FEEDING HABITS.—

1. Crop Contents.
2. Range of materials attacked.
3. Food requirements of nymphs and adults.
4. Taste.—
Wallpapers; Writing and Printing paper; The cause of the unpalatability of the mechanical pulp; Deterrent spray; Adhesives; Artificial silk; Poison baits.

IV. DIGESTION AND ABSORPTION.—
Process of digestion; Cellulose digesting bacteria; pH of alimentary canal; Redox potential; Distribution of certain dyes.

IV. LIFE HISTORY.—

1. Egg.
2. Early instars.
3. Adults.—
Ecopsis and feeding; Process of molting; Mating and Egg laying.

V. EFFECTS OF TEMPERATURE AND HUMIDITY.—

1. Temperature.—
Length of naecium; Activity and distribution; Length of life cycle; High temperature.
2. Humidity.—
Water content; The effect of dry air; The effect of a range of humidities; Absorption from moist air; Discussion.

VI. NOCTURNAL HABITS.

VII. SPRAYING.

VIII. CONCLUSION.

IX. SUMMARY.

I. Introduction.

Ctenolepisma longicauda was first described by Escherich in 1905 from material collected in South Africa. It has since been found in Palestine, Seychelles, and the New Hebrides, and the first record from Australia was made by Silverstein in 1938 from material of the 1905 Hamburg expedition. It is widely distributed in Australia and collections have been received from all the coastal regions, as far north as Cairns, and as far inland



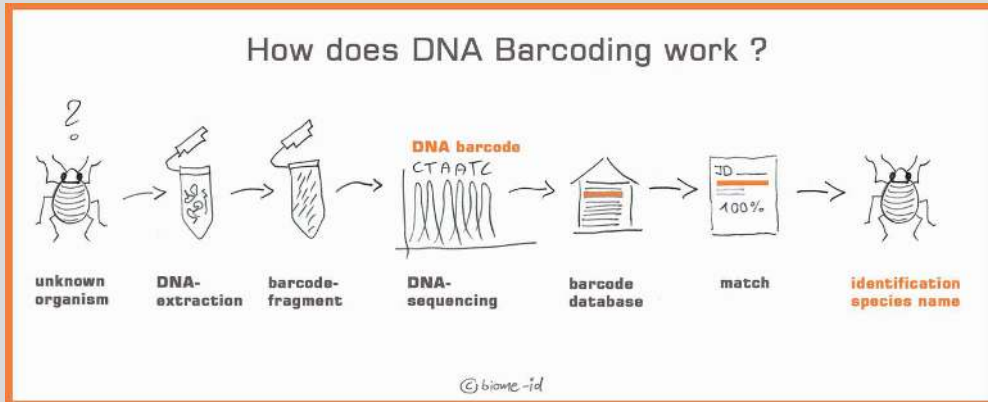
1940, 50 pages



Rathgen-Forschungslabor
Staatliche Museen zu Berlin

A 50 page publication in 1940 describes *Ctenolepisma longicauda* as widely distributed in Australia.

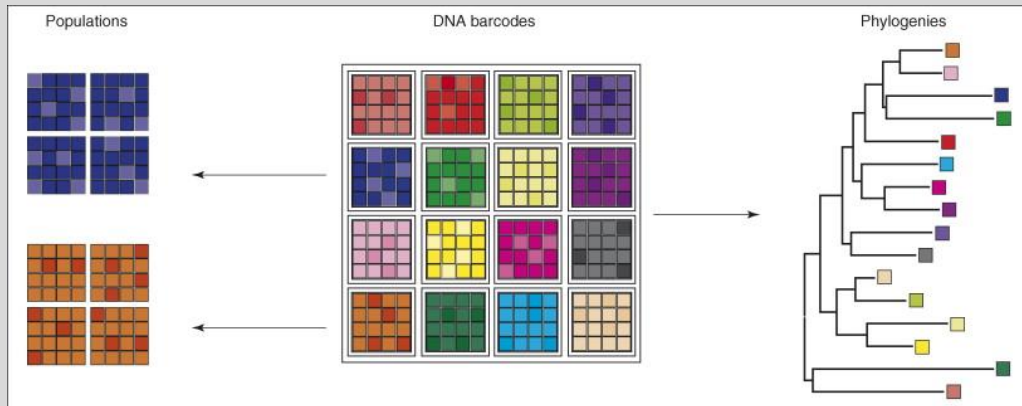
Species discrimination and identification



<https://www.biome-id.com>

DNA barcoding is a well established technique for identifying species. Sample material is extracted and a target gene (mostly COI) amplified in order to determine which species it belongs to after DNA sequencing and comparison with a barcode database.

Intraspecific variation and phylogeographic analysis

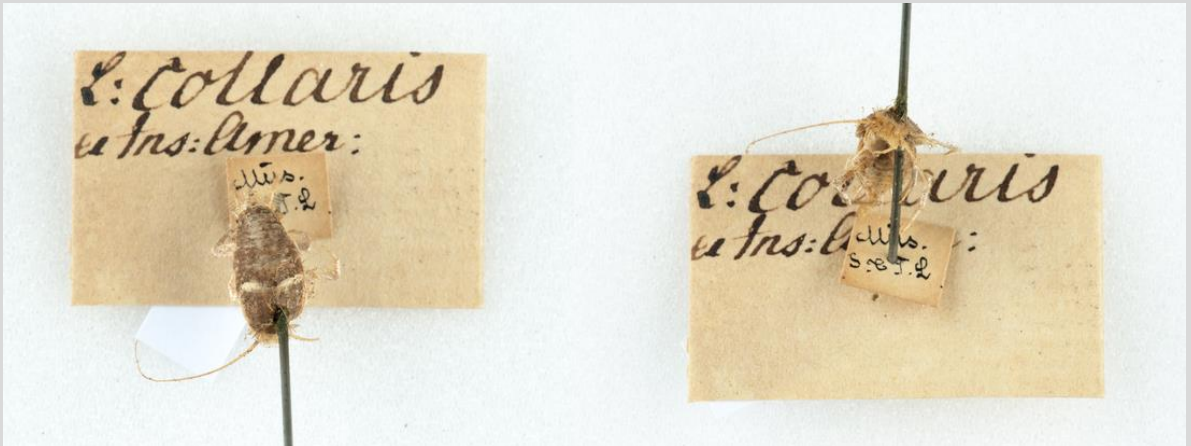


[http://www.cell.com/trends/genetics/fulltext/S0168-9525\(07\)00036-4](http://www.cell.com/trends/genetics/fulltext/S0168-9525(07)00036-4)

However, it is rather more demanding to characterize different, geographically separated, intraspecific populations and to show phylogenetic relationships. Patterns of genetic differentiation in the mitochondrial cytochrome c oxidase I (COI) gene as the standard metazoan DNA barcoding marker can be used to uncover potential distribution routes of these pests and to obtain information on their likely geographical area(s) of origin, which could help to identify natural biological control agents.



After an initial call, more than 300 samples of Gray Silverfish and Ghost Silverfish from Europe and South Africa have been compiled, but mainly from Germany. More samples from other regions are very welcome.



<http://sofiareboleira.weebly.com/blog/catalogue-of-the-type-material-in-the-entomological-collection-of-the-natural-history-museum-of-denmark>

In a next project stage, specimens preserved in natural history collections are to be investigated worldwide. This is going to be more challenging technically, but generally pinned insects seem to work reasonably well.

