

6.750 Käferarten und kein Ende in Sicht – Wie vermittelt man artenreiche und schwierige Gruppen?

Erfahrungen aus der Erarbeitung eines Käfer-Kurses für die NABU | naturgucker-Akademie

Thomas Hörren, Vorsitzender vom Entomologischen Verein Krefeld



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Burg Hohenzollern bei Bisingen. Foto: EVK



DIVERSITY OF INSECTS
DINA
IN NATURE
PROTECTED AREAS

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Über DINA | Ehrenamtliche in DINA | Projektteile von DINA | Aktuelles | Kontakt

Diversität von Insekten in Naturschutz-Arealen (DINA)
Verbundforschungsvorhaben zum Insektenschwund



dina-insektenforschung.de



Untersuchungsgebiete

- | | |
|--|---------------------------------|
| 01 Lütjenholmer Heidedünen | 11 Wipperdurchbruch |
| 02 Riedensee | 12 Bottendorfer Hügel |
| 03 Insel Koos, Kooser See, Wampener Riff | 13 Schwellenburg |
| 04 Geesower Hügel | 14 Hofberg |
| 05 Oderhänge Mallnow | 15 Koppelstein – Helmestal |
| 06 NSG Wisseler Dünen | 16 Rheinhänge Dörscheider Heide |
| 07 NSG Bislicher Insel | 17 Brauselay |
| 08 Gipskarstlandschaft Hainholz | 18 Mittelberg |
| 09 Porphyrlandschaft bei Gimritz | 19 Ipf |
| 10 Ziegenbuschhänge bei Oberau | 20 Kürnberg |
| | 21 Mühlhauser Halde |

OPEN

Direct pesticide exposure of insects in nature conservation areas in Germany

Carsten A. Brühl^{1,2,3}, Nikita Bakanov¹, Sebastian Köthe², Lisa Eichler³, Martin Sorg⁴, Thomas Hörrn⁴, Roland Mühlethaler², Gotthard Meinel³ & Gerlind U. C. Lehmann²

In Germany, the decline of insect biomass was observed in nature conservation areas in agricultural landscapes. One of the main causal factors discussed is the use of synthetic pesticides in conventional agriculture. In a Germany-wide field study, we collected flying insects using Malaise traps in nature conservation areas adjacent to agricultural land. We used a multi-component chemical trace element analysis to detect 92 common agricultural pesticides in ethanol from insect traps sampled in May and August 2020. In total, residues of 47 current use pesticides were detected, and insect samples were on average contaminated with 16.7 pesticides. Residues of the herbicides metolachlor-S, prosulfocarb and terbuthylazine, and the fungicides azoxystrobin and fluopyram were recorded at all sites. The neonicotinoid thiacloprid was detected in 16 of 21 nature conservation areas, most likely due to final use before an EU-wide ban. A change in residue mixture composition was noticeable due to higher herbicide use in spring and increasing fungicide applications in summer. The number of substances of recorded residues is related to the proportion of agricultural production area in a radius of 2000 m. Therefore, a drastic pesticide reduction in large buffers around nature conservation areas is necessary to avoid contamination of their insect fauna.

After biomass reductions of almost 80% within 27 years were documented for Germany¹, the decline of insects has received increased attention from researchers²⁻⁵ and the media⁶⁻⁷ in recent years. As a result, evaluations of the status of insect populations around the world were reviewed⁸, and related publications in the same issue). These scientific and public discussions on insect decline were followed by political measures such as the "Action Programme for Insect Protection" of the Federal Government of Germany⁹ and changes in nature protection laws.

Insects play a crucial role within almost all trophic levels in terrestrial food webs. As primary consumers, herbivorous insects feed on plants and are then consumed by predators like other insects, spiders, amphibians, reptiles, birds and mammals as for example bats and shrews. The benefits of insect-mediated ecosystem functions and services such as nutrient cycling, soil formation, decomposition, water purification, biological pest control, pollination and food web interactions, which are all also critical to human health, were recently highlighted^{10,11}. The decline of insects has become especially obvious in agricultural landscapes¹ where the parallel decline of farmland birds has been recorded in Europe since the 1980s, and especially the reduction of insects as food for juvenile birds has been discussed over the past decades^{12,13}.

Insecticides that are used to control "pest" insect species affect equally other non-target insects, many of them beneficial to the crop, not only in the treated agricultural fields but also in neighbouring habitats. The exposure and direct effects of neonicotinoid insecticides on pollinating insects such as honey bees has received special attention¹⁴. Wildflower pollen in field margins showed similar residue concentrations as treated oilseed rape pollen in the field¹⁵ and neonicotinoid concentrations were in the range of causing acute mortality in some insect species¹⁶. Additionally, herbicides are used to reduce "weeds" in fields that are food plants for insects¹⁷, therefore indirectly affecting higher trophic levels¹⁸. The role of herbicides in the decrease of insect food for grey partridge chicks was demonstrated in a field experiment almost 40 years ago¹⁹. A pan-European study on the biodiversity of plants, insects and birds in wheat fields identified pesticide applications as the main explanatory variable for reduced species numbers²⁰. Especially for pollinators, the constant presence of mixtures of pesticides in the landscape has been suggested as a factor for their decline^{18,21}. However, data on pesticide residues

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Abbreviation study site	Full name of study site	Herbicide residues	Fungicide residues	Insecticide residues	Sum pesticide residues
01_LUE	Lüpfenholmer Heide	5	3	1	9
02_RIE	Riedensee	10	11	1	22
03_KOO	Insel Kees	8	9	2	19
04_GEE	Gesener Hügel	10	9	2	21
05_MAL	Oderhänge Mallow	5	7	2	14
06_WIS	Wieseler Dünen	6	13	1	20
07_BES	Bälcher Insel	7	11	2	20
08_GIP	Gipskarstlandschaft Hainholz	5	6	1	12
09_POR	Porphyrylandschaft bei Gimritz	9	10	2	21
10_ZIE	Ziegenbuschhänge Niederera	8	17	2	27
11_WIP	Wipperfurthbruch	6	7	2	15
12_BOT	Bottendorfer Hügel	7	10	4	21
13_SBG	Schwellenburg	8	10	3	21
14_HOF	Hofberg	5	3	1	9
15_KOP	Koppeltstein	4	3	0	7
16_DOE	Rheinhänge Dierschbeider Heide	6	12	2	20
17_BRA	Braunsley	3	15	2	20
18_MIT	Mittelberg	5	5	1	11
19_IPF	Ipf	6	6	2	14
20_KUE	Kürenberg	6	9	2	17
21_MUE	Mühlhauer Halde	6	4	0	10
Minimum		3	3	0	7
Maximum		10	17	4	27
Mean		6.4	8.6	1.7	16.7

Table 1. Number of CUP residues detected at 21 nature conservation areas across Germany and the resulting minimal, maximal and mean number of pesticide substances. For study site locations and descriptions, (see (33) and SOM).



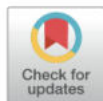
RESEARCH ARTICLE

More than 75 percent decline over 27 years in total flying insect biomass in protected areas

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Abstract

Global declines in insects have sparked wide interest among scientists, politicians, and the general public. Loss of insect diversity and abundance is expected to provoke cascading effects on food webs and to jeopardize ecosystem services. Our understanding of the extent and underlying causes of this decline is based on the abundance of single species or taxonomic groups only, rather than changes in insect biomass which is more relevant for ecological functioning. Here, we used a standardized protocol to measure total insect biomass using Malaise traps, deployed over 27 years in 63 nature protection areas in Germany (96 unique location-year combinations) to infer on the status and trend of local entomofauna. Our analysis estimates a seasonal decline of 76%, and mid-summer decline of 82% in flying insect biomass over the 27 years of study. We show that this decline is apparent regardless of habitat type, while changes in weather, land use, and habitat characteristics cannot explain this overall decline. This yet unrecognized loss of insect biomass must be taken into account in evaluating declines in abundance of species depending on insects as a food source, and ecosystem functioning in the European landscape.

Introduction

Loss of insects is certain to have adverse effects on ecosystem functioning, as insects play a central role in a variety of processes, including pollination [1, 2], herbivory and detritivory [3, 4], nutrient cycling [4] and providing a food source for higher trophic levels such as birds, mammals and amphibians. For example, 80% of wild plants are estimated to depend on insects for pollination [2], while 60% of birds rely on insects as a food source [5]. The ecosystem services provided by wild insects have been estimated at \$57 billion annually in the USA [6]. Clearly, preserving insect abundance and diversity should constitute a prime conservation priority.

Current data suggest an overall pattern of decline in insect diversity and abundance. For example, populations of European grassland butterflies are estimated to have declined by 50% in abundance between 1990 and 2011 [7]. Data for other well-studied taxa such as bees [8–14]

OPEN ACCESS

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Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

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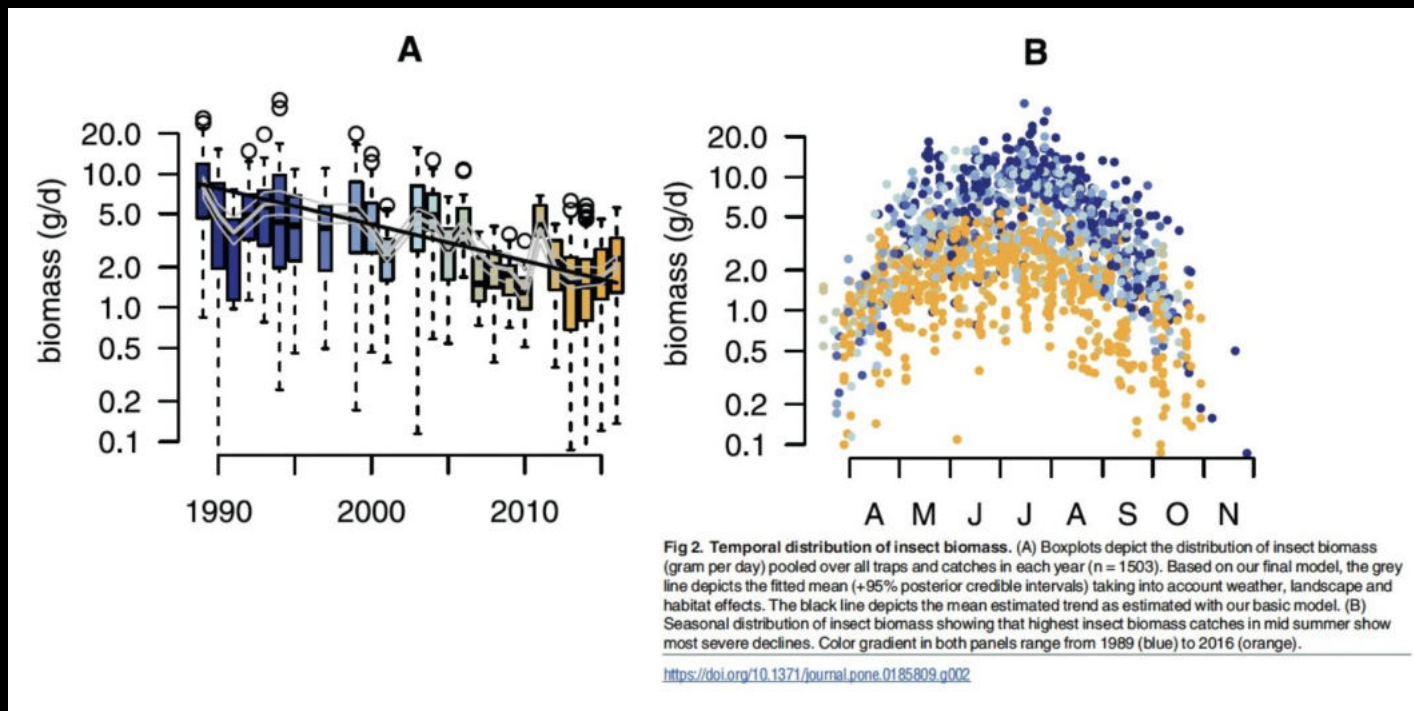


Fig 2. Temporal distribution of insect biomass. (A) Boxplots depict the distribution of insect biomass (gram per day) pooled over all traps and catches in each year ($n = 1503$). Based on our final model, the grey line depicts the fitted mean (+95% posterior credible intervals) taking into account weather, landscape and habitat effects. The black line depicts the mean estimated trend as estimated with our basic model. (B) Seasonal distribution of insect biomass showing that highest insect biomass catches in mid summer show most severe declines. Color gradient in both panels range from 1989 (blue) to 2016 (orange).

<https://doi.org/10.1371/journal.pone.0185809.g002>

1993



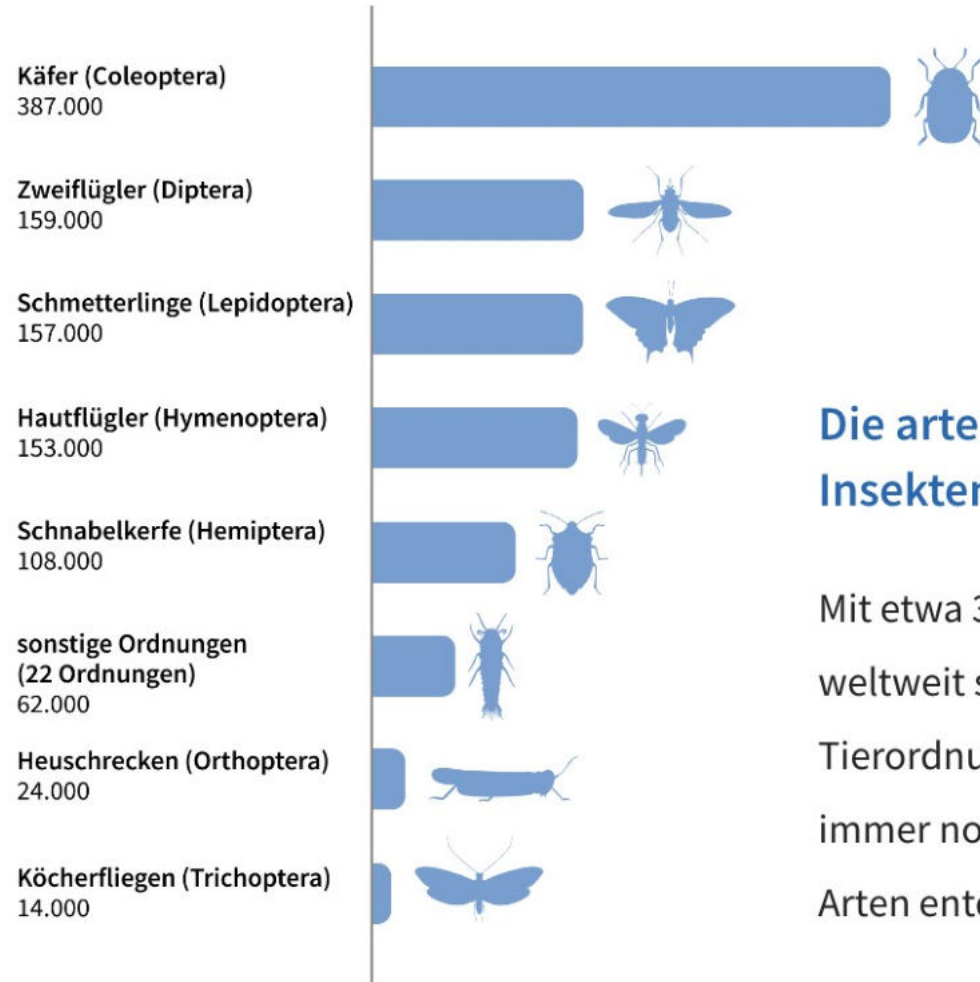
2014





Vielfalt der Käfer

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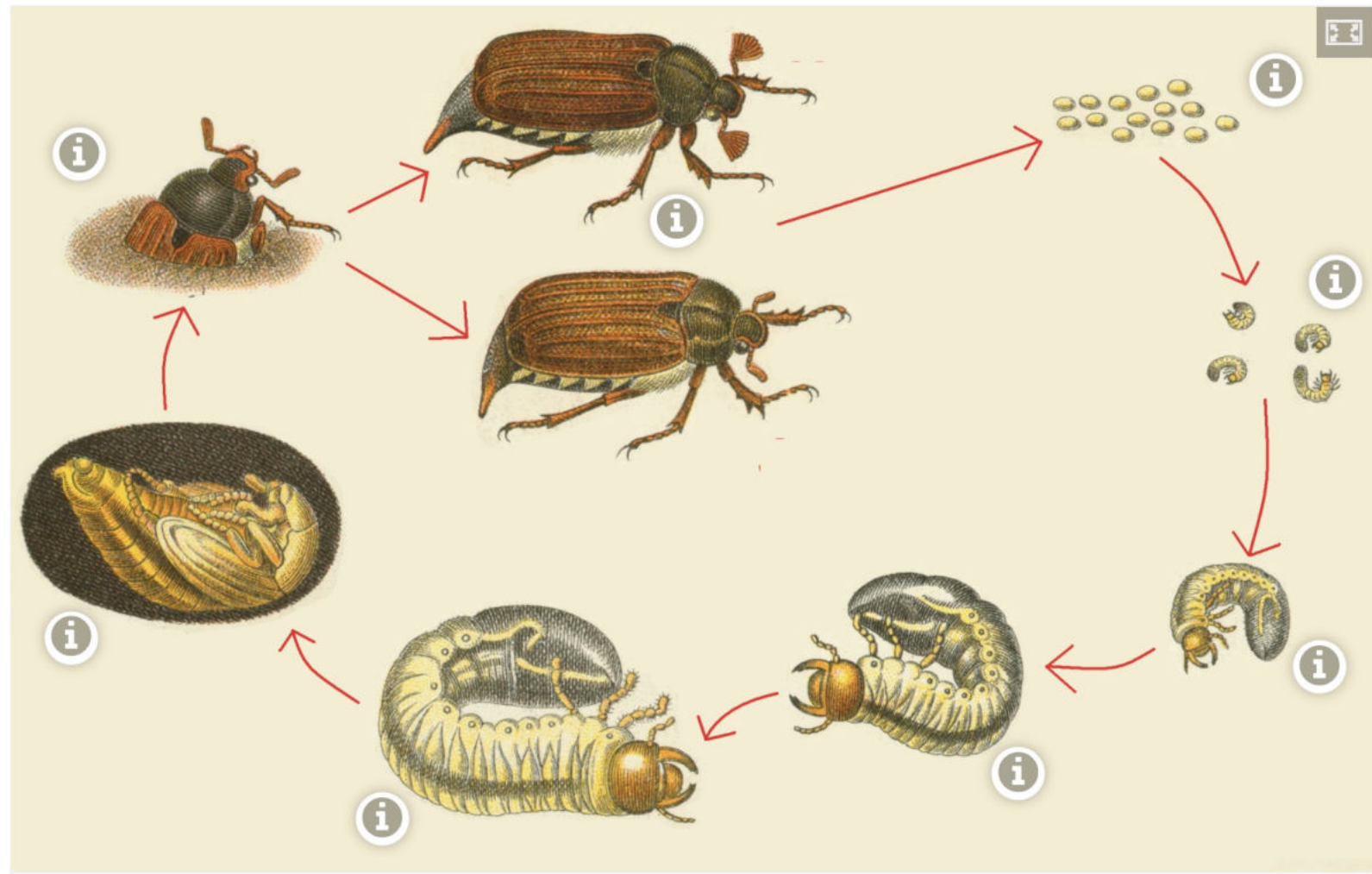


Die artenreichste Insektenordnung

Mit etwa 390.000 beschriebenen Arten weltweit sind Käfer die artenreichste Tierordnung, die wir heute kennen – und immer noch werden jedes Jahr neue Arten entdeckt....

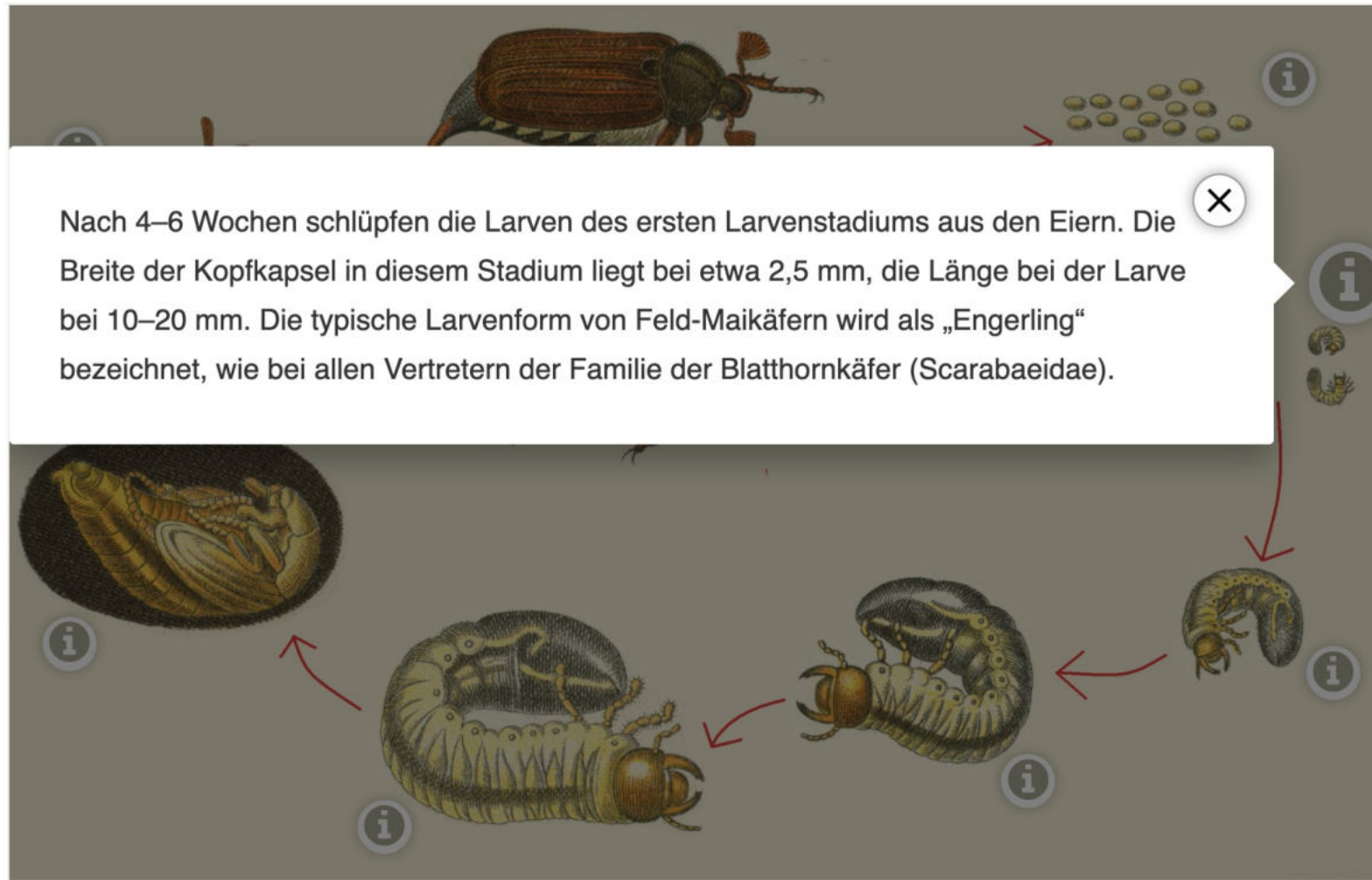
Käfer sind holometabole Insekten

Auf diesem Bild könnt ihr den holometabolen Lebenszyklus und die starke Gestaltenwandlung während der Metamorphose entdecken. Geht der vollständigen Entwicklung des Feld-Maikäfers (*Melolontha melolontha*) in den einzelnen Entwicklungsstufen nach, indem ihr auf die Informationspunkte klickt. Ihr erfahrt viel Wissenswertes zur Biologie dieses berühmten Käfers.



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Exklusive Einblicke bieten

5 Punkte, die m.E. zentral für eine spannende Vermittlung sind

- Wenn Expertise vorhanden ist, diese ausschöpfen!
- Neben “klassischen Grundlagen” auch Ungezeigtes zeigen!
- Welche Lebensweisen entziehen sich unseren Blicken besonders?
- Gibt es besondere Gegensätze oder Spannweiten (z.B. sehr winzige und sehr große Arten)?
- Frage an mich selbst: Welche Geschichte hätte mich selbst zu Beginn besonders fasziniert?





Erfahrungen einfließen lassen

Was ist spannend, was ist zu „trocken“?

- Didaktische Erfahrung hilft
 - Feedback berücksichtigen
- Auch komplexe Inhalte zutrauen!
- Durchlesen Dritter und Lektorate









Lange Beine



(c) Sophie Gronwald/NABU-naturgucker.de



Seine langen Beine nutzt der Dünen-Sandlaufkäfer, um sich bei großer Hitze möglichst weit vom Boden abzudrücken. Unter seinem Körper sammelt sich eine Art „Luftglocke“, bei der die Luft durch den eigenen Schatten kühler als die Umgebungsluft ist.

totholz.thomas   



79 Beiträge **10,4 Tsd.** Follower **1.015** Gefolgt




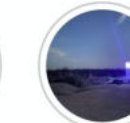

Thomas Hörren | Insektenforscher & Autor
WissenschaftlerIn
(he/him)



 Biodiversität & Wissenschaft
* Forschung zu Insektenvielfalt und -verlusten
 Vorsitzender von @entomologica_org... mehr


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 Borkenkäfer  Insektenhot...  Q&A  Südfrankrei...  Honigbienen



  






So könnt ihr mich buchen

 **der_brunch_4Wo.** ·  von Verfasser 


sehr schöne Information. direkt vor der Haustür da wird jetzt viel mehr drauf geachtet und wenn notwendig geschützt

 **steffeng69x** 4Wo. ·  von Verfasser 




Das ist doch mal ein hübscher Käfer 👍 werde bei uns in Sachsen mal die Augen offen halten.

 **dani_anima** 4Wo. ·  von Verfasser 



Oh wow, obwohl ich aus der Region komme, ist er mir bisher noch nicht aufgefallen. Ich werd aber nun umso aufmerksamer sein. 😊 Toll finde ich übrigens auch, dass du schreibst, mit welchen Käfern man ihn verwechseln könnte. Für mich als Laie super.

 **siebenkaefer** 15Wo. ·  von Verfasser 

Mal wieder n sehr schöner Beitrag und soooo schöne Fotos. Finds so toll, dass du das kombinierst 🥰

 **schaut_an** 35Wo. ·  von Verfasser 

berührende worte. ♡ liest sich ein bisschen wie eine aufzeichnung humboldts. das entdecken, das begreifen, das staunen. und der wille das gesehene/erlebte weiterzugeben. und ein erstaunlich schönes, kleines wesen das du uns da zeigst. danke dafür. 🙌

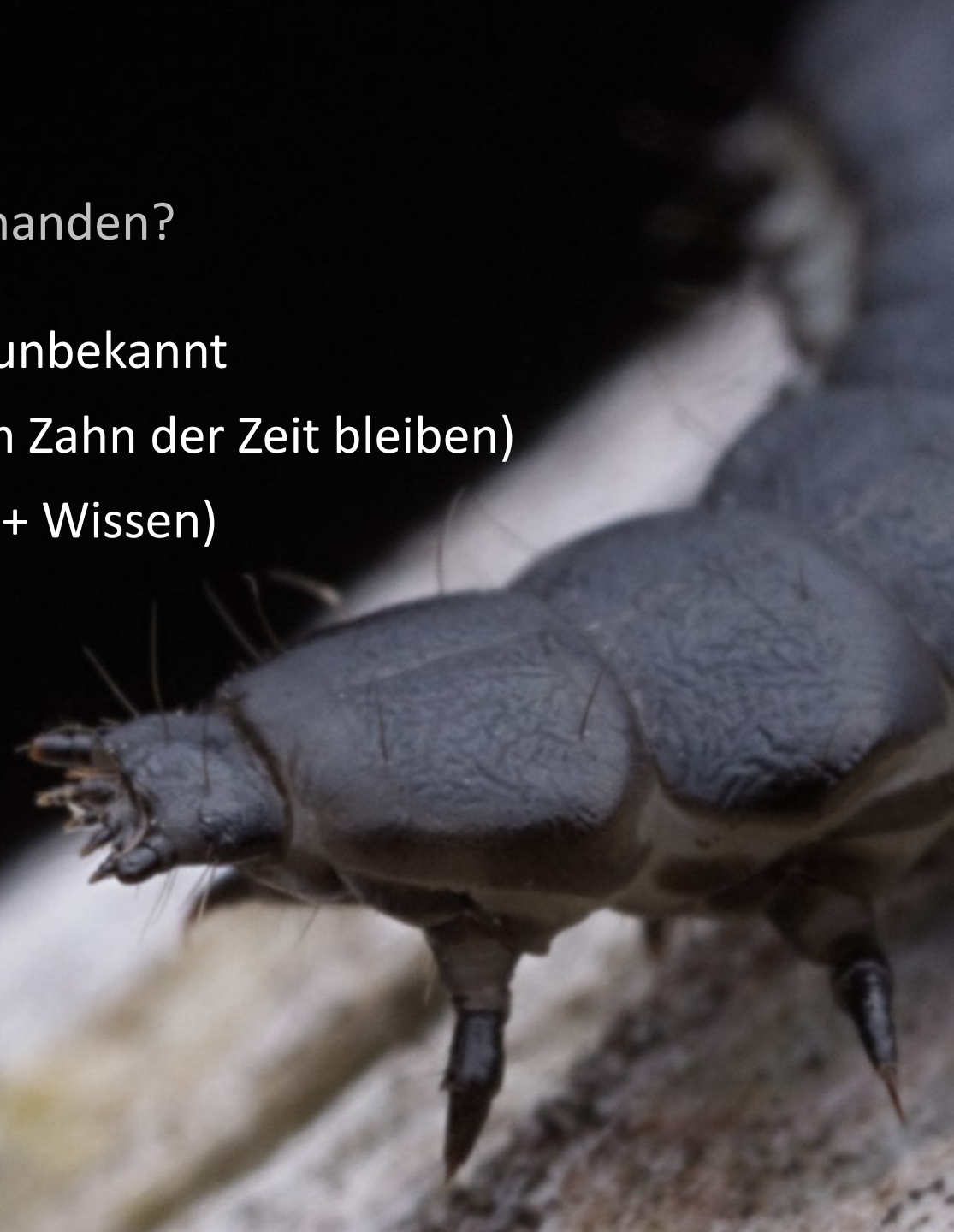
 **klima_und_artenschutz.kerpen** 35Wo. ·  von Verfasser 

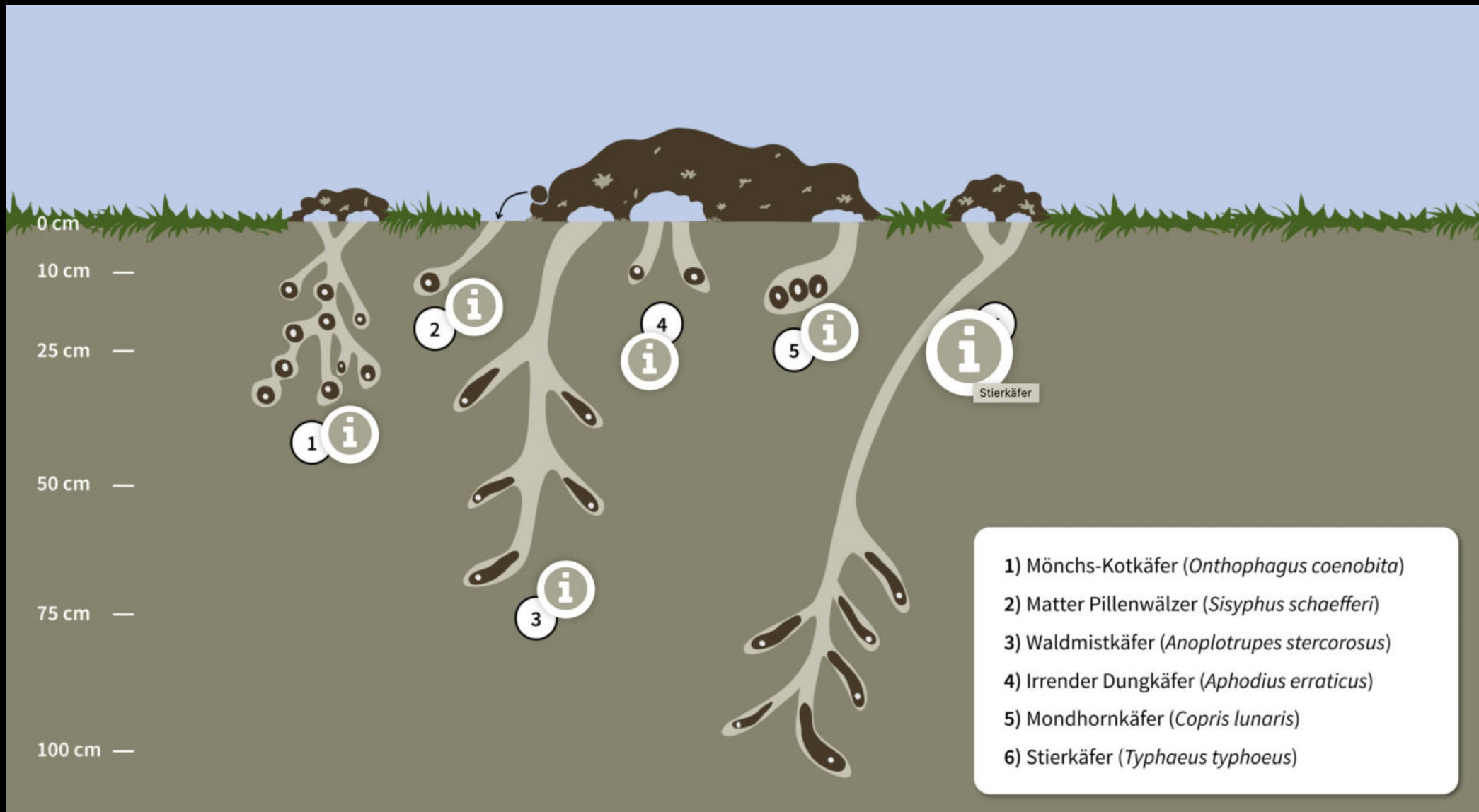
Toller Käfer. Da frage ich mich, welchen evolutionären Vorteil ein transparenter Schild bietet bei insgesamt glänzender Erscheinung?

Zugänge zu Wissen schaffen

Welche Bereiche sind nur in der Fachliteratur vorhanden?

- Bei Käfern z.B. die Entwicklungsstadien meist unbekannt
- Fakten aus neuen Studien berücksichtigen (Am Zahn der Zeit bleiben)
- Informationen sinnvoll verknüpfen (Lustvolles + Wissen)





Selbst entdecken lassen!

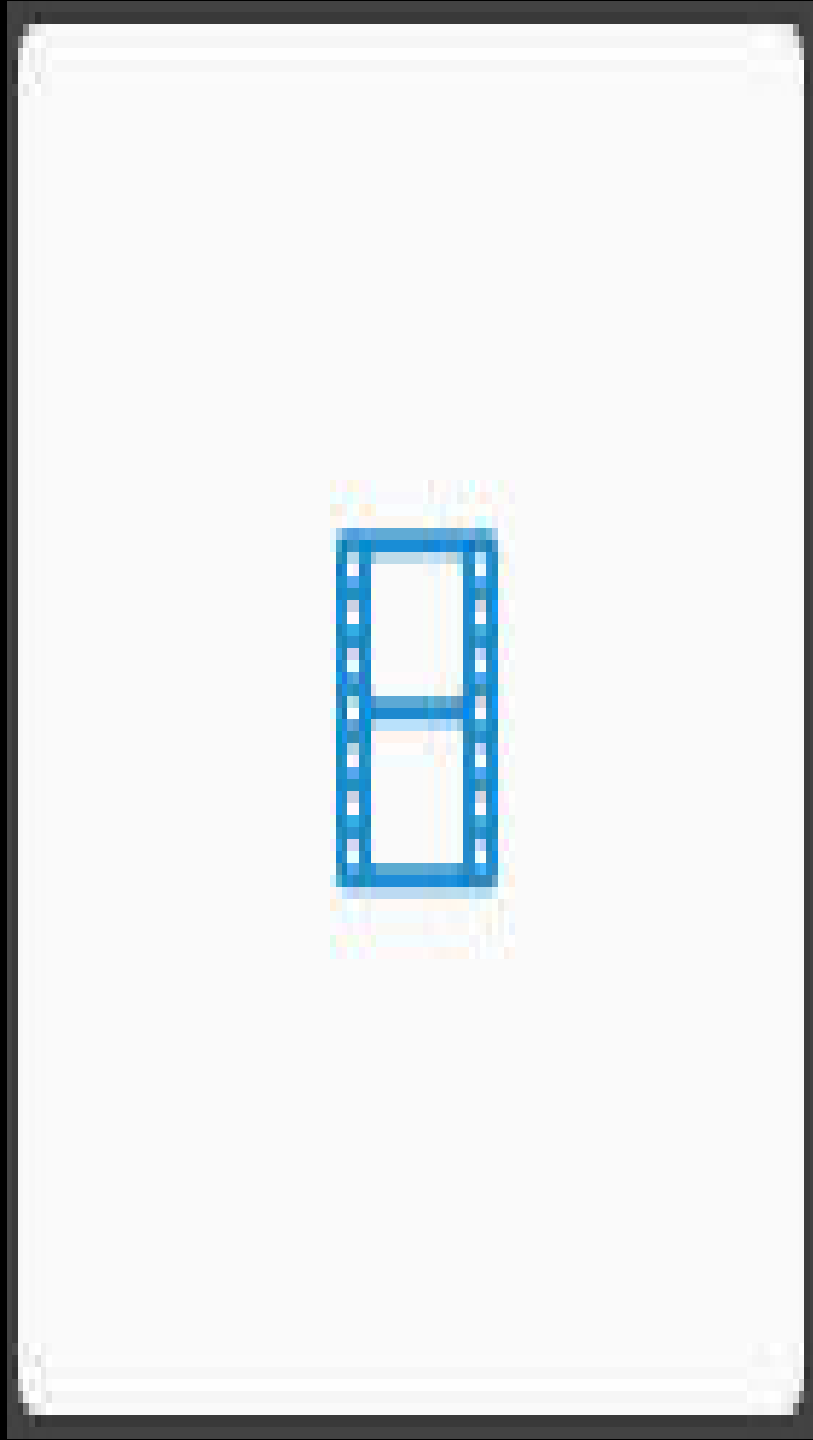
Eigene Erlebnisse sind immer das Schönste

- Arten mit Anleitungen zum selber Entdecken auswählen
- Dabei neben häufigen Arten unauffällige und exklusive!
- Gute und simple Anleitungen schaffen





Der Mauer-Ahlenläufer *Ocys quinquestriatus* an einer Friedhofsmauer.





Vielen Dank für Ihre Aufmerksamkeit!

Bis bald, im Netz!



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